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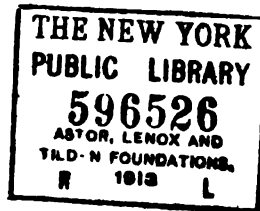
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† Mr. Henry Irving died early in 1895; his articles have been read in proof by Mr. W. J. McGee, of the U. S. Bureau of Ethnology.

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PECULIAR PHONETIC SYMBOLS

USED IN THE WRITING OR TRANSLITERATION OF THE DIFFERENT LANGUAGES.

- | | |
|---|---|
| <p>ā, ē, etc.: long vowels; in the Scandinavian languages the accent (á, é, etc.) is used to denote length.</p> <p>ą: a nasalized <i>a</i>; so used in the transliteration of the Iranian languages.</p> <p>å: labialized guttural <i>a</i> in Swedish.</p> <p>æ: open <i>a</i> of Eng. <i>hat</i>, used chiefly in O. Eng.</p> <p>af: used in Gothic to denote <i>e</i> (open), in distinction from <i>ái</i>, the true diphthong.</p> <p>au: used in Gothic to denote <i>o</i> (open), in distinction from <i>áu</i>, the true diphthong.</p> <p>bh: in Sanskrit a voiced labial aspirate (cf. <i>ch</i>).</p> <p>ɸ: voiced bilabial (or labio-dental) spirant, used in discussions of Teutonic dialects.</p> <p>ç: voiceless palatal sibilant, similar to Eng. <i>sh</i>, used especially in transliteration of Sanskrit.</p> <p>č: frequently used, e. g. in Slavonic languages, to denote the sound of Eng. <i>ch</i> in <i>cheek</i>.</p> <p>c: voiceless palatal explosive, commonly used in transliteration of Sanskrit and the Iranian languages.</p> <p>ch: as used in the transliteration of Sanskrit, a voiceless palatal aspirate, an aspirate being an explosive with excess of breath; as used in German grammar, the symbol for a voiceless palatal or guttural spirant.</p> <p>dh: voiced dental aspirate (cf. <i>ch</i>) in Sanskrit.</p> <p>ɖ: voiced cerebral explosive, so used in transliteration of Sanskrit.</p> <p>ɗ: voiced cerebral aspirate (cf. <i>ch</i>) in Sanskrit.</p> <p>ð: voiced dental (interdental) spirant, equivalent to Eng. <i>th</i> in <i>then</i>; so used in the Teutonic and Iranian languages and in phonetic writing.</p> <p>ē: a short open <i>e</i>, used in Teutonic grammar, particularly in writing O. H. G.</p> <p>ə: the short indefinite or "obscure" vowel of Eng. <i>gardener</i>; used in the reconstruction of Indo-Eur. forms, and in transliterating the Iranian languages.</p> <p>gh: in Sanskrit a voiced guttural aspirate (cf. <i>ch</i>).</p> <p>g: voiced velar (back-guttural) explosive, used most frequently in Indo-Eur. reconstructions.</p> <p>ȝ: voiced guttural (or palatal) spirant, equivalent to Mod. Greek <i>ȝ</i>, and used in transliteration of Iranian languages and O. Eng.</p> <p>h: a voiceless breathing, the Sanskrit <i>visarga</i>.</p> <p>hw: a labialized <i>h</i>, similar to <i>wh</i> in Eng. <i>what</i>; used in transliteration of Gothic and the Iranian languages.</p> <p>h̥: voiceless guttural (or palatal) spirant, equivalent to German <i>ch</i>, and used in transliteration of the Iranian languages.</p> <p>j: the semi-vowel <i>y</i>, or consonant form of <i>i</i>; used in phonetic writing and reconstructions of Indo-Eur. forms.</p> | <p>j: in the transliteration of Sanskrit and the Iranian languages a voiced palatal explosive; in the Teutonic languages a semi-vowel (= <i>y</i>), for which in Indo-Eur. reconstructions <i>i</i> is generally used.</p> <p>jh: in Sanskrit a voiced palatal aspirate (cf. <i>ch</i>).</p> <p>kh: in Sanskrit a voiceless guttural aspirate (cf. <i>ch</i>).</p> <p>l: the guttural ("thick" or "deep") of the Slavonic and some of the Scandinavian languages.</p> <p>ɭ: vowel <i>l</i>; used in transliterating Sanskrit, in reconstructing Indo-Eur. forms, and in other phonetic writing.</p> <p>ŋ: nasal vowel; used in reconstruction of Indo-Eur. forms and in phonetic writing.</p> <p>ṇ: in Sanskrit the cerebral nasal.</p> <p>ñ: in Sanskrit the guttural nasal (see following).</p> <p>ɲ: the guttural nasal, equivalent to Eng. <i>n</i> in <i>longer</i>; used in transliteration of Iranian languages.</p> <p>ɳ: palatal nasal, similar to <i>gn</i> in Fr. <i>regner</i>; used in transliterating Sanskrit and in phonetic writing.</p> <p>ō: palatalized <i>o</i>; used in German and in phonetic writing.</p> <p>ɔ: short open <i>o</i> in Scandinavian.</p> <p>ø: short palatalized <i>o</i> (ø) in Scandinavian.</p> <p>ph: in Sanskrit, voiceless labial aspirate (cf. <i>ch</i>).</p> <p>ɸ: voiceless velar (back-guttural) explosive; used in reconstructions of Indo-Eur. forms and in other phonetic writing.</p> <p>ɹ: vowel <i>r</i>; used in transliterating Sanskrit, in reconstructions of Indo-Eur. forms, and in other phonetic writing.</p> <p>š: voiceless cerebral sibilant, equivalent to Eng. <i>sh</i>; used in transliterating the Iranian languages and in phonetic writing.</p> <p>ʃ: voiceless cerebral spirant; used in transliterating Sanskrit.</p> <p>th: in Sanskrit a voiceless dental aspirate (cf. <i>ch</i>).</p> <p>ʈ: in Sanskrit a voiceless cerebral aspirate (cf. <i>ch</i>).</p> <p>ʈ̥: in Sanskrit a voiceless cerebral explosive.</p> <p>ʈ̣: a form of dental spirant used in transliterating the Iranian languages (represented in Justi's transliteration by <i>ṭ</i>).</p> <p>ɸ: voiceless dental (interdental) spirant, equivalent to Eng. <i>th</i> in <i>thin</i>; used in Teutonic dialects and in phonetic writing.</p> <p>u: consonant form of <i>u</i>; used in phonetic writing.</p> <p>ž: voiced cerebral sibilant, equivalent to <i>s</i> in Eng. <i>pleasure</i>, and to <i>j</i> in Fr. <i>jardin</i>; used in Iranian, Slavonic, and in phonetic writing.</p> <p>z: a symbol frequently used in the writing of O. H. G. to indicate a voiced dental sibilant (Eng. <i>s</i>), in distinction from <i>z</i> as sign of the affricata (<i>ts</i>).</p> |
|---|---|

EXPLANATION OF THE SIGNS AND ABBREVIATIONS USED IN THE ETYMOLOGIES.

>, yielding by descent, i. e. under the operation of phonetic law.

<, descended from.

=, borrowed without change from.

:, cognate with.

+, a sign joining the constituent elements of a compound.

*, a sign appended to a word the existence of which is *inferred*.

ablat.	ablative	Dan.	Danish
accus.	accusative	Eng.	English
adject.	adjective	Fr.	French
adv.	adverb	Germ.	German
compar.	compare	Goth.	Gothic
conjunc.	conjunction	Gr.	Greek
deriv. of	derivative of	Heb.	Hebrew
dimin.	diminutive	Icel.	Icelandic
fem.	feminine	Ital.	Italian
genit.	genitive	Lat.	Latin
imper.	imperative	Lith.	Lithuanian
imperf.	imperfect	Mediæv. Lat.	Mediæval Latin
indic.	indicative	Mod. Lat.	Modern Latin
infinit.	infinitive	M. Eng.	Middle English
mascul.	masculine	M. H. Germ.	Middle High German
nom.	nominative	O. Bulg.	Old Bulgarian (= Church Slavonic)
partic.	participle	O. Eng.	Old English (= Anglo-Saxon)
perf.	perfect	O. Fr.	Old French
plur.	plural	O. Fris.	Old Frisian
prep.	preposition	O. H. Germ.	Old High German
pres.	present	O. N.	Old Norse
pron.	pronoun	O. Sax.	Old Saxon
scilicet.	scilicet, supply	Pers.	Persian
sing.	singular	Portug.	Portuguese
subst.	substantive	Prov.	Provençal
vocat.	vocative	Sanskrit.	Sanskrit
Anglo-Fr.	Anglo-French	Sc.	Scotch
Arab.	Arabic	Span.	Spanish
Avest.	Avestan	Swed.	Swedish
		Teuton.	Teutonic

KEY TO THE PRONUNCIATION.

aa..... as <i>a</i> in <i>father</i> , and in the second syllable of <i>armada</i> .	ö..... as in <i>Göthe</i> , and as <i>eu</i> in French <i>neuf</i> , <i>Chintreuil</i>
ä..... same, but less prolonged, as in the initial syllable of <i>armada</i> , <i>Arditi</i> , etc.	ü..... as in <i>but</i> , <i>hub</i> .
a..... as final <i>a</i> in <i>armada</i> , <i>peninsula</i> , etc.	û..... obscure <i>o</i> , as final <i>o</i> in <i>Compton</i> .
ä..... as <i>a</i> in <i>fat</i> , and <i>i</i> in French <i>fin</i> .	ü..... as in German <i>süd</i> , and as <i>u</i> in French <i>Buzançais</i> , <i>vu</i> .
ay or ä.. as <i>ay</i> in <i>nay</i> , or as <i>a</i> in <i>fate</i> .	y or l.... see <i>l</i> or <i>y</i> .
äy or ä.. same, but less prolonged.	yu..... as <i>u</i> in <i>mule</i> .
ë..... as <i>a</i> in <i>welfare</i> .	yü..... same, but less prolonged, as in <i>singular</i> .
aw..... as <i>a</i> in <i>fall</i> , <i>all</i> .	ch..... as in German <i>ich</i> .
ee..... as in <i>meet</i> , or as <i>i</i> in <i>machine</i> .	g..... as in <i>get</i> , <i>give</i> (never as in <i>gist</i> , <i>congest</i>).
ëö..... same, but less prolonged, as final <i>i</i> in <i>Arditi</i> .	hw..... as <i>wh</i> in <i>which</i> .
e..... as in <i>men</i> , <i>pet</i> .	kh..... as <i>ch</i> in German <i>nacht</i> , <i>g</i> in German <i>tag</i> , <i>ch</i> in Scotch <i>loch</i> , and <i>j</i> in Spanish <i>Badajos</i> , etc.
e..... obscure <i>e</i> , as in <i>Bigelow</i> , and final <i>e</i> in <i>Heine</i> .	ñ..... nasal <i>n</i> , as in French <i>fin</i> , <i>Bourbon</i> , and nasal <i>m</i> , as in French <i>nom</i> , Portuguese <i>Sam</i> .
é..... as in <i>her</i> , and <i>eu</i> in French <i>-eur</i> .	ñ or n-y.. Spanish <i>ñ</i> , as in <i>cañon</i> , <i>piñon</i> , French and Italian <i>gn</i> , etc., as in <i>Boulogne</i> .
i..... as in <i>it</i> , <i>sin</i> .	l or y.... French <i>l</i> , liquid or mouillé, as (-i)ll- in French <i>Baudrillart</i> , and (-i)l in <i>Chintreuil</i> .
I..... as in <i>five</i> , <i>swine</i> .	th..... as in <i>thin</i> .
ï..... same, but less prolonged.	th..... as in <i>though</i> , <i>them</i> , <i>mother</i> .
ö..... as in <i>mole</i> , <i>sober</i> .	v..... as <i>w</i> in German <i>zwei</i> , and <i>b</i> in Spanish <i>Cordoba</i> .
ö..... same, but less prolonged, as in <i>sobriety</i> .	sh..... as in <i>shine</i> .
o..... as in <i>on</i> , <i>not</i> , <i>pot</i> .	zh..... as <i>s</i> in <i>pleasure</i> , and <i>j</i> in French <i>jour</i> .
oo..... as in <i>fool</i> , or as <i>u</i> in <i>rule</i> .	
öo..... as in <i>book</i> , or as <i>u</i> in <i>put</i> , <i>pull</i> .	
oi..... as in <i>noise</i> , and <i>oy</i> in <i>boy</i> , or as <i>eu</i> in German <i>Beust</i> .	
ow..... as in <i>now</i> , and as <i>au</i> in German <i>haus</i> .	

All other letters are used with their ordinary English values.

NOTE.

The values of most of the signs used in the above Key are plainly shown by the examples given. But those of ö, ü, ch, kh, ñ, and v, which have no equivalents in English, can not be sufficiently indicated without a brief explanation, which is here given.

ö. The sound represented by this symbol is approximately that of -u- in *hurt* or -e- in *her*, but is materially different from either. It is properly pronounced with the tongue in the position it has when ä is uttered and with the lips in the position assumed in uttering ö.

ü. This vowel is produced with the lips rounded as in uttering oo and with the tongue in the position required in uttering ee, into which sound it is most naturally corrupted.

ch and kh. These are both rough breathings or spirants made with considerable force, ch being made between the flat of the tongue and the hard palate, and kh between the tongue and the soft palate. ch approaches in sound to English sh, but is less sibilant and is made further back in the mouth; kh is a guttural and has a hawking sound.

l or y. These are both used to represent the sound of French *l* mouillé, in (-i)ll- and (-i)l, which resembles English -y- in *lawyer*. Final *l*, that is, (-i)l, may be approximated by starting to pronounce *lawyer* and stopping abruptly with the -y-.

ñ or n-y. The consonants represented by ñ (Spanish *ñ*, French and Italian *gn*, etc.) are practically equivalent to English -ni- or -ny- in *bunion*, *bunyon*, *onion*, etc., and, except when final, are represented by n-y. Final ñ, as French -gn(e), may be produced by omitting the sound of -on in the pronunciation of *onion*.

v. This may be pronounced by attempting to utter English *v* with the use of the lips alone.

See PREFACE (vol. i., p. xxiv.) and the article PRONUNCIATION OF FOREIGN NAMES.

JOHNSON'S UNIVERSAL CYCLOPÆDIA.



Raleigh (city), capital of North Carolina and of Wake County; on the Seaboard Air Line and the Southern railways; 148 miles S. by W. of Washington, 286 miles S. & W. of Washington, D. C. (for location, see map of North Carolina, ref. 9-11). It is on a rolling, rich, and tobacco-growing region, handles about 125,000 bales of cotton annually, and contains large railway-car works and cotton-gins, 4 breweries, 2 large planing-mills, 2 cotton-mills, a steam-laid mill, 2 clothing-factories, a manufactory of machinery, agricultural-implement works, a factory, and other industries. The public buildings include the Capitol, in a small park of magnificent oaks; a U. S. Government building cost \$400,000; the State penitentiary (cost over \$200,000); one of three State asylums for the insane;

between 1563 and passed several years fighting in behalf of the Huguenots in France; served under Sir John Norris, and afterward under the Prince of Orange, in the Netherlands 1576-79. His half-brother, Sir Humphrey Wilkyns, having meanwhile obtained from Elizabeth letters patent dated June 11, 1579, empowering him to discover and possess any countries in North America not previously occupied, Raleigh sailed with him for Newfoundland 1579, but was forced by storms (and perhaps by an engagement with a Spanish fleet) to return without having landed in America. He went to Ireland as captain of a company 1580; aided in suppressing the Earl of Desmond's rebellion; was associated with Sir William Morgan in the government of the province of Munster; presented himself at court 1582; obtained the favor of Elizabeth; was employed in confidential negotiations with the French ambassador and the Duke of Anjou; subscribed £2,000 to the second expedition to Newfoundland under Sir Humphrey Gilbert, which resulted in the occupation of that island and the death of Sir Humphrey by shipwreck 1583, and obtained from Elizabeth a new patent for discoveries and colonization in North America, by virtue of which an expedition, headed by Philip Amidas and Arthur Barlow, sailed from England Apr. 13, 1584, and explored Pamlico and Albemarle Sounds in the summer of that year. Their enthusiastic accounts of the newly discovered region being made known to Elizabeth, she bestowed upon it the name of Virginia, and conferred knighthood upon Raleigh 1585, who in the course of the year was made lord warden of the shrieves and somerschal of the counties of Cornwall and Devon; took his seat in Parliament for Devonshire; obtained the passage of a bill confirming his proprietary rights, and dispatched to Virginia an expedition of seven vessels and 108 colonists under Sir Richard Grenville, which made a settlement on Roanoke island. Re-enforcements were sent in the two following years, but the enterprise failed through the capture of two ships by the French, and from mismanagement on the part of the leaders of the colonists, some of whom returned home, and the remainder perished by starvation or massacre; the chief practical result being the introduction of tobacco and potatoes into England. He took an active part in the preparations for repelling the Spanish Armada as captain of the queen's guard, member of the council of war, and lieutenant-general of the forces in Cornwall; commanded a vessel which rendered good service in the actions with the Armada, July, 1588; accompanied Sir Francis Drake in his expedition to Portugal 1589; visited Edmund Spenser at Killybegs Castle, Ireland, on his return, and in behalf of the poet presented to Elizabeth the first three books of the *Faerie Queene*. In 1590 he equipped a fleet of thirteen vessels, and with Frolicher cruised successfully against Spanish vessels in the West Indies. He was imprisoned for two months in the Tower of London 1592, on account of his secret marriage with Elizabeth Throgmorton, one of the queen's maids of honor, and, being forbidden to present himself at court, he organized an expedition of five vessels, with which he sailed from Plymouth Feb. 9, 1595, explored the coasts of Guiana, and ascended Orinoco river, and on his return published *The Discovery of the Large, Rich, and Beautiful Empire of Guiana* (Am. 1596). He served as rear-admiral at the taking of Cadix, where he



State Capitol, Raleigh, N. C.

the Duke Agricultural and Mechanical College; the State fair-ground, and State institutions for the white blind and the colored deaf-mute and blind. There are 14 churches for white people and 19 for colored. The educational institutions include Wake University for colored males and females (founded, opened in 1900, with an agricultural and mechanical annex); Peace Institute (Presbyterian, chartered in 1872); St. Mary's School (Protestant Episcopal, opened in 1885); the Raleigh Male Academy (non-sectarian, opened in 1887); St. Augustine's Normal School and Collegiate Institute (Protestant Episcopal, colored, opened in 1895); Latin Academy, colored; and 6 public schools. There are 4 libraries, including the State (founded in 1822) and the University (founded in 1845), with an aggregate of over 100,000 vols. The city has improved water and sewerage systems, electric lights, street-railway, 2 national banks with combined capital of \$600,000, 2 State banks with capital of \$100,000 and \$50,000, 5 weekly, and 2 monthly periodicals. Pop. (1880) 12,363; (1890) 17,079.

Author of "Fighting Vessels."

Ralegh, or Raleigh, Sir Walter, explorer and author; born Hinton, parson of East Budleigh, Devonshire, England, 1. Father, second son of Walter Raleigh by his wife Catherine Baskerville, widow of Oliver Gillard; entered at Christ Church, Oxford, about 1593; enrolled himself in a volunteer company of mercenaries commanded by his relative, Henry Cham-

was wounded, June, 1596; was readmitted at court May, 1597; sailed with the Earl of Essex to the Azores in the same year and took Fayal, but quarreled with his commander and contributed to the ruin of Essex; obtained a grant of the fine manor of Sherborne, Dorsetshire; went as ambassador to the Netherlands 1600; became governor of Jersey 1601; lost favor at court on the accession of James I., was accused of conspiring to raise Lady Arabella Stuart to the throne, committed to the Tower in July, and condemned to death at Winchester, Nov. 17, 1603; suffered confiscation of his estates, which were given to Carr, the new favorite; was kept thirteen years in the Tower, during which time he wrote and published his principal work, *The History of the World* (1614); recovered his liberty, though not his pardon, through the influence of Villiers, Jan. 30, 1616; obtained from James a commission as admiral, and sailed with a fleet of fourteen ships for the discovery of his promised El Dorado in Guiana Mar. 28, 1617; had several engagements with the Spaniards, in one of which he lost his oldest son; lost several vessels, and was foiled in his objects; landed at Plymouth on his return June, 1618; was imprisoned on complaint of the Spanish ambassador, Gondomar, in consequence of his conduct in Guiana, and it having been decided by the judges that the sentence of death pronounced in 1603 was still valid, he was executed at the palace yard, Westminster, Oct. 29, 1618. Raleigh was a man of splendid genius and extensive attainments, wrote many miscellaneous, literary, and political essays, and a few poems of high order. His *Complete Works* were edited at Oxford in 8 vols. (1829). Biographies have been written by William Oldys, Arthur Cayley, P. F. Tytler, James A. St. John, and Edward Edwards, the two latter having appeared almost simultaneously in 1868. Revised by C. K. ADAMS.

Rallidæ [Mod. Lat., named from *Rallus*, the typical genus, from the Fr. *râle*, rail. See RAIL]: a family of birds including the rails and gallinules. The neck is moderately elongated; the head rather small; the bill more or less elongated, compressed, and with the culmen advancing to a greater or less extent upon the forehead and decurved toward the apex; the nostrils are lateral, rather inferior, and in a membranous groove; the wings moderate and rounded, rather short; the tail rather short, inclined upward, and rounded; the tarsi rather long and slender, and in front covered with transverse scutellæ; the toes three in front, and well developed, the hinder comparatively short and rather elevated; the claws curved and sharp.

Revised by F. A. LUCAS.

Ralph, JAMES: poet and pamphleteer; b. in Philadelphia, Pa., about 1698; became a schoolmaster in his native city, where he made some pretensions to literary ability; was an early friend of Benjamin Franklin, with whom he sailed for England 1724, abandoning his wife and child; published in 1728 a poem entitled *Night*, which was sufficiently bad to merit notice by Pope in the *Dunciad*; sought favor with the Whig politicians by writing pamphlets and plays; was patronized by Frederick, Prince of Wales, and received a pension on the accession of George III. D. at Chiswick, Jan. 24, 1762. Author of *Zeuma*, a poem (1729); *The Use and Abuse of Parliaments* (2 vols., 1744); *History of England* (2 vols. folio, 1744-46); and *The Case of Authors by Profession or Trade Stated* (1758). Revised by H. A. BEERS.

Rāma: See RĀMĀYĀNA.

Ramadan: Arabian form for RAMAZAN (q. v.).

Ra'mah [from Heb. *Rāmāh*, liter., lofty place]: the name of several places in Palestine, two of which are historically interesting and important. One of these, first mentioned in Josh. xviii. 25, and identified by Robinson in 1838, is on the top of a high hill about 5 miles N. of Jerusalem. It belonged to the tribe of Benjamin. The other, where Samuel was born (1 Sam. i. 1), has not yet been identified with certainty.

Rāmā'yana [Sanskrit. *rāmāyana*, concerning Rāma, sc. noun *ākhyāna*, story]: the name of a celebrated poem of ancient India. It is the first great Indic literary or personal epic, as distinguished from the popular epic, exemplified in the *Mahābhārata*. Much critical work is yet to be done ere all the specific problems concerning the genesis of the poem can be solved; but their ultimate solutions are sure to be most illuminating for the student of the genesis of epic poetry. Respecting the general theory of the origin of the poem, see EPIC POETRY. The original nucleus of the *Rāmāyana* differs wholly from that of the *MAHĀBHĀRATA* (q. v.) in two most important respects: First, it is the work of

one man; and, second, it is of unitary design and character. The man is called Vālmiki—a fact quite bare of significance, as compared with the fact that he is namable; and whereas the *Bhārata* is inordinately episodic, and is in effect a great cyclopædia of Indic legend, the *Rāmāyana* concerns itself with the legends clustering about the one great name of Rāma.

Vālmiki's material (like that of the *Bhārata*) is truly popular. It consists of the legends of Rāma of the race of Ikshvāku in the land of Kosala. These were the subject of many little epic songs sung by the bards (*sūtas*) at the courts of the Ikshvāku princes. A Brahman, Vālmiki, of pre-eminent poetic gifts, made himself master of these songs, transfused them into a consistent whole, and so created an epos. This was learned by the professional rhapsodists, and by them recited in public. The date of the written reduction we do not know; but it was doubtless made while the institution of wandering minstrels or professional reciters of the poem was still in full vogue, and while their oral traditions of the poem possessed as much authority as the then extant written copies. It is probable that the fixation of the poem in writing took place independently in different localities, and that each of the now extant recensions is an independent reflex of one of the locally or otherwise varying oral traditions.

The most important recensions are three: One is the Bengali recension, edited by Gorresio; and another, the so-called "northern," which has the widest currency, and is the basis of the Bombay editions. The poem, like some mediæval cathedral, has suffered additions and changes at the hands of successive generations, but not in such wise as greatly to obscure its original compass and design. In its present form the *Rāmāyana* consists of seven books, of which, however, the first and last are doubtless later additions. The seven books contain about 25,000 double verses—say about twice as much as the *Iliad* and *Odyssey* together; but Jacobi believes that a reconstructed text would contain, after casting out all provable additions, some 8,000 or 10,000 double verses.

Story of the Poem (after Monier-Williams).—To Daśaratha, King of Ayodhyā, by his three wives, are born four sons: Rāma, the eldest; and, by Kaikeyi, Bharata. Rāma is taken to the court of King Janaka, and by his strength, shown in bending a wonderful bow, wins for his wife Sītā. He returns, and preparations are made to install him as successor to his father's throne. Kaikeyi now demands of Daśaratha—by way of fulfillment of an old promise that he would grant her any two requests she might make—that Rāma be banished, and her own son Bharata be made king. Rāma dutifully goes into exile with Sītā. The king dies in grief. Bharata goes and proffers Rāma the kingdom, and is refused.

Sītā is carried off by Rāvana, the demon-king of Lankā. The ape Hanumant seeks and finds her. Rāma makes alliance with Sugriva, king of the apes, and with his aid, and that of Vibhishana, brother of Rāvana, he invades Rāvana's capital, slays him, and recovers Sītā. He then returns to Ayodhyā and assumes his crown.

Here are two parts fundamentally different. Up to Rāma's refusal of the kingdom all is natural, human, and possible. From the rape of Sītā on, all is unnatural and fantastic to the last degree. This instructive combination is an instance of what has taken place also among other peoples—the mingling of heroic-legendary elements with mythological elements. The first part gives us the story of Rāma as a popular hero; the second blends the conceptions of Rāma the hero with those of Rāma the divinity. As early as the Rig-Veda, Sītā appears as the personified Furrow. She is a genius of the corn-field and wife of the rain-god. The battles of Rāma and Rāvana are only another form of the battles of the rain-god Indra with the demon of drought. What to the nomad herdsman of Vedic times was a penning up of the heavenly waters, that was to the husbandman of epic times a carrying away of the goddess of their corn-field. Hanumant, son of the wind-god, is a rain-god, the genius of the monsoon, who recovers Sītā, i. e. brings back to life the dead and parched fields.

Place and Date.—The place of the human part of the poem is Kosala, the region about Ayodhyā (Oudh). There is not the slightest allusion to the most important fact in the pre-Christian political history of India, the empire of the great Mauryan dynasty of the neighboring Magadha, founded by contemporaries of Buddha, nor to its capital Pataliputra. In short, the whole political and geographical

Ramsay, David, M. D.: physician and author; b. in Lancaster co., Pa., Apr. 2, 1749; graduated at Princeton 1765; studied medicine at the University of Pennsylvania; settled as a physician at Charleston, S. C., 1773; served in the war of the Revolution as a field-surgeon, participating in the siege of Savannah; was a leading member of the South Carolina Legislature 1776-83, and of the council of safety at Charleston, on the capture of which city he was treated by the British as a hostage and kept eleven months in close confinement in St. Augustine, Fla., 1780-81; was a member of the Continental Congress 1782-84, and again 1785-86; was acting president of Congress during most of the latter period, on account of the sickness of Hancock; published a *History of the Revolution of South Carolina* (2 vols., Trenton, 1785), *History of the American Revolution* (2 vols., Philadelphia, 1789), a *Life of Washington* (New York, 1807), a *History of South Carolina* (Charleston, 1809), and *History of the United States 1607-1808* (3 vols., Philadelphia, 1816-17), besides medical and other essays. His first wife was a daughter of President Witherspoon, of Princeton; his second was Martha, daughter of Henry Laurens, and of her he published a memoir in 1811. During the last fourteen years of his life Dr. Ramsay was a member of the South Carolina Legislature, and for much of the time president of the Senate. D. at Charleston, May 8, 1815, from a wound inflicted by a lunatic two days before.

Ramsay, William Mitchell, D. C. L.: scholar; b. in Glasgow, Scotland, Mar. 15, 1851; was educated at the Universities of Aberdeen, Oxford, Göttingen, and Berlin; held the traveling studentship of Oxford University in 1879; was fellow of Exeter College in 1882; resided and traveled in Asia Minor 1880-84, and made frequent excursions to that land 1885-91; was Lincoln Professor of Classical Art and Archaeology in Oxford 1885; and since 1886 has been Professor of Humanity in Aberdeen University. Dr. Ramsay has published numerous articles in magazines of Europe and the U. S.: *Historical Geography of Asia Minor* (1890); *The Church in the Roman Empire before 170 A. D.* (1893); and *St. Paul's Travels: the Narrative, its Author, and Date*; Morgan lectures in Theological Seminary, Auburn, N. Y. (London, 1895). C. K. Horr.

Ram'ses, or Ram'seses (Egypt. *Rā-messu*): the name of thirteen Kings of Egypt belonging to the nineteenth and twentieth dynasties. **RAMESSES I.**, the first king of the nineteenth dynasty, ascended the throne at the close of a period of confusion consequent upon the religious reforms attempted by KHUNATEN (*q. v.*), during which the Nubians and the Shasu or Eastern nomads had thrown off the yoke of Egypt. All that is known of him is that he waged war in a small way in Nubia, where he left memorial stelæ; that he made a treaty with the Hittites; and that he did some building at Thebes, where he commenced the great hypostyle hall at Karnak. His chief claim to distinction is that he was the father of Seti I., one of the greatest of Egyptian warriors and conquerors, who claimed to have extended his sway till it included all that Thothmes III. had held. Seti thus handed on a united and powerful kingdom to **RAMESSES II.**, whom he had already associated, in his twelfth year, with himself as king. **RAMESSES II.** ruled for sixty-six or sixty-seven years. He was a powerful monarch, a great builder, and a liberal patron. The Greek writers ascribed to him many wonderful deeds under the name of Sesostris, but this name was a sort of conglomerate in which the personalities of several kings were combined, such, e. g., as Useraten II. of the twelfth, Ramses II. of the nineteenth, and Ramses III. of the twentieth dynasty. The name of Ramses II. is found on monuments or buildings from Beirut to Napata and from one end of Egypt to the other, as well as throughout the length of Nubia. (See *IPSAMBUL*.) In many cases, however, his name was inserted in the inscriptions of other kings by a process of usurpation in which he was the worst offender in Egyptian history. His principal residence appears to have been at Tanis, where he erected a granite temple which he adorned with a colossal statue of himself. At Thebes he erected the Ramesseum, besides extending the buildings of his predecessors. He built also at Abydos (see *MEMNONIUM*), at Memphis, and Heliopolis, besides a multitude of other places. The Ramesseum, a large temple on the W. of the Nile opposite Karnak, was devoted to the worship of the manes of the great Ramses. On its walls were inscribed the accounts of his wars, especially the account of the expedition against the Hittites which is commemorated in the famous poem of Pentaur.

His warlike operations began while he was coregent with Seti I., when he led expeditions into Nubia and Libya. Near Beirut are inscriptions which record his advance to that point in his second and fourth years. In his fifth year he marched against the Hittites, whose principal seat was in the region about Carchemish. With them were allied all the peoples of the entire region. At Kadesh, on the Orontes, battle was joined, and in the conflict Ramses was successful over Mäutenure, the Hittite king, largely by reason of his personal daring and prowess, if we may credit the monumental record. In his eighth year another expedition was undertaken against certain cities in Palestine, Ascalon being the principal place captured. In his twenty-first year Ramses entered into an offensive and defensive alliance with Chetasar, the Hittite king, and to confirm this treaty, which remained in force during the rest of his reign, he took to wife the daughter of the Hittite. In consequence, more intimate relations of friendship and trade were established between Egypt and the East. After a reign of sixty-seven (Josephus, sixty-six) years, Ramses died, and was succeeded by his son Menepthah (Egypt. *Mer-en-Ptah*, beloved of Ptah), who is usually regarded as the Pharaoh of the Exodus, under whom the kingdom rapidly lost prestige.

RAMESSES III. was the second king of the twentieth dynasty, and ten others bearing the same name followed in immediate succession. The period which preceded the reign of Ramses III. was almost one of anarchy, and in it even a Syrian appears to have succeeded in gaining temporary royal power. During the period following his death the power exercised by the priests was such as to lead to a speedy deterioration of the kingdom, and to a final usurpation of the throne by Her-Hor (*q. v.*), the priest-king. Ramses III. waged war with the Libyans and with his neighbors to the N. E., the Hittites and their allies, while Punt and Ethiopia were forced to pay tribute. His reign was brilliant, and was commemorated on the walls of Ramses's memnonium at *MEDINET HABU* (*q. v.*), at Thebes, which in its various extensions presented the annals of the king. For ethnological purposes its mural decorations, giving life-like portraits of prisoners taken in war, are very valuable. See *Petrie's Racial Types from Egypt* (1887).

The most notable events of the following reigns were the thefts practiced in the necropolis at Thebes and elsewhere, in the times of Ramses IX. and X., which were made the subject of investigations. The results of these inquiries have come down to us, showing the extent of the depredations.

The mummies of the first three Ramses are at the Gizeh Museum, having been among those found in 1881 near Der el-Bahri, W. of Thebes. CHARLES R. GILLET.

Ramses, or Raamses: the name given in Ex. i. 11 to one of the "store-cities" built by the Israelites for the Pharaoh of the Oppression, who usually has been identified with the great Ramses II. of the nineteenth dynasty. Its location is unknown, but it was probably a frontier town like PITHOM (*q. v.*). By some it is supposed to have been located in the Wadi Tumilat, W. of Pithom, while others identify it with Tanis, which in some inscriptions bears the name Pi-Ramses, dwelling or house of Ramses. C. R. G.

Ramsgate: town; in the county of Kent, England; on the southeast coast of the Isle of Thanet; 72 miles E. by S. of London (see map of England, ref. 12-L). It is an important fishing-station, with a harbor of refuge 51 acres in extent inclosed between two piers. Among its features are an iron promenade-pier, a beautiful Roman Catholic church designed by Pugin, a Benedictine monastery, and a Jewish college. It is much frequented as a watering-place by Londoners. Pop. (1891) 24,676.

Ramus, Petrus (Fr. *Pierre de la Ramée*): humanist and mathematician; b. at Cuth, department of Somme, France, in 1515, in humble circumstances; studied under great difficulties at the University of Paris, and published in 1543: his *Animadversionum in Dialecticam Aristotelis Libri XX.* and *Institutionum Dialecticarum Libri III.*, in which he attacked Aristotle and the scholastic method of philosophizing with great boldness. The university, the Church, the Parliament, took great offense; the books were condemned, and the author forbidden to teach. By the favor of the king he was nevertheless afterward appointed at the university, and continued till his death his opposition against the empty subtleties of the philosophy of his time. Among other works were *Geometria* (1569) and *Scholæ Mathematicæ* (1569). In 1561 he embraced Protestantism:

committee of vigilance chosen Mar. 10, 1773, and an efficient worker in promoting through correspondence a concert of action with the other colonies; presided over the Virginia convention at Williamsburg, Aug., 1774; was chosen a delegate to the Continental Congress; was first president of that body upon its meeting at Carpenters' Hall, Philadelphia, Sept. 5, 1774, though from ill-health he soon resigned that post; presided over the second Virginia convention at Richmond, Mar. 20, 1775; was again chosen president of the Continental Congress when it reassembled at Philadelphia, May 10, 1775, but resigned May 24, returning to Virginia to preside over the house of burgesses; resumed his seat in Congress a few months later. D. in Philadelphia, Oct. 22, 1775.

Randolph, Thomas: poet; b. near Daventry, England, in 1605; d. 1635. He was educated at Westminster and at Trinity College, Cambridge, of which he became a fellow. His plays include *Amyntas*, a pastoral comedy, and *The Muses' Looking-glass*, a morality in defense of stage-plays. His best-known poem is his *Ode to Sir Anthony Stafford*. He was a friend and disciple of Ben Jonson. II. A. B.

Randolph-Macon College: an educational institution chartered in 1830 and opened in 1832, endowed and sustained by the Virginia and Baltimore conferences of the Methodist Episcopal Church South. It was first located in Mecklenburg co., Va.; suffered severely during the civil war, and was removed in 1866 to Ashland, Hanover County, and re-endowed.—**RANDOLPH-MACON WOMAN'S COLLEGE**, Lynchburg, Va., is an endowed institution for women with courses of instruction parallel to those for men at Ashland. It was founded in 1891.—**RANDOLPH-MACON ACADEMY**, Bedford City, Va., was established in 1889 as a fitting school for the college; and **RANDOLPH-MACON ACADEMY**, at Front Royal, Va., practically a duplicate of the one at Bedford City, was established in 1891.—These institutions are all controlled by the board of trustees, and under the supervision of President William W. Smith, A. M., LL. D.

Rangoon': chief city of Burma, and third port in importance in British India; on the eastern arm of the Irawadi delta, 20 miles from its mouth (see map of S. India, ref. 4-L). It is in unimpeded connection with the main stream and with the coast, and is accessible for large craft. It is the center of a system of canals, and the terminus for two railways running northward, one to Prome, the other to Mandalay. It is provided with street-cars, fire brigades, and other modern improvements; but is badly built and unsanitary, with the houses often on bamboo piles, and the narrow streets intersected by canals. The teak forests in the region about it and the excellent character of the port early caused the development of a considerable ship-building industry, which has latterly declined. The principal exports are rice, teak, cotton, spices, and skins. Rangoon is the chief port of importation for the trade of Upper Burma and Yunnan. The city has few noteworthy buildings or monuments, but near by is the Shway-Dagon Pagoda, a massive and imposing structure, with a tower 321 feet high capped by an enormous gilded crown and containing a bell weighing 30 tons. The pagoda is the repository of eight hairs from the head of Gautama Buddha, and is a favorite object of pilgrimage and seat of an annual fair.

Rangoon was in 1753 selected by Alompra as capital of Pegu, and given its present name *Ran-kun*, or "end of the war." Before that it was named after the pagoda, which was built, according to tradition, about 585 B. C. The city was occupied by the British in 1821, but soon returned to the Burmese. It was again taken in 1852, and has since been held by the British. It has prospered under their rule, and the population increased from 25,000 in 1852 to 180,324 in 1891. The city forms a separate administrative district of 22 sq. miles. The population is chiefly Buddhist.

MARK W. HARRINGTON.

Rangpur': district of Bengal, British India; between 25° 16' and 26° 21' N., and bounded E. by the Brahmaputra. Area, 3,486 sq. miles. Pop. 2,100,000. The surface is very low, and in the wet season entirely inundated. Cotton does not succeed. Indigo is the principal product; fifty large factories are in operation, M. W. H.

Ran'idæ [Mod. Lat., deriv. of Lat. *ra'na*, frog]: the family of anurous batrachians which contains the true frogs.

Ranke, Johannes, M. D., Ph. D.: physiologist and anthropologist; b. at Thurnau, Bavaria, Aug. 23, 1836; studied at the Universities of Munich, Tübingen, Berlin, and

Paris, graduating M. D. in 1861 at the first named, from which he received Ph. D. in 1882. He was appointed Extraordinary Professor of Physiology in the University of Munich in 1869. He was the co-editor of the *Beiträge zur Anthropologie und Urgeschichte Bayerns* (1877); and has been editor of the *Archiv für Anthropologie* since 1882. His principal work is *Grundzüge der Physiologie des Menschen*.

S. T. ARMSTRONG.

Ranke, Leopold, von: historian; b. at Wiehe, Thuringia, Dec. 21, 1795; studied at Halle and Berlin; was appointed teacher at the gymnasium of Frankfurt-on-the-Oder in 1818, and Professor of History at the University of Berlin in 1825. His principal writings are *Geschichte der romanischen und germanischen Völker von 1494-1535* (1824); *Fürsten und Völker von Südeuropa im 16. und 17. Jahrhundert* (1827); *Die serbische Revolution* (1829), one of his most brilliant productions; *Ueber die Verschwörung gegen Venedig im Jahre 1683* (1831); *The Popes of Rome, their Church and State* (3 vols., 1834-37; translated into English by Mrs. Austin in 1840, by Scott in 1846, and by E. Foster in 1848); *History of Germany in the Time of the Reformation* (6 vols., 1839-47; translated into English by Mrs. Austin); *Memoirs of the House of Brandenburg, and History of Prussia during the Seventeenth and Eighteenth Centuries* (3 vols., 1847-48; translated into English by Sir A. Duff Gordon); *Jahrbücher des deutschen Reichs unter dem sächsischen Hause* (3 vols., 1837-40); *Französische Geschichte vornehmlich im 16. und 17. Jahrhundert* (5 vols., 1852-55); *A History of England principally in the Seventeenth Century* (6 vols., 1859-68; English translation 1875); *Geschichte Wallensteins* (1869); *Weltgeschichte* (1881-88). The complete edition of his works comprises forty-seven volumes. His very first productions immediately attracted great attention, both on account of the high merit of their style and composition, and on account of the ingenuity evinced in gathering and sifting the materials. It is also to this latter point that the expression "the school of Ranke" principally refers—to the method of studying history rather than to the method of writing it. D. in Berlin, Germany, May 23, 1886.

Rankine, William John Macquorn: physicist and engineer; b. in Edinburgh, Scotland, July 5, 1820. In his early education his father, a retired lieutenant of the rifle brigade, was his chief instructor. He early displayed fondness for the natural sciences, and was fortunate in having the eminent Prof. J. D. Forbes as his tutor in natural philosophy. To him he dedicated his earliest and a somewhat remarkable paper, advocating the use of cylindrical wheels for railway carriages. Civil engineering naturally attracted his attention, and from 1841 to 1851 he was employed on the railways of Scotland. One of the most noticeable of his physico-mathematical researches was based on an hypothesis of "molecular vortices," by which was deduced the laws of elasticity, and of heat as connected therewith; from this he took at once prominent rank as an original investigator. His theoretical results, conforming closely to those subsequently obtained experimentally by Regnault and Dr. Ure, were in their ultimate form published in *The Philosophical Magazine*, Dec., 1851 (*On the Centrifugal Theory of Elasticity as applied to Gases and Vapors*). Important papers on kindred subjects succeeded this, among which are *On the General Law of the Transformation of Energy* and *On the Lines of the Science of Energetics*. In 1855 Rankine became Regius Professor of Civil Engineering and Mechanics in the University of Glasgow. Soon after taking the chair he turned his attention to the production of a series of manuals for engineering students and practical men. D. in Glasgow, Dec. 24, 1872.

Ransom, Matthew Whitaker: U. S. Senator; b. in Warren co., N. C., Oct. 8, 1826; graduated at the University of North Carolina 1847; admitted to the bar in the same year; became a planter and politician; attorney-general of North Carolina 1852-55; member of the Legislature 1858-60; peace commissioner to the Montgomery convention 1861; entered the Confederate service as lieutenant-colonel; rose to be major-general, serving through the war; surrendered at Appomattox Court-house; elected as a Democrat in Jan., 1872, to the U. S. Senate for the term expiring in 1877; re-elected for 1877-83, 1883-89, and 1889-95.

Ransom, Robert: officer; b. in North Carolina, Feb., 1829; graduated at the Military Academy, and promoted brevet second lieutenant of First Dragoons July 1, 1850; became captain First Cavalry Jan., 1861, resigned May 24, 1861, and

joined the United States army, in which he became a major-general, serving with distinction throughout the civil war along the western coast to the Army of Northern Virginia, after the war he engaged in numerous political and business deals, was great success in the service of the U. S. as member of many and various commissions from 1878 until he died Jan. 12, 1902.

JAMES MANSUE.

Ransom, Charles Gustav (Swedish name) soldier; b. at Vasteras, Sw., Nov. 29, 1844; admitted at Norwich University, a military institute provided over by his father, Col. Gustav M. Ransom killed at Chapultepec, Mexico, Sept. 13, 1877, because in 1861 a civil engineer in Canada was subsequently a consular agent at Chicago; raised a company of volunteers in Apr., 1861, elected major of the 10th Maine Infantry, Volunteered three months' service and became captain of the same regiment on the 1st of Feb. 1862, distinguished himself in the capture of Charleston, S. C., on the night of Aug. 15, when he was severely wounded; was at the capture of Fort Henry; made colonel in command in the assault upon Fort Donelson, where he was severely wounded, distinguished at the battle at Shiloh; became chief of staff to Gen. McFerrell and in command of the Army of the Tennessee June, 1862; distinguished from enemy's staff near Vicksburg; appointed assistant adjutant to Gen. Sherman, 1862; took part in the Mexican campaign commanding McFerrell's corps during the general campaign, and in the Atlanta campaign at the head of a division, and subsequently in command of the 2nd Cavalry Corps. D. at Miami, Fla., Oct. 20, 1894.

Ranunculus (Lat. from a lark frog or badger applied to ranunculus, probably because they grow where badgers dwell), a genus of Ranunculaceae, dicotyledons of the Ranunculaceae family. The flowers, which are mostly yellow, are five sepals, five petals, many stamens, and many epistemonous stamens each with a solitary erect seed. About 200 species are known, widely distributed in all parts of the world, and of these more than one-fourth occur in North America. *R. acris*, *R. repens* and *R. scutellaria* are the commonest of species collected for their flowers, in which the stamens have been changed to petals. The southern buttercup with bright yellow flowers are *R. acris* and *R. bulbosus*, common to the U. S. from Europe. Among the commoner Ranunculaceae to the U. S. are *R. repens*, *R. bulbosus*, with large yellow flowers, *R. scutellaria*, *R. abortivus*, with small white flowers, and *R. repens*, an aquatic with divided leaves and yellow flowers. The common white-flowered Ranunculaceae with dissected leaves has recently been placed in the allied genus *Pedicularis* under the name *P. repens*. The small-flowered, creeping buttercup, common in wet places, has flowers been removed to an allied genus, *Pedicularis*, as *P. repens*. — CHARLES E. HENRY.

Ranvier, Paul (Lat. Louis, M. D.), pathologist; b. at Lyons, France, in 1832; graduated M. D. from the Paris school of medicine in 1855; was appointed to the chair of anatomy in the College of France. He is one of the foremost pathologists and histologists in France. Among his chief works are *Leçons de technique histologique* (Paris, 1875-77); *Leçons de technique de l'anatomie normale* (1879); and, with Verne, *Leçons de technique pathologique* (1889-91). — M. F. A.

Ranz des Vaches, name given to (Swiss Fr.) (Fr. *voix de vache*, *voix de vache*, *voix de vache*). The name of the inclusion that the sheep sometimes play upon the alpenhorn.

Rape = *See* *Sexual Intercourse*, *Memory*.

Rape (from Lat. *rapo*, to steal, to carry off) the *Ranunculus repens*, a member of the family Ranunculaceae, and closely related to the Ranunculaceae and other from which it may be distinguished most easily by the fact that its young leaves are green and glaucous. The name is of the same origin as the word *rape*. Rape is largely raised in Europe for the use of its seeds. Its seeds are valuable forage, and are used as a green manure for manure. Its oilseed is used as a sheep-dip and as a fertilizer. The oil is used for machinery, for medicinal purposes, etc., and the seed is fed to cattle and sheep. — L. H. HALL.

Raphael (from Heb. *Rafael*, God heals through the Greek word, as also name of a son, 1 Chron. xxix. 7); according to some Apocryphal, one of the chief angels. In the book of Tobit he is "one of the angels which present the prayers of the just" (Tobit, i. 3). He binds Asmodeus, who possesses Tobias in his father's, and others leading to Tobit. A similar story is told of him in the book of Judith. Raphael binds

Asmodeus, one of the fallen angels, stands near the Eternal throne, is the angel of the spirits of men, leads the earth, and is set over all the diseases and wounds of the children of men" (Tobit, i. 3; ii. 3; iii. 5; iv. 6; ix. 1). In Jewish theology Raphael is also one of the chief angels—the patron of the healing art. In the Midrash he is said to have been one of the three angels sent to Abraham. Catholic theology formally accepted him as one of the archangels at the council of Rome (743) and at Aix-la-Chapelle (750). See *The Apocrypha*, ed. Wace (London, 1896), i. p. 171; Bredier, *Des Tynarodendites, Magie et magie Hebraïques en Tynarodendites* (Paris, 1850); Handlanger, *Real-Encyclopädie der Bibel und Talmud* (H. 1866); Waser, *System der Aberglaube, Fabel, Theologie* (Leipzig, 1880), p. 154; Rönisch, *Recht der Judentum* (p. 188, seq.).

RICHARD FOOTBALL.

Raphael, or **Raffaello**, the name by which *Raffaello Sanzio*, or *Sanzio*, the painter, is usually known. He was born at Urbino, Italy, Apr. 6, 1482, and probably received his first instruction in art from his father, Giovanni Santi, who died when he was eleven years of age, leaving him in the care of his uncle. It is uncertain who directed the young Raphael's studies after his father's death to the time he entered Perugino's studio at Perugia about 1500 or a little earlier. Some writers mention Pintoricchio della Vite, others Sigismondo. Perugino's influence is evidently predominant in the first work to which we can fix a date, the *Moorings of the Virgin*, commonly called the *Spesitation*, painted in 1504, now in the Uffizi at Milan. At this period of his studies Raphael went to Florence, and the work of the great masters living there became known to him; on his return to Perugia he painted in 1507 the *Adoration of the Magi* for the Baglioni family. In this picture (now in the Borghese gallery at Rome) he shows the influence of Florentine art. His fame as one of the most promising artists of the day was established, and he was called to Rome by Julius II, to carry out the grand scheme for the decoration of the Vatican in 1508. The fall of the Signoria was the first committed to him; in this he painted the so-called *Disputa del Sacramento* and the *School of Athens*, besides adorning the vault with allegorical figures. The pope was so well satisfied that he commissioned Raphael to decorate the remaining rooms. The designs were made by Raphael, who painted the most important parts and put in final touches; but he was greatly assisted by Giulio Romano, Francesco Penni, Giovanni da Udine, and Perino del Vaga. The Sala di Constantino was painted after his death by his pupils. Besides the work at the Vatican, Raphael finished other important pictures in the course of twelve years. Of these the principal are the *Madonna di Foligno*, *del Pao*, *della Sedia*, *di St. Sisto*, *di Loreto*, *dell'Immacolata*, and *La Perla*, the *Santa Cecilia*, *La Sedia*, the *Transfiguration*; the *Troncone* of the Sibyls in Santa Maria della Pace, the *Psyche*, *Troncone*, and the *Urbino* in the Vatican, the cartoons for the Sixtine tapestries, besides innumerable subjects for engraving. Raphael also was distinguished as a portrait-painter. Leo X, who succeeded Julius II. in 1513, continued to treat Raphael with the highest favor. At the death of Bramante, the year following this pope's accession, Raphael became the architect of St. Peter's, and fitted himself by deep study for this new office, to which was added in 1515 that of director of the excavations among the ruins of ancient Rome. His love of antique art led him in pursuit with the greatest and most fresh researches, but the strain of so much work was too much for his fragile constitution. He caught a fever, and died, after a few days' illness, on Good Friday, Apr. 6, 1520. Raphael received more consideration from his contemporaries than any other artist; he became rich and famous; over honor was showered on him, and he might even have allied himself by marriage with one of the princesses of the Church. His death at the early age of thirty-seven made a profound sensation. He was buried with great pomp in the Pantheon. Those who wish to form a true estimate of the genius of Raphael must study his drawings and cartoons, which preserve the essence and spirit of his work, as often less by repainting or by his assistant's interpretation in the frescoes and pictures. Among works of reference are Paulus Jovius, *Raffaello Urbinate Vita* (in Tiraboschi's *Storia della Letteratura*, Florence, 1812, vol. vii); Behrberg, *Raffaello Sanzio aus Urbino* (Munich, 1824); A. Springer, *Raffaello und Michelangelo* (2d ed., Leipzig, 1883); L. Eugene Monte, *Raffaello, sa Vie, etc.* (Paris, 1881); Crowe and Cavalcaselle, *Life and Works of Raphael* (1883); Kugler's *Handbook*, ed. by Sir A. Layard (1891). — W. J. STILLMAN.

Raphides: See RHAPHIDES.

Rapidan' River: a stream of Virginia which rises by several head-streams at the base of the Blue Ridge, and flows between Green and Orange Counties on its right, and Madison and Culpeper on its left. Ten miles above Fredericksburg it joins the Rappahannock, after a course of about 80 miles.

Rapid City: city; capital of Pennington co., S. D.; on the Rapid river and the Fremont, Elkhorn, and Mo. Valley Railroad; 45 miles S. E. of Deadwood, about 140 miles W. by S. of Pierre (for location, see map of South Dakota, ref. 7-B). It is in the famous Black Hills; is the seat of the State School of Mines, created by act of the territorial legislature in 1885, and contains 2 national banks with combined capital of \$125,000, a State bank with capital of \$50,000, and a daily and 5 weekly newspapers. Pop. (1880) 292; (1890) 2,128.

Rapid-fire Guns: See MACHINE AND RAPID-FIRE GUNS.

Rapp, GEORGE: founder of the sect of HARMONISTS (q. v.); b. at Iptingen, Württemberg, Germany, Oct., 1770; founded in early manhood a communistic religious association to restore the practices of the primitive Christian Church; came into conflict with the authorities; emigrated to the U. S. in 1808 with a number of his associates; founded the town of Harmony, Butler co., Pa., and later the town of Economy, now Harmony, in Beaver co. D. at Economy Aug. 7, 1847.

Rappahannock River: a stream which rises in the foothills of the Blue Ridge, near the northwest border of Fauquier co., Va., and flows southeast, generally parallel to the Potomac, reaching Chesapeake Bay through a broad estuary. Its largest branch is the Rapidan. At its rapids at Fredericksburg a fine dam affords extensive water-power. Below Fredericksburg it is a noble tidal stream, the navigation of which is important. It is about 250 miles in total length.

Raptores, sometimes **Raptatores** [Mod. Lat. pl., from Lat. *raptor*, a robber]: a group, or order, of birds containing the birds of prey, comprising the hawks (*Falconidae*), owls (*Strigidae*), secretary-bird (*Gypogeranidae*), and American vultures (*Cathartidae*). These last differ from the others in many important particulars, and should, very likely, be placed apart. The *Raptores* are birds of powerful flight, characterized by a hooked, cere beak, and, with few exceptions, powerful feet and sharp, curved claws. The palate is desmognathous, there are two carotids, the oil-gland is present, as are also ceca, except in *Cathartidae*. The female is generally larger than the male; the young are helpless when hatched. There are about 500 species, distributed throughout the world. ACCIPITRES (q. v.) is by many authors restricted to the hawks or diurnal birds of prey. F. A. LUCAS.

Raritan River: a river in New Jersey, which rises in two branches in Morris co., flows S. E. through Somerset and Hunterdon Counties, and falls into Raritan Bay at Perth Amboy. It is navigable as far as New Brunswick.

Raschid: See HAROUN AL RASCHID.

Rash: a popular name for the acute exanthematous or eruptive diseases, or more frequently for the eruption itself which attends such diseases. Nettle-rash or urticaria, scarlet rash (roseola), and canker-rash (scarlet fever) are the diseases generally called by this name, which, though convenient for nursery use, is of no scientific value.

Rashi [a combination of the initial letters of his title and name]: the celebrated Jewish commentator Rabbi Solomon Ben Isaac; b. at Troves, in Champagne, France, in 1040. Little is known about his life, except that he studied at the theological schools of Mayence and Worms. He died July 13, 1105. He wrote commentaries on all the books of the Bible except Chronicles; which, though they contain much of the traditional rabbinic exegesis, seek to determine the simple meaning (*Peshat*) of the text. They have been held in the highest esteem not only by Jewish writers, but also by Nicolaus de Lyra, Luther, Sebastian Münster, etc. His commentary on the Pentateuch was the first Hebrew book printed (1475). He also wrote a commentary on twenty-three of the treatises of the Babylonian Talmud, which is printed in every edition of that work. Among his other writings may be mentioned a commentary to *Bereshith Rabba*; *Happard's*, containing decisions on ritual and legal matters; and a few hymns. In his commentaries Rashi cites a large number of Provençal words which have been collected by Arsène Darmesteter, and which are of value in determining the pronunciation of the particular dialect used by the Jews in that part of Provence. See ZUNZ, *Zeitschrift*

für die Wissensch. des Judenthums (Berlin, 1822, iii., p. 277); Graetz, *History of the Jews* (Philadelphia, 1894, p. 286); Siegfried, *Raschi's Einfluss auf Nicolaus von Lyra und Luther* (in Merx, *Archiv*, i., p. 428); Maschkowski, *Raschi's Einfluss auf Nicolaus von Lyra* (in *Zeitschrift für alttest. Wissenschaft*, xi., p. 268); Clément-Mullet, *Documents pour servir à l'histoire de Raschi* (Troyes, 1855); Arsène Darmesteter, *Glosses et Glossaires Hébreux-Français du Moyen Âge* (in *Romania*, i., pp. 146, seq.).

RICHARD GOTTHEIL.

Rask, RASMUS KRISTIAN: scholar; b. at Brøndekilde, on the island of Fünen, Denmark, Nov. 22, 1787; studied at the University of Copenhagen. In 1808 he published his *Introduction to the Study of the Icelandic Language*, which, with his edition of the *Eddas* (1818), the first critical and complete one published, forms the foundation for the study of Icelandic literature and language. In 1818 he began his extensive travels. He spent first two years in Iceland, the result of which was his celebrated *Researches concerning the Origin of the Icelandic Language* (1818), which received the gold medal of the Danish Scientific Society, and in which the first observations of the transpositions of sounds in the Teutonic languages were published. He next spent two years in Stockholm, where he published a grammar of the Anglo-Saxon language (1817), translated into English by B. Thorpe (1830), and studied Finnish, and then, in 1817, he proceeded by St. Petersburg, where he remained over a year, studying the Slavonic dialects, to Astrakhan, through Persia, and to India, which he traversed in its whole length from 1820 to 1822, returning home, by Ceylon, in 1823. He brought to Copenhagen a great number of rare Oriental manuscripts, one of the greatest treasures of the Royal Library; but incomparably greater was his working knowledge of most of the languages composing the Indo-European family, from the English to the Manchchu. But his health was broken, and the results of his enormous linguistic acquisitions were fragmentary. He wrote essays on the Zend language, the genuineness of the *Zend-Avesta*, the ancient Egyptian and Hebrew chronology, and published grammars of the Spanish (1824), Frisian (1825), Italian (1827), and English (1832) languages. His richest and most original work is his *Introduction to a Scientific Orthography of the Danish Language* (1826), in which he gave comparative philology a new and powerful impulse, and foreshadowed many ideas later established as truths. He undoubtedly anticipated Grimm in the discovery of the law of the permutation of consonants. D. in Copenhagen, Nov. 14, 1832. *Samlede Afhandlinger* (vols. iii., 1834-38). Revised by D. K. DODGE.

Rasköl'niks [from Russ. *raskolenik'*, schismatic, heretic]: members of the *Rasköl'*, or schism, which dates officially from the year 1666. During the long period of the Mongol yoke numerous errors crept into the ritual and liturgical books of the Russian Church. In the seventeenth century, during the reign of Alexis Mikhailovich, the patriarch Nikon introduced numerous reforms, which were met by great opposition. Nikon fell, but the council which deposed him in May, 1667, confirmed his reforms. From that time the schism in the Russian Church became established. The Rasköl'niks objected to the alterations in and the printing of the church-books, to the form of the cross, and to various other matters. Thence they took the name of *Starobryadtsy*, or Old Ritualists (from *stary*, old, and *obryad*, a rite); but, as they professed to be the preservers of old faith, as well as of old rites, they called themselves also *Starovertsy*, or Old Believers (from *vera*, faith). When Peter I. introduced his reforms into Russia the Rasköl waxed stronger, its old religious opposition being fortified by a political resistance to the census, to military conscription, to shaving, to giving up the national dress. Peter I. vainly endeavored to crush their opposition. Since his time their treatment has fluctuated. Peter III. was their avowed protector. Catherine II. treated them leniently for a time, granting them the official designation of *Edinovertsy*, or Like-Believers, and allowing them to retain their old ritual. After the insurrection of Pugachev, an outbreak of schismatic and rebellious fury, they met with less favor. Nicholas I. in vain tried severe measures. Toward the end of his reign advances were made to them by the Poles and the Russian socialists, but the only result was the installation in 1846, at Belokrinitza in Bukovina, of a Rasköl'nik metropolitan, Ambrose, formerly Metropolitan of Bosnia. His successor, Cyril, visited Moscow in 1863, and there held

a Russian second period; but just then the Polish insurrection broke out, and the U.A. Bolevers sent him away and addressed to the Russian an assurance of loyal devotion. They were rewarded by liberal measures, and large summing-ups made to them.

Little is known as to the numbers of the Raskolniks. The official returns show over 1,000,000, but it is said that more than 14,000,000 really exist. They form the most interesting feature, and a great portion of the Russian community. They belong almost exclusively to Great Russia, from the Priamur, Livonia, Little Russia, and White Russia to all countries from Great Russia. They follow a truly Russian family of organization, forming readily into communities ruled by practical systems of self-government. At a very early period they split into two great bodies—the *Sposobny* or *Stavsky*, and the *Protopopov*, or *Protopopov* from the *Protopop*, and pop, a priest. The former were almost everywhere for their priests upon the "pop" from the establishment; the latter depended with the service of consecration upon those of others instead. For long a mother mother body possessed any legal or ecclesiastical but about 1911, after the great plague of Russia, such priests were allowed to have a cemetery in the village, and to build there a church and a convent, and these still exist as the headquarters of the Raskol. In addition to these bodies the Raskol comprises the *Dobrye*, *Khrystians* (Orthodox Christians), who are divided into a number of minor sects. None of them are so important as the *Melchizedek* (and in he is called from Melchizedek, because they do not abstain during fasts from milk and its products), and the *Stavsky* (from the German *Stav*, head of which bodies hold what may perhaps be called Protestant doctrines. The *Dobrye*, or *Stavsky*, were once known as *Stavsky*, or *Stavsky*, and were in consequence mostly transferred to the Caucasus. The rest of these sects have either been crushed by the police or by the sects with which, such as the *Dobrye*, or *Stavsky*, or *Stavsky*, who had been taken to death in order to increase their numbers. One of these sects, that of the *Stavsky*, or *Stavsky*, a set of young families greatly added to their numbers, has isolated adherents in all parts of Russia. The sect of the Russian Church for Philanthropy, founded (after German by Blumenthal) (2 vols., Frankfurt, 1911), *Stavsky*, *Stavsky* (New York, 1911), pp. 900-924. A. J. Smith, *Russian Church and Russian Society* (1887); *The Slavonic* (London, 1911). W. R. S. RALSTON.

Raspberries (Med. Lat., from Lat. *raspberry*, *raspberry*, *raspberry*, a former group of herbs containing originally the *Raspberries*, and later the *Raspberries*. See GALLIA, R.

Rasp: see RAIL.

Raspberries (*Rubus idaeus* Linn.): cf. Ital. *raspberry*, *raspberry*, associated with *raspberry*, *raspberry*; Fr. *raspberry*, *raspberry*; a name of *Rubus idaeus*; a name applied to those species of the *Rubus* genus *Rubus*, in which the "fruit" or collection of *raspberries* falls away, in a thumb-like mass, from the *raspberry*, leaving the latter on the stalk. *Raspberries* are important fruits in the U. S. Up to about the middle of the nineteenth century the cultivated varieties belonged to the European species *Rubus idaeus*, but very nearly all the varieties grown in the U. S. are offsprings of native *Rubus*, *R. strigosus* the wild red, and *R. occidentalis*, the wild black, or *blackberry*. The commonest form of the former in cultivation is the *raspberry*. The black species is represented by Gregg, Ohio, and many others. An *intermediate* class, hybrids between the two, has become prominent, and it now comprises some of the best varieties, of which *raspberry* may be taken as a type. This class has now developed as a distinct species under the name of *Rubus strigosus*. *Rubus strigosus* is the American representative of *Rubus*, with which it is very closely allied. The leaves are smaller and the fruit less firm and usually smaller than those of the European species, and the *raspberry* is glandular, while the *raspberry* is not. The *raspberry* are also more bristly hairy, and the *raspberry* have the tendency to open throughout the season, whereas it is often a marked trait of the European berry. The introduction of the European varieties is attended with difficulty in the southern parts of the U. S., chiefly because of the *raspberry* of the winter. Another species of *raspberry*, *R. strigosus*, has been introduced from Japan. See *Raspberries*.

The *raspberry* requires a warm, well-drained, and fertile soil. The *raspberry* is to be considered in the growing of

the *raspberry* is the fact that the stem or "canes" bears only one good crop of fruit; therefore the stems are cut away after the fruit is harvested, or at latest before the following summer, and new shoots from the root, which have grown while the others were in fruit, are allowed to take their place. That is, the stems grow one year and bear the next year, after which they are worthless. From two to eight shoots or canes are allowed to grow to each plant, depending upon the age of the plant, strength of the soil, and method of raising. The style of pruning and training varies. Good *raspberries* propagate naturally by suckers or sprouts thrown up from the roots, while the *blackberry* multiply by means of "tips," or new plants which spring from the tips of the remaining stolon-like canes when these come in contact with the ground. All *raspberries* are readily multiplied by means of root cuttings. (See *Raspberries*.) *Raspberries* are important fruits for evaporating and for making into commercial preserves. There are no special manuals devoted to *raspberry* culture in the U. S. L. H. BARTY.

Rassam, ROBERT, archaeologist; b. of Chaldean Christian parents at Mosul, Turkey, in 1858. In 1883 he became acquainted with Austen H. Layard, who was then beginning his excavations in Assyrian ruins, and in 1887 he accompanied Mr. Layard to Bagdad. In 1904 he was sent by the British Government on a mission to Assyria, to secure the release of several Europeans who were held in confinement by King Theodore, but was himself imprisoned by Theodore 1894-98. *Rassam's Narrative of the British Mission to Assyria*, etc. (2 vols., London, 1890), is his chief publication. After the death of George Smith in 1900, Rassam made repeated trips for the British Museum to the Babylonian-Assyrian region, and enriched the museum with many important discoveries. Most notable among these are the bas-reliefs of Balawat, from the time of Shalmaneser II., 824-824 B. C., and the tablets from the temple of the Sun-god in Sippar, commonly known as the Ash Hadda tablets, regarding the restoration of the temple by Nabonassar, a contemporary of Shalmaneser II. See T. G. Pinches, *The Babylonian Tablets discovered by Mr. Rassam at Balawat* (Transactions of the Society of Biblical Archaeology, vi., 83-119, London, 1902), and *The Bronze Tablets of the Palace of Ashur* (London, parts I.-IV., published by the Society of Biblical Archaeology, London). D. G. LLOYD.

Ras'tadt or **Rastatt**: town in the grand duchy of Baden, Germany; on the Rhine, 4 miles from its junction with the Rhine, and 15 miles S. W. of Karlsruhe (see map of German Empire, ref. 6-D). It is surrounded by fortifications, built in 1840-48 by Austrian engineers as a protection to the northern entrance of the Black Forest. It was the residence of the last margraves of Baden, whose palace (planned after that of Versailles) still exists. In 1714 the treaty which ended the war of the Spanish Succession was signed at Ras'tadt, and in 1797-99 a congress met which terminated without any result, the event being marked by the assassination of the French plenipotentiaries. Steel works, tobacco, and beer are manufactured. Pop. (1896) 11,537.

Rat [O. Eng. *rest*; Germ. *ratte* < O. H. G. *ratto*. The relation to the Romanic word, Fr. *rat*; Ital. *ratto*, is not clear]; any one of the larger species of the family *Muridae*, the smaller being known as mice. The best known of these are the common brown rat (*Mus domesticus*) and the black rat (*Mus rattus*). The common rat was originally a native of India and Persia, but its present distribution is almost coextensive with that of man. It is generally believed that it extended into Europe about the middle of the eighteenth century, and found its way to America about 1778. It was anticipated in its incursions by the black rat, but its superior strength and aggressiveness have driven that species before it, and have supplanted it in almost all countries. It is very prolific, breeding four or five times during the year, and having about a dozen young each time. It is almost omnivorous, feeding upon grains, vegetables, and meat. The black rat (*Mus rattus*) is smaller than the brown species, and is much more timid. It also was originally peculiar to Asia. With prefixes or qualifying terms the name rat is applied to various other species of *Muridae* and to rodents of other families. The wood-rats belong to the genus *Neotoma*, the porcupine rats or gophers (see *Gopher*) to *Geomys* or *Thomomys*, the cotton-rats of the southern parts of the U. S. to *Sigmodon*, the kangaroo-rats (see *KANGAROO-RAT*) to *Dipodomys*, *Perodipus*, and allied genera, the spiny rats of South America to *Echinosys*, and the bamboo-rats of India to *Rhizomys*. Revised by F. A. LUCAS.

Ratafi'a [Fr.; Malay, *araq*, arrack + *tafi'a*, a spirit distilled from molasses]: a name given to a large class of liqueurs, or sweet alcoholic drinks strongly flavored with aromatics.

Ratel: any one of three carnivorous mammals of the family *Mustelidae* and genus *Mellivora*, found in Africa and India, and sometimes known from their habits as honey-badgers. The typical species, *M. ratel* or *capensis*, a native of South Africa, has a stout, badger-like body and short tail; its total length is about 3 feet. The back is iron-gray, with a white crown and streak down each side. The other species, *M. indica* and *M. leuconota*, differ only in size and amount of white in their pelage. F. A. L.

Ratio [= Lat. *ra'tio*, reckoning, account, calculation, relation, deriv. of *re'ri*, *ra'tus*, reckon, believe, think, judge]: the numerical measure of the relation which one quantity bears to another of the same kind. The only way in which two quantities can be compared is by division. The operation of dividing one quantity by another of the same kind consists in dividing the number of times that any assumed unit is contained in the former by the number of times the same unit is contained in the latter. The operation of finding a ratio is therefore purely numerical, and the resulting ratio is consequently an abstract number. If the terms of the ratio are commensurable, their ratio is *exact*; if the terms are incommensurable, the expression of their ratio by quotient of two abstract numbers is only *approximate*; but it is to be remarked that the approximation to the true value may be made to any desirable degree of exactness.

Prime and ultimate ratios were used by Newton as the method of analysis in his *Principia*. It is a simplification of the method of exhaustion as used by ancient geometers. To conceive an idea of this method, let us suppose two variable quantities whose values approach each other so that their ratio continually approaches *a*, and finally differs from *a* by less than any assignable quantity; then is *a* the ultimate ratio of the two quantities. Again, if two variable quantities simultaneously approach two other quantities, which on the same hypothesis remain constant, the ultimate ratio of the variable quantities is the same as that of the constant quantities. The ratios are called *prime* or *ultimate*, according as the ratio of the variable quantities is receding from or approaching to the ratio of the constant quantities.

Revised by S. Newcomb.

Rationalism [from Lat. *rationalis*, rational, reasonable, deriv. of *ratio*, *ra'tio*, reckoning, thinking, judgment, reason, deriv. of *re'ri*, *ra'tus*, reckon, think, judge]: that tendency in modern thought which claims for the unaided human reason the right of deciding in matters of faith. It asserts the prerogative of the intellect to be supreme arbiter in all departments of revealed truth. It requires certainty as the condition of its favor, and promptly rejects what does not come before it with all the exactness and clearness of a mathematical demonstration. Like naturalism, supernaturalism, and other terms expressive of the relation of reason and faith, the term rationalism was first used in its present sense by the philosopher Kant. The scene where rationalism has exerted its chief sway is Germany. The sources were various, not only embracing different countries, but likewise different departments of investigation. The deism of England, one of the most polished and powerful of all forms of free thought, was industriously propagated in Germany, where the works of Lord Herbert, Hobbes, Shaftesbury, Tindal, Woolston and Wollaston were circulated in the language of the people and read by wide circles. In Holland the philosophy of Descartes and Spinoza was very powerful, and its influence was very decided east of the Rhine, particularly in the universities of Germany. The pantheism of Spinoza was very attractive to many minds, and was regarded as a welcome relief from the cold and heartless banishment of God from his own creation. France, however, was the chief foreign country which contributed to the rise and sway of German rationalism. The influence of Voltaire and the Encyclopædists was very great, and Berlin became as much a home to these men as Paris had ever been. The domestic causes were, first of all, the philosophy of Leibnitz, popularized and simplified by Wolf at Halle University; the destructive theology of Semler; the influence of the skeptical court of Frederick the Great, with its French surroundings; the *Wolfenbüttel Fragments*, published by Lessing; and the *Universal German Library*, issued by Nicolai. Rationalism was in the ascendant in Germany from 1750 to 1800, but with the beginning of the new century it began to lose its hold upon the best minds. Schleiermacher was the

transitional theologian from the old rationalistic to the new evangelical faith of Protestant Germany. His *Discourses on Religion: Speeches to its Cultured Despisers* (Eng. trans. London, 1893) diverted public attention from the rationalistic criticism to the necessity of feeling and a sense of dependence on God. Jacobi was really the first to introduce the sense of dependence into the domain of religious philosophy, but Schleiermacher was the first to apply it to the man of general culture. Neander, the Church historian, was the first positive theologian of the so-called "mediatory" school. His historical works breathe a fervent and devout spirit, at the same time that they evince the profound scholarship of the original student. In 1835 a new impulse was given to rationalistic criticism by Strauss's *Life of Jesus* (n. e., Eng. trans. London, 1893)—a work proceeding directly from the Hegelian school. It advocated the mythical origin of the Gospels. This work was promptly replied to by Neander, Ullmann, Tholuck, and many other representatives of evangelical thought. The most recent phase of rationalistic thought is materialistic. The views of Büchner, Carl Vogt, Moleschott, and others have gained a wide influence. Evangelical theology is, however, in the ascendant again in most of the German universities. On the literature of rationalism compare Farrar, *Critical History of Free Thought* (Bampton lectures, 1863); Lecky, *History of the Rise and Influence of the Spirit of Rationalism in Europe* (2 vols., London, 1865); Hurst, *History of Rationalism* (New York, 1865; 9th ed., rev., 1875); Fisher, *Faith and Rationalism* (New York, 1879); Pfleiderer, *The Development of Theology in Germany since Kant* (London, 1890). J. F. HURST.

Rat'isbon, or **Regensburg**: town of Bavaria; on the right bank of the Danube, opposite the influx of the Regen; 82 miles by rail N. N. E. of Munich (see map of German Empire, ref. 6-F). It is surrounded with walls pierced by six gates, and has a Gothic cathedral begun in 1275, but not finished till the middle of the seventeenth century; a town-house, in which the imperial diet assembled from 1662 to 1806; a magnificent stone bridge over the Danube, 1,100 feet long, connecting the town with the suburb of Stadt-am-Hof; and a monument of Kepler, who was born here. Gold, silver, brass, iron, steel, earthen and porcelain ware, leather, tobacco, and glass are manufactured, and there is an active trade in wheat and salt. Originally a Celtic town (Radasbona), it was made a frontier fortress by the Romans. In 1245 it was made a free imperial city. It was stormed by both the French and the Austrians in 1809, and was ceded to Bavaria in 1810. Pop. (1890) 37,635.

Rat'itæ [Mod. Lat., liter., fem. plur. of Lat. *ra'tio*, marked with a raft (sc. *a'ra*, birds), deriv. of *ra'tis*, raft]: an order or sub-order of birds, considered by many authorities as a sub-class, contrasting with all the other living forms of the class, and containing the ostriches, cassowaries, and kiwis. It is distinguished, according to Huxley, by the sternum being devoid of a crest, and ossifying only from lateral and paired centers, the parallelism or identity of the long axes of the adjacent parts of the scapula and coracoid, and the non-development of an acromial process to the scapula, and of a clavicular process to the coracoid; the vomer has a broad cleft; the hinder and posterior ends of the palatines and the anterior ones of the pterygoids are very imperfectly or not at all articulated with the basisphenoidal rostrum. It may be further added that in all the living representatives the feathers are characteristic, the barbs being disconnected. The group embraces the largest of birds, all of which are incapable of flight, and progress by running. The species, though comparatively few, represent several well-defined families—viz., *Struthionidae*, embracing the African ostriches; *Rheidae*, including the South American ostriches or nandus; *Casuaridae*, with the cassowaries and emus of the Papuan Archipelago, Australia, etc.; and *Apterygidae*, including the kiwis of New Zealand; the order was also well represented in former geological epochs, especially in New Zealand, by the gigantic *Dinornithidae*, which seem to have been destitute of true wings.

Revised by F. A. Lucas.

Raton: town; Colfax co., N. M.; on the Atch., Topock and S. Fé Railroad; 111 miles N. by E. of Las Vegas (for location, see map of New Mexico, ref. 8-T). It is in a coal-mining region, and contains the machine-shops of the railway company, a national bank with capital of \$50,000, and three weekly newspapers. Pop. (1890) 1,255.

Ratramnus, also called **Bertramus** by an error of copyists: a learned monk of the famous abbey of Corbie, near

It continued part of the states of the Church (with the exception of intervals during 1797-1815) until it was incorporated in the kingdom of Italy in 1860.

No Italian city seems more apart from the currents of modern life. Ravenna is not so much a city as a museum. Here better than at Rome may be studied primitive Christian art from the fifth to the ninth century. In the Cathedral of Sant' Urso, partly of the fourth century but reconstructed in the eighteenth, are frescoes by Guido Reni; the original campanile still remains. Close by is the octagonal-domed baptistry of the fourth century, containing the famous fifth century mosaic, representing the baptism of our Saviour in the Jordan. Near the Church of San Francesco, built on the ruins of a temple of Neptune about 450, but completely modernized, is the mausoleum of DANTE ALIGHIERI (q. v.), who died at Ravenna in 1321. In SS. Nazario e Celso, erected (440) in the form of a Latin cross by Placidia, daughter of Theodosius the Great, are the sarcophagi of that empress (d. 450) and of Honorius I. and Constantius III. The round tower of St. Giovanni Battista was constructed in 438. Santo Spirito and Sta. Maria in Cosmedin, embellished with mosaics of the sixth century, were built by Theodoric for the Arian bishops. Sant' Apollinare Nuovo, erected by Theodoric about 500 as the Arian cathedral, is resplendent with mosaics, mostly of the sixth and ninth centuries. San Vitale (consecrated in 547), a work of Justinian, is a partial copy of St. Sophia in Constantinople. Its gorgeous mosaics, admirably preserved, give the whole New Testament story; especially interesting are those of Justinian and his suite, and of his empress Theodora and her retinue. In the Carthusian monastery is the library founded in 1714, with over 50,000 volumes and 700 MSS. Among the latter is an autograph MS. of Dante of the fourteenth century. Half a mile outside the Porta Serrata is the rotunda or mausoleum of Theodoric. The cupola, 36 feet in diameter, and weighing over 200 tons, is hollowed from a single block of stone. Also outside the walls is the imposing Sant' Apollinare in Classe, on the site of a temple of Apollo, dedicated in 549 and restored in 1779, a specimen of the purest early Christian art. Two miles from the city is La Colonna dei Francesi, the square pillar raised in 1557 to commemorate the battle of Ravenna (1512), in which Pope Julius II. was defeated by Gaston de Foix. S. of Ravenna toward Rimini extends the Pineta, the vastest and most ancient pine forest in Italy. It begins not far from Sant' Apollinare in Classe, on the site of the ancient harbor, and stretches 25 miles along the Adriatic, with a breadth of from 1 to 2 miles. Pop. (1881) of city, 18,571; of commune, 60,573.

E. A. GROSVENOR.

Ravenna: village (settled in 1799); capital of Portage co., O.; on the Penn., the Erie, and the Pitts. and W. railways; 16 miles E. N. E. of Akron, 38 miles S. E. of Cleveland (for location, see map of Ohio, ref. 8-1). It contains 6 churches, 3 large public schools, a Roman Catholic school, 2 national banks with combined capital of \$250,000, gas and electric light plants, water-works system owned by the village, and a semi-weekly and 2 weekly newspapers. The manufactories include glass-works, coach and hearse factory, carbon-works, flour and planing-mills, foundry, machine-shop, novelty-works, large dyeing establishment, 2 brick and tile works, 2 shoe-factories, and basket, chair, sad-iron, and spoke and hub factories. Pop. (1880) 8,255; (1890) 3,417.

EDITOR OF "REPUBLICAN."

Ravenscroft, JOHN STARK, D. D.: bishop; b. near Blandford, Prince George co., Va., in 1772; taken to Scotland in infancy; received there a classical education; returned to Virginia 1788; studied at William and Mary College; admitted to the bar, but ultimately studied theology; took orders in the Episcopal Church 1817; a minister in Mecklenburg co., Va., 1817-23, and pastor of churches successively at Raleigh, N. C., and at Williamsburg, Va., when he became Bishop of North Carolina. D. at Raleigh, Mar. 5, 1830. Two volumes of his *Sermons* were edited by Dr. (afterward Bishop) J. M. Wainwright in 1830, preceded by a memoir. See biographical sketches in *American Church Review* and in *Batterson's Sketch-book of the American Episcopate*.

Revised by W. S. PERRY.

Ravenstein, ERNEST GEORGE: geographer and statistician; b. at Frankfort-on-the-Main, Germany, Dec. 30, 1814; son of an eminent local geographer and cartographer; educated chiefly in his native town; removed to London about 1852; held an appointment in the intelligence department of the War Office 1855-75; member of the coun-

cils of the Royal Geographical and Royal Statistical Societies; founded the German Gymnastic Society 1861, and for ten years was its president; has published *The Russians on the Amur* (London, 1861); *Geographie und Statistik des Britischen Reiches*, in Wappäus's *Handbuch der Geographie* (Leipzig, 1862); *London*, one of Meyer's *Handbooks for Travelers* (1872, subsequent editions); *Cyprus* (London, 1876); *The Laws of Migration* and other papers in *Transactions of the Royal Geographical and Statistical Societies: A Handbook of Gymnastics and Athletics* (London, 1864); also a map of Eastern Equatorial Africa (twenty-five sheets, published by the Royal Geographical Society (1882-83); a *Systematic Atlas* for private study and superior schools, fifty-two sheets (London, 1893); a topographical map of England and Wales (1893).

Ravignan, rā'v'ēn'yān', GUSTAVE XAVIER DELACROIX, de; pulpit orator; b. at Bayonne, France, Dec. 2, 1795. He first studied and practiced law, but in 1822 entered the Jesuit seminary at Montrouge and was ordained priest in 1828. After some years of teaching his talent as orator revealed itself, and in 1836 he succeeded Père Lacordaire at Notre Dame, Paris, where he remained till 1848. He was also an ardent champion of the Jesuits in pamphlets, and active in charitable works and foundations. D. Feb. 26, 1858. See his *Life*, by Père de Pontlevy (2 vols., Paris, 1860; Eng. trans., New York, 1873). A. G. CANFIELD.

Rawal Pindi: a district of British India, in the Northern Punjab. It lies on the south slopes of the Western Himalayas; is noted for its fertility and salubrity; embraces 4,681 sq. miles, and since the extension of the railway has carried on considerable trade with Afghanistan (see map of North India, ref. 3-C). Pop. over 1,000,000. Its largest town is Rawal Pindi; pop. (1891) 73,460; best known in recent times for the great durbar held there (1885) by the Viceroy of India, in honor of the Amir of Afghanistan.

Revised by C. C. ADAMS.

Rawdon-Hastings, FRANCIS, Marquis of Hastings: soldier and statesman; b. in Ireland, Dec. 7, 1754; was educated at Oxford; entered the army 1771; was sent to America in 1773; was present at the battle of Bunker Hill; became aide-de-camp to Sir Henry Clinton; participated in the battles of Long Island and White Plains and the attacks upon Forts Washington and Clinton; soon afterward raised in New York a corps called the Volunteers of Ireland, of which he took command; distinguished himself at Monmouth; was made general and sent to the Southern States with re-enforcements for Cornwallis 1780; took a prominent part at the battle of Camden Aug. 16; remained in the Carolinas after Cornwallis's return northward; attacked and defeated Gen. Greene at Hobkirk's Hill Apr. 25, 1781; relieved Fort Ninety-six; fortified himself at Orangeburg; incurred much obloquy on account of the execution of Col. Isaac Hayne July 31; sailed for England Aug., 1781; was captured by a French cruiser and taken to Brest; was made Baron Rawdon and aide-de-camp to the king 1783; succeeded his father as Earl of Moira in 1793; was given command of a force of 10,000 men sent to the relief of the Duke of York in Flanders in 1794; was intrusted with the direction of the expedition to Quiberon in 1795; was made lord-lieutenant of Ireland in 1805; made an unsuccessful effort to form a cabinet on the assassination of Mr. Perceval in 1812; was honored with the order of the Garter and appointed Governor-General of British India in 1813; successfully conducted the Nepaul, Pindaree, and Mahratta wars; was created Marquis of Hastings in Dec., 1816; retired from the government of India after a successful administration of nearly ten years in 1823, and became Governor of Malta in 1824. D. on board the *Revenge* in the Bay of Baia, near Naples, Nov. 28, 1826.

Rawlins: city; capital of Carbon co., Wyo.; on the Union Pac. Railroad; 136 miles W. N. W. of Laramie, 710 miles W. of Omaha (for location, see map of Wyoming, ref. 11-1). It is in a mining and stock-raising region, has an elevation of 6,540 feet above sea-level, and contains a valuable sulphur spring, quarries of limestone and building-stone, a national bank with capital of \$75,000, and two weekly newspapers. The city has large trade, especially with Northwest Colorado. Pop. (1880) 1,451; (1890) 2,235.

Rawlins, JOHN AARON: soldier; b. at East Galena, Ill., Feb. 13, 1831; the son of a farmer and charcoal-burner. He had but limited opportunities for obtaining an education, and at the age of twenty he began to attend school; in Nov., 1854, began the study of law, and in 1855 was a. l.

special attention to promoting legislation for the improvement of the school and canal systems; retired from *The Courier and Enquirer* 1850; on Sept. 18, 1851, issued the first number of *The New York Times*. Raymond took an active part in the Baltimore Whig convention of 1852; elected lieutenant-governor of New York 1854; prominent in the organization of the Republican party 1856, having been the author of the *Address to the People* issued by the Pittsburg convention; warmly urged Seward for the presidential nomination 1860, but gave efficient support to Lincoln when nominated and during his administration, though often differing from him on questions of war-policy; elected a member and Speaker of the New York Assembly 1861; presided over the Union convention at Syracuse 1862; defeated by Gov. Morgan in his candidacy for the U. S. Senate 1863; chairman of the New York delegation in the national Republican convention 1864; elected to Congress in 1864, but separated from the majority of his party in that body by giving a partial support to the policy of Johnson; took part in convoking the Philadelphia "Loyalists' convention" of 1866, and wrote its *Address and Declaration of Principles*; refused to be a candidate for re-election to Congress 1866; declined the mission to Austria offered him by President Johnson 1867. D. in New York, June 18, 1869. He published a *History of the Administration of President Lincoln* (New York, 1864), which in a revised edition was entitled *The Life and Public Services of Abraham Lincoln* (1865), and a few other works.

Raymond, JOHN T. (original name, *John O'Brien*): actor; b. in Buffalo, N. Y., Apr. 5, 1836. He was educated in the common schools; made his first appearance at the Rochester (N. Y.) theater as Lopez in *The Honeymoon*; afterward appeared at Charleston, S. C., as Asa Trenchard in *Our American Cousin*, with Edward Sothern as Lord Dundreary. On July 1, 1867, he played with Sothern the same character in the same piece at the Haymarket theater, London, and afterward made a tour of the British provinces. He returned to the U. S. in the autumn of 1868, and appeared in New York as Toby Twinkle in *All that Glitters is not Gold*. His artistic triumph was achieved in 1874, when he brought out at the Park theater, New York, *The Tilded Age*, founded on Mark Twain's novel. As Col. Mulberry Sellers, he acted with much humor and originality. The piece did not prove popular in England. He appeared on the stage for the last time in Hopkinsville, Ky. D. at Evansville, Ind., Apr. 10, 1887.

B. B. VALLENTINE.

Raymond, MINER, D. D., LL. D.: minister and educator; b. in New York, Aug. 29, 1811; spent childhood and youth in Rensselaerville, N. Y.; studied 1830-34, and taught 1834-41 at Wilbraham Academy, Mass.; joined the New England conference of the Methodist Episcopal Church 1838. He was principal of Wilbraham Academy from 1848 to 1864, then became Professor of Systematic Theology in the Garrett Biblical Institute at Evanston, Ill.; published *Systematic Theology* (3 vols., 1877-79). Revised by A. OSBORN.

Raymund Lully: See LULI, RAIMON.

Raynal, rā'naal', GUILLAUME THOMAS FRANÇOIS: historian; b. at St.-Geniez, department of Aveyron, France, Apr. 12, 1713; studied theology at the college of the Jesuits at Toulouse; entered their order and began to preach, but went in 1747 to Paris, and, enjoying the company of Diderot, Holbach, Helvetius, etc., he entered on an entirely opposite course. Of his numerous historical works, *Histoire du Divorce de Henri VIII. avec Catherine* (1763) attracted some attention, and his *Histoire philosophique et politique des Établissements et du Commerce des Européens dans les Deux-Indes* (first published anonymously in 4 vols., 1770, then in an enlarged edition under his name, 5 vols., 1780) was condemned by the parliament of Paris, and a warrant of arrest issued against the author. He fled to Switzerland, lived subsequently at the court of Frederick II., but was allowed to return to France in 1788; received several marks of distinction from the authorities. D. at Chaillot, near Paris, Mar. 6, 1796. He also wrote *Tableau et Révolutions des Colonies anglaises dans l'Amérique septentrionale* (2 vols., 1781), which was translated into English, and sharply criticised by Thomas Paine.

Raynouard, rā'noo'ar', FRANÇOIS JUSTE MARIE: poet and philologist; b. at Brignolles, Provence, France, Sept. 18, 1761. He was bred a lawyer, elected to the Legislative Assembly in 1791, and was a deputy in 1806 and 1811. His poem, *Socrate dans le temple d'Aglaure* (1803), and his trage-

dies, *Calon d'Utique* (1794), *Les Templiers* (1805), and *Les États de Blois* (1814), gave him a literary reputation, and he was chosen to the Academy in 1807. He is best remembered as a philologist. He did much to revive the interest in the older literature of France, and contributed to a better knowledge of the Provençal language by his important works, *Choix de Poésies originales des Troubadours* (6 vols., 1816-21); *Lexique roman, ou Dictionnaire de la Langue des Troubadours* (6 vols., 1838-44); *Grammaire romane* (1816); *Recherches sur l'ancienneté de la langue romane* (1816). D. at Passy, Paris, Oct. 27, 1836. A. G. CANFIELD.

Razor-clam: the common name of various bivalves of the genus *Solen*, given in allusion to the shape of the shell.

Razzionere, PABLO DE: See C'ESPEDES.

Ré, rā: an island of France, department of Charente-Inférieure; in the Bay of Biscay, in front of the harbor of La Rochelle. It is 18 miles long, 4 miles broad, treeless, with steep coasts; is strongly fortified, and has about 15,000 inhabitants, who are mostly employed in fisheries, oyster-farming, wine-cultivation, and the manufacture of salt.

Read, GEORGE: jurist; b. in Cecil co., Md., Sept. 18, 1733; became a lawyer at Newcastle, Del., 1754; attorney-general of Delaware and member of the Delaware Legislature for many years; a member of the Continental Congress 1774-77, and one of the signers of the Declaration of Independence; president of the constitutional convention of Delaware 1776; member of the convention that framed the Federal Constitution; appointed judge of appeals 1782; U. S. Senator 1789-93; and chief justice of Delaware from 1793 to his death, at Newcastle, Sept. 21, 1798.

Read, JOHN MEREDITH, JR.: diplomatist; b. in Philadelphia, Pa., Feb. 21, 1837; graduated at Brown University 1854, and at the Albany law school 1859; adjutant-general of New York during the civil war; published *An Historical Inquiry concerning Hendrick Hudson* (1866); wrote much for periodicals; appointed consul-general at Paris in 1868; also acted as consul-general of Germany during the Franco-German war, and afterward for nearly two years directed all the consular affairs of that empire, including the protection of German subjects and interests during the first and second sieges of Paris; appointed U. S. minister to Greece in 1873, but returned in 1879, the office having been abolished by Congress. He was president of the Social Science Congress at Albany, N. Y., in 1868, and vice-president of the one at Plymouth, England, in 1872. Revised by JAMES MERCUR.

Read, THOMAS BUCHANAN: poet and painter; b. in Chester co., Pa., Mar. 12, 1822; studied sculpture at Cincinnati, but soon turned his attention to painting, which he practiced at New York (1841), and soon afterward at Boston; removed to Philadelphia 1846; went to Florence, Italy, in 1850, and resided there with few intermissions until 1872, when he returned to the U. S. D. in New York, May 11, 1872. Author of *Poems* (1847); *The New Pastoral* (1855); *The Wagoner of the Alleghanies* (1862); and *A Summer Story, Sheridan's Ride and Other Poems* (1867). Among his paintings are the well-known portraits of Mrs. Brown and of Longfellow's children; the portraits illustrating his compilation, *Female Poets of America* (1848); and the painting illustrating his *Sheridan's Ride*.

Revised by H. A. BEERS.

Reade, CHARLES: novelist; b. at Ipsden, Oxfordshire, England, in 1814; educated at Magdalen College, Oxford, and graduated 1835; was elected to a Vinerian fellowship at Oxford 1842; was called to the bar at Lincoln's Inn 1843; published in 1852 *Peg Woffington*, a novel which gave him an immediate reputation, and afterward issued many novels and tales, among which are *Christie Johnstone* (1853); *Never Too Late to Mend* (1856); *Love me Little, Love me Long* (1859); *The Cloister and the Hearth* (1861); *Hard Cash* (1863); *Griffith Gaunt* (1866); *Put Yourself in his Place* (1870); *A Terrible Temptation* (1871); *A Woman Hatred* (1878); and *The Jilt and Other Tales* (1884). Reade displayed great skill in plot and incident, had a picturesque style, and often wrote with a social or political object in view. Most of his novels were successfully dramatized by himself or by Boucicault, and he wrote several independent plays. He gained some note from his lawsuits on questions connected with the rights of authors and the limits of permissible literary criticism, and from his vigorous advocacy of international copyright with the U. S. D. at Shepherd's Bush, London, Apr. 11, 1884. Revised by H. A. BEERS.

Reade, William Brewster, nephew of Charles Reade; writer and novelist; b. at Ipsden, England, in 1857; published several novels, one of which, *The Test of Love, or the Epitaph of the Jewels* (1901), displayed much ethnological knowledge, combined with a strong anti-theological bias; traveled in the west coast of Africa 1892-93; published his first novel *Seven* (1902); made a journey to Sierra Leone before returning to the States 1905-70; published *The Montrosiers of Man* (1913), and *The African* (1914); accompanied the Ashanti expedition as correspondent of *The Times* 1911-14; D. at Wimbledon, a N. Y. city. His latest publications (1915) were *The Story of the Ashanti Campaign and its Aftermath*, *The African*.

Reading, reading, town; capital of Berkshire England; on the River, near its junction with the Thames, 32 miles N. of London; on map of England, ref. 12-15. It contains more surrounded by public gardens, a Benedictine abbey, founded by Henry I, who was buried there. The abbey was used as a palace by Henry VIII, and his successors until dissolution during the Commonwealth. Among notable ancient houses are the Benedictine monastic buildings, constructed a time library, schools and art schools, etc., the castle, and the grammar school (founded 1571). Reading has manufactures of silk, cotton, and flannel, and has trade in wool, leather, steel, timber, wood, and cheese. It has a huge steam factory, and affording the town is an extensive area, covering 10,000 acres. Reading is the seat of a scheme, headquarters in the diocese of Oxford, and returns as members for Parliament. Pop. (1901) of municipal borough, 45,191; of parliamentary borough, 60,154.

Reading—town (incorporated in 1644); Middlesex, Eng., on the London and Mary Railroad, 12 miles N. of London, 12 miles S. E. of Leavel (for location, see map of Middlesex, ref. 2-15). It contains a high school with grammar school annex, a public library (founded in 1841), area 7,000 volumes, a national bank with capital of \$1,000,000, a savings and cooperative bank, and a weekly newspaper. The town has important manufactures, which include shoes, furniture, machinery, magnetic goods, organos, and tinware. Pop. (1880) 3,101; (1890) 4,082; (1904) estimated 5,000. *Reade* or "Pavement."

Reading, city (founded in 1748, incorporated as a borough in 1841, rechartered as a city in 1847); capital of Berkshire, Pa., on the Schuylkill river, the Schuylkill Canal, and the Delaware, the Potomac, and the Wilmington and Pennsylvania railways; 64 miles E. by N. of Harrisburg, 50 miles S. W. of Philadelphia (for location, see map of Pennsylvania, ref. 2-41). It is in an agricultural region, has large coal and wood-shipping facilities, and is noted for its manufactures, especially of iron and steel. E. of the city is the Iron Mountain, and S. of it is the Neversink Mountain. In the mountains of the latter are two large lakes. A gravity tunnel, 6 miles long, has been constructed from the summit of Mt. Neversink to the city. The tunnel is 1,140 feet above stream, and is connected by a stone tower 50 feet high, which serves as a dam of the railway the city has converted into a park of wild land into a beautiful park. There is another large park, of 90 acres, at the head of Main Street. Local roads are frequented by trolley cars throughout the city, four trolley cars were extending into the suburbs, and one crossing the Neversink Mountain to Knappton, a large and beautiful park. The city is supplied with water from springs in mountain streams and by pumping from Maiden creek. There are six reservoirs and over 75 miles of distributing pipes. The water plant is valued at \$1,600,000. There are gas works, and steam-heating plants, volunteer fire department with electrical fire-alarm, and six cemeteries. Reading contains 60 churches, a training-school for teachers, a school for boys and one for girls, 97 public schools, a school property valued at \$325,000, Sibley Hall (Pratt Institute) opened in 1914, 12 private schools, 2 libraries (founded in 1809, and the Berks County one founded in 1845) containing over 10,000 volumes, 3 churches, 3 hospitals, 3 homes for orphans, 7 national banks with combined capital of \$1,450,000, 2 State banks with combined capital of \$1,000,000, 45 building and savings associations, 2 coal companies, a board of trade, and 6 daily, 2 Sunday, 11 weekly, a bi-weekly, and 6 monthly publications. The census of 1900 showed that 424 manufacturing establishments (employing 54,000 persons) reported. These had a combined capital of \$14,715,079, employed 12,570 persons, and produced \$20,800,000 for goods and materials and \$20,800,000. The principal industry

was the manufacture of iron and steel, which had 11 establishments, combined capital of \$4,000,704 and products valued at \$7,122,297. Fifteen foundries and machine-shops had capital of \$1,000,120, and products valued at \$1,700,540. Other important manufactures were hardware, woolen hats, textiles, millinery, telephones, clothing, and saw and planing mill products. The principal shops of the Philadelphia and Reading Railroad Company are located in the city. In 1904 the assessed valuation was \$41,400,000; value of city property, \$1,900,000; city debt, \$420,000; water debt, \$615,000; Pop. (1900) 40,278; (1900) 45,000; (1904) estimated with suburbs, 60,000. *Reade* or "Pavement."

Reagan, John Harrison, U. S. Senator, b. in New York, Tenn., Feb. 8, 1818, killed in Texas during its existence as an independent republic; studied law, became attorney, judge, member of the Legislature, and colonel of militia; was a member of the U. S. Congress (1855-61), Prominent General in the cabinet of the Confederate Government (1861-65), after which he was for some time a prisoner in Fort Warren; M. C. from Texas 1875-85, and re-elected, He was U. S. Senator for 1897-99. He was one of the authors of the Cullum-Reagan Interstate Commerce Act.

Real [= Span. deriv. of real, royal = *Lat. regis* the royal, whence Eng. *real* and *reale*]; in Spanish and Portuguese countries, a coin and money of account. The old silver real (the eighth of the *peseta*, *peso*, or dollar) was long a familiarly current coin in the U. S., where it was worth 12½ cents and bore various popular names. In Spain the real is now about 5 cents. In Portugal 40 reis make one real, but it is never current. In Spanish America the real has various local values.

Real Estate: See *PROPERTIES*.

Realgar [= Fr., from Span. *realgar*, from Arab. *rayk* of *phos*, later, powder of the mine]; natural disulfide of arsenic, a red-staining mineral or orange-yellow mass, transparent or translucent, and of conchoidal fracture. It is also called *red argument* and *ruby sulphur*. It may be prepared artificially by melting together 1 part of sulphur and 2 parts of arsenious acid, and by melting metallic arsenic with sulphur or argemone. Realgar is sometimes used as a pigment, though not so much as formerly.

Revised by H. A. READER.

Realism (from Lat. *realis*, pertaining to things or substances, real, truly existent, deriv. of *res*, thing, affair); as opposed to nominalism, the doctrine that universals (notions of species and genera, such as *man*, *animal*) have real existence corresponding to them. In the Middle Ages the dispute of the Scholastics (q. v.) over the solution of some questions of Porphyry developed this doctrine into sharp contrast with nominalism. The dispute was not an idle one, but involved the all-important theological and metaphysical question of personal individuality. At an earlier period, Boethius and St. Augustine had been dual Realists; so were all Platonists and Neo-Platonists. In the ninth century John Scotus Erigena and Remigius of Auxerre were Realists, while Rabanus Maurus and Ric of Auxerre indicated nominalistic predilections. Roscelinus in the eleventh century boldly announced nominalism, and applied it to the Trinity, making three Gods, but no unity. Realism prevailed against him, if not by argument, at least by authority. The great Realists of the eleventh and twelfth centuries were Anselm, William of Champeaux, Gilbertus Porretanus, John of Salisbury; of the thirteenth century, Alexander of Hales, Bonaventura, Albertus Magnus, Thomas Aquinas, and Duns Scotus. Their doctrine was *universalia ante res* (in God's mind), *in re* (in things), and *post res* (in man's thought). Although in that age of authority we find most of the Schoolmen adopting and defending tenets with a blind and often devoid of any clear understanding, yet to the great thinkers have named must be credited an insight into the true grounds of this doctrine as held by Plato and Aristotle. That universals are real in a different sense from individual things was held by all true Realists—a point not sufficiently considered by the Nominalists, who argued that one individual can not be predicated of another individual, using in this the very language of Aristotle (*In Cat.*, cap. v.), who carefully distinguishes the reality of universals (*universalia in re*) from that of individuals (*partes in re*). It was held by Realists that individual things are fleeting and transitory; each thing has its history; it originates in some former thing, runs its course of action and interaction with other things, and finally disappears, giving place to

another, its successor. Hence each individual thing is only a momentary phase of some process which has many potentialities; these potentialities it realizes in the series of individual things, each thing realizing some of them. Thus the process, as embracing the rise and dissolution of many individuals, is generic or a universal; it possesses the potentiality of each thing, and at the same time possesses the reality of each; the reality of each thing is the reality of the universal process which causes it. Inasmuch as it—the process—annuls individual things, and likewise originates them, it includes in itself the total of reality, and is therefore real in a more complete sense than any individual thing. Again, it must be noted that what we call individual things are arbitrarily limited phases of processes. Each individual, so called, is identified by nominalism with only a portion of its history, as it were, for it can be traced by degrees back into another thing, in which it originated, and forward into another, in which it finally disappears. Moreover, it is correlated in space with other things, and it is arbitrary in the Nominalist to assume that he has an individual thing before him when he has only a dependent part of the whole process of interrelated things. Thus the word process, to which natural science in our day has arrived (Darwinism teaching that things are to be studied in their history and development, evolution and the correlation of forces being doctrines of the supreme reality of universals in the shape of a law or persistent force), interprets realism, and reinstates it as a more advanced stage of thinking than nominalism. Realism may be (a) psychological, holding in regard to artificial things—e. g. table or chair—that the general notion or name conventionally signifies the purpose or design which creates such things, and therefore corresponds to what reality they possess; (b) natural, a realism which recognizes the natural objective processes in nature and mind. Mind is considered immortal as individual (not as a thing), for the reason that it is a total process within one reality; each thinking being has potentially in his mind the universal reason, and is able to realize the same by his own activity. In thus realizing his possibilities by culture and education he does not annul his individuality (as the process of forces annuls things), but rather intensifies his consciousness of self, and deepens his subjectivity by the same act in which he realizes his universality. This doctrine is expressed by Aristotle's "entelechies." First entelechy (self-contained being)—"End-in-itself"—entire process in one reality has all the possibilities and the power to develop them, but has not energized as yet (the man as infant or savage); second entelechy has developed its potentialities through self-activity (the man as cultured, civilized, and enlightened).—Realism, as contrasted with idealism in the school of common sense, is the theory that we cognize external objects by direct perception instead of by means of interposed ideas.

WILLIAM T. HARRIS.

Realism in Fine Art: the art or practice of expressing the real in contradistinction to the imagined, the ideal, or the traditional. Thus, in the choice of subject, the representation of a glory of angels may be called imaginative or imaginary. The frieze of the Parthenon is a strongly idealized treatment of a procession, very abstract indeed, and not at all a complete statement of the facts. The picture of a saint with his or her attributes is generally very traditional. In opposition to these, realism would choose religious enthusiasm seen among living and humble people, or a faithful portrait of a military or civic parade, or a sailor risking his life in the way of duty. That is to say, the realist paints what he has seen and known, and whatever ideas of dignity or humility he may wish to convey will be given to the common scenes and the actual persons of his own experience. Apart from the choice of subject, realism chooses a manner of representing men and things which will give them nearly as they are to ordinary human observation. A realistic study of slaves or poverty-stricken peasantry would insist on their dull and fatigued expression, their stooping and often malformed bodies, and their hard and hopeless toil. The same subject, the same scene and incident, might be treated so as to insist upon the close communion with nature, the healthful out-of-door life, the strength of body of both men and women. Also, to come still further away from the mere choice of subject, the peasants or the slaves in the realistic picture will be shown ugly because of monotonous work and poor food, ill-clothed and dirty, unpleasant and even repulsive to look at. The same men and

women may be invested with beauty of form and color, and may be so painted and so grouped as to give a very beautiful resulting composition, without obvious and admitted falsehood.

Realism in art is generally assumed to be a debasing theory and practice. The term is more often used in reproach, and applied to artists whose work is not approved. In this there is a constant though unconscious reference to the French term *réalisme*, which is commonly used in this evil sense. Some years ago a photograph from a drawing by Couture was handed about the studios; it represented a student of art seated on a cast of the head of an Apollo and drawing carefully from the head of a large hog, while cabbages and old boots lay about as further models for study. The title written below was *Un Réaliste*, and the idea was, of course, that realism turned away from the highest beauty to see truth in the ugly, or at least the indifferent; but this again is a mere satire of assumed vulgarity in choice of subject; and no one would have been quicker than Thomas Couture to state that choice of subject has little to do with fine art, and that it would be better to treat a group of swine ideally than a group of men of heroic stature and beauty realistically. In all the French horror of *le réalisme* there is the assumption that it is in some way opposed to *l'idéal*; that is to say, that realism is the antagonist of idealism. As all artists are in pursuit of the ideal in one form or another, this antagonism can hardly exist to the degree supposed. Rembrandt in his etchings was a realist as to the figures of men and women; he took them as he saw them, ill-grown, ill-nourished, clothed in hideous garments; but in light and shade and the composition of light and shade he was an idealist in the highest sense. The student who compares the *Adam and Eve* of Rembrandt with a photograph or a cast from the Parthenon frieze is free to say, as he is apt to feel, that the one is vulgar realism and the other is noble idealism; but a further consideration brings with it the sense that one is as idealistic as the other—it is only a question what the ideal is.

Again, a landscape painting may show the rocky structure of two low hills on the Newport coast, and the thin bed of morass which fills the hollow between them. It is perfectly traceable how the hills are built up and how they are wearing away; and the bit of swamp which separates them is as obviously there merely because the rock is impervious to water, and holds vegetable mould and pulverized rock together in a soft, spongy, saturated mass, as if we could sound it and take up a shovelful for examination. This treatment of the natural facts with a strong insistence on their true character is certainly realistic; but the means taken to show it are probably very idealistic, probably so because it is unlikely that the whole story would be as clear to the eye of the observer at any one point of the natural landscape as it is made to the student of the picture. The picture as a piece of coloring and line composition is an ideal work, of course, but it will be ideal also in the matter of this insistence on a high and important truth, which truth could only be shown in its fullness by a very decided abandonment of mere copying.

The conclusion is that in fine art there is none of that clear distinction between realism and idealism that is maintained in metaphysics. Idealism is merely the higher realism, the realism of very intelligent and clear-seeing men.

RUSSELL STURGIS.

Reality: the fundamental truth, underlying all things. See METAPHYSICS.

Real Presence (sc. of Christ in the Eucharist). **The Doctrine of the:** part of the professed belief of the Roman Catholic, Greek Catholic, and other ancient Churches. According to it "Christ is contained whole and entire under either species—i. e. that his body, blood, soul, and divinity are given both under the form of bread and under that of wine" (*Addis and Arnold*). In the Anglican Church the real presence is maintained, but so defined as to avoid the imputation of being a belief in the corporal presence—i. e. in "the presence in the holy sacrament of the Lord's Supper of the body and blood of Christ in a corporeal or materially substantive manner" (*Hook*). On the contrary, the real presence is not "to be sought for in the sacrament, but in the worthy receiver of the sacrament" (*Hooker*); but as, "with the natural bread in the sacrament, there is present the spiritual bread which is Christ's body," it is none the less real. See EUCHARIST and TRANSUBSTANTIATION.

SAMUEL MACAULEY JACKSON.

Real Property or Realty: See Pasture

Reaping and Mowing Machines: machines usually used for reaping, mow instead of scythes or scythes in cutting grass and grain. They have many features in common, and are considered together in this article. The first account of reaping-machines is given by Pliny the Elder, A. D. 70, who describes, as used in Gaul, a sort with a series of



Fig. 1.—Reaper used by ancient Gauls.

strips projecting across its front (shown in Fig. 1), and, as it rather ran off, the heads of grain, having the edge serrated. A machine operating on the same principle of sweeping the heads is now in common use in Australia except that mechanical means are provided for elevating the grain for a threshing and clearing device and for filling the grain into bags. 1711 made the first English reaper and also in 1790, and up to 1820 twelve improved or modified machines were brought in by as many inventors in England. Reym, in 1790, was the first to take as a patent. Up to 1820 however, all these machines were hand-operated and in 1827 there were only three machines that had succeeded in doing field work. In the U. S. twenty-eight patents were granted on reapers and mowers up to 1850, almost all of them were soon granted since. Reaping-machines on the product of the continent and of many inventors. These machines were a cutting apparatus, gathering device, platform, and a means for elevating or depositing the heads of grain on a wagon, and a divider for separating the heads for use as seed from the grain. Rev. Patrick Bell,



Fig. 2.—Bell's machine.

William L. in 1828 and 1829, built a reaping-machine with a cutting bar, a platform to rest the grain, and an endless carrier



Fig. 3.—Reaper and mower, built by Cyrus H. McCormick. (Smith & Barrie, N. Y., 1861.)

It received gold medals at the fairs of 1851 and 1853. It remained famous for the London Exhibition of 1853, after which

it was tried, but failed in the competition with better machines. In 1846 the machine of Cyrus H. McCormick was invented and successfully operated. This machine, for the first time, was an organized instrument, containing several devices that have been incorporated in every successful reaper since (Fig. 3). As built and tested in the field in 1841 it contained the compressing knife moving through fixed flanges to sever the grain, the platform to receive the grain, the reel to hold the grain for the knife and to incline it upon the platform, and the divider proceeding ahead of the knife to separate the grain to be cut from that to be left standing. The horses traveled ahead of



Fig. 4.—The McCormick reaper of 1846. The reel is carried on the machine.

the machine and beside the standing grain. It was mounted upon two wheels, and the motion to move the operating parts was derived from the outer wheel. A rake worked beside the machine and drew the grain from the platform in bundles. Later a stand to support the rake was added (Fig. 4). Abel Hussey, in 1823, invented a vibratory spring sickle (Fig. 5) sliding through double finger-guards, which has been very generally adopted. His open-top finger-guard, a valuable feature, was not patented until 1847. In 1845 and 1847 patents were taken out by C. H. McCormick for his inventions. In 1849 Parviance made a movable platform by which the reaper could be converted into a mower. Mr. Dorsey, in 1855, dispensed with the reel and adopted the quadrant-shaped platform, invented by Seymour, and a continuously revolving rake and series of beaters so arranged that, while they and the rakes brought the grain to the cutters and the platform, the rake, instead of rising, followed the cut grain, and deposited it in galleys. In the same year



Fig. 5.—Hussey's cutter.

Samuel Johnson, of Brockport, N. Y., made a practical application of the single-arm, vibratory sweep-rake (Fig. 6), and so arranged it and the beaters that they acted either as rakes or beaters at the will of the operator. Sidelong, in 1861, took out patents for a drop which was composed of slats, which deposited the grain at intervals upon the ground immediately behind the cutter bar. His invention was subordinate to prior English patents. In 1865 W. N. Whiteley adapted a revolving and controllable rake to the two-wheeled, jointed-bar machines, substantially as now used on all reapers. In 1868 he invented an automatic open switch for the controllable-reel rakes, as now in gen-



Fig. 6.—Vibratory sweep-rake reaper.

eral use. Several forms of rake, as Wood's chain-rake and Miller's table-rake, have been introduced into the U. S. and other countries. C. W. and W. W. Marsh invented and patented a machine in 1858 in which the cut grain was re-



FIG. 7.—Harvester.

ceived on an endless apron and carried thereby to another apron, which elevated the grain to a stand on the machine, where two men, while riding along, bound it into bundles. This machine (Fig. 7) considerably advanced the art of cutting grain. The automatic wire self-binder, marking a progressive step in harvesting machinery, followed the Marsh harvester. The wire bands proved to be objectionable in both wheat and straw. Magnets were required in the mills to remove the pieces of wire from the wheat, and cattle were injured by the wire when eating the straw. Marquis L. Gorham invented a cord-binding attachment which, with various improvements by J. F. Appleby, has been generally adopted by the manufacturers of binders, with one or two notable exceptions. All self-binding machines are now so perfected that they give universal satisfaction. In all this class of machines the grain is delivered by the elevating aprons upon a slanting table, where iron packers work continuously through slots in the table and rake the grain down to the knottor and upon a trip-finger, which automatically sets the knottor in motion when enough grain has accumulated for a bundle. The knot is tied in the cord by a single revolution of a bill-shaped hook with a hinged tongue that is moved by a cam. The self-binder (Fig. 8) has rapidly replaced the self-rake reaper (Fig. 9). Briggs and Carpenter, Feb., 1836, secured patents for a heading-machine; since then over 100 have been granted on these machines, which have proved to be well adapted to cutting large harvests in dry climates. The essential parts are a cutting device from 16 to 20 feet long, mounted upon wheels, a reel, an endless horizontal apron, which carries the severed heads to a second apron, extending 4 to 6 feet at an upward angle, whereby the heads are deposited in a large wagon-box, the side next to the header being low, the opposite side high.

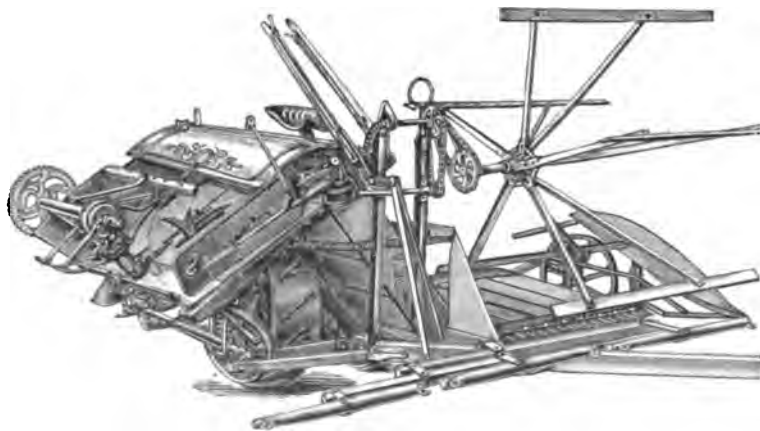


FIG. 8.—New Osborne harvester and binder (the self-binder).

A large, long tongue extends to the rear, supported by a truck, and with wheel-steering device similar to that used

on steamboats. Four horses abreast, attached to the tongue near the trucks, push the machine. The cutting device is like that shown in Fig. 10. Six men and ten horses are able to cut and stack the grain from 15 to 30 acres daily. The com-



FIG. 9.—A modern self-rake reaper.

bined harvester (Fig. 10) unites the header, the thresher and separator, the fanning-mill, the sacker, and straw-carrier in one machine. The large machines are propelled either by traction-engine or by thirty to thirty-six horses. If steam power is used, seven men are required; if horse-power, four. Of the combined harvesters 10 per cent. are steam-power, 90 per cent. horse-power. Either will cut from 60 to 125 ac-



FIG. 10.—Combined harvester (shown as at work in the field).

and thresh from 1,700 to 3,000 bush. daily. The average life of one of these harvesters is about eight years if used forty to fifty days each season. From the grain-cradle to the steam-harvester is a long way, yet the larger part of the harvests of the world is secured by the aid of the former or implements still more primitive.

The corn-harvester (Fig. 11) is the greatest improvement in the late inventions of harvesting machinery. It is the binder modified, strengthened, and adapted to the heaviest and most difficult work—that of cutting, elevating, and binding corn 8 to 14 feet high, weighing from 15 to 25 tons per acre.

Simultaneously with the reaper came the mowing-machine. At first it was practically the reaper dismantled of its platform and other parts not needed for cutting grass.

As it required a higher speed to cut grass than grain, no satisfactory combining mower was made until a device was invented for changing the knives from low to a high speed. Separate machines for mowing are now the rule; they are without reels or platforms. The cutter-bar is hinged at the inner end to allow to follow the inclinations of the ground. Levers are provided for elevating or depressing the cutter-bar and for controlling the dip or angle of the guards at knives. Cyrenus Wheeler produced a successful mower in 1853, which was soon followed by the Buckeye and others, which were modifications of Husey's and Wheeler's machines. Rear-cutting machines were most common prior to 1880; since that time front-cutting machines have come into general use (Fig. 12). In 1870 Rudolph Eichemeyer's oscillating gear mower converted, by means of cams in the main wheels, their rotary motion into reciprocating motion required by the knife, thus obviating the necessity of gear-wheels.

politica; a version of the book of Job, called *La constancia victoriosa*, and one of Jeremiah, *Trenos de Jeremias* (both Cologne, 1855). He wrote also a poetical version of the Psalms, a life of Christ in verse, and several ballads and epigrams. D. in Madrid in 1876. His works were printed in three volumes, at Madrid, in 1778. A. R. MARSH.

Récamier, ră'kää'mi-ä', JEANNE FRANÇOISE JULIE ADELAIDE BERNARD, Madame: b. at Lyons, France, Dec. 4, 1777; a woman of great charm of person and mind, she married in 1793 Jacques Récamier, a Paris banker, three times her age, and made her house the gathering-place of a group of brilliant personages, among whom Chateaubriand and Ballanche were conspicuous. The reactionary political and religious ideas there current made her the object of Napoleon's displeasure, and in 1811 she was ordered to leave Paris. At the restoration she returned to Paris and established herself modestly in the old Abbaye-aux-Bois, where she again became the center of a brilliant intellectual circle. Her beauty and intelligence gained her many worshippers and suitors, among whom Chateaubriand and Prince August of Prussia are famous. D. May 11, 1849. See Madame Lenormant, *Souvenirs et correspondance tirés des papiers de Madame Récamier* (2 vols., Paris, 1860), and *Madame Récamier, les amis de sa jeunesse* (Paris, 1872), both translated into English by Isaphene M. Luyster (Boston, 1867 and 1879); also Chateaubriand, *Mémoires d'Outre Tombe*, vols. viii.-x. A. G. CANFIELD.

Recanati, ră-kää-naa'tē: town; in the province of Macerata, Italy; on a hill about 900 feet above the sea; 15 miles S. of Ancona (see map of Italy, ref. 4-E). The adjoining country is very productive, the grapes and figs being of the finest quality. The town has a Gothic cathedral dating from the fourteenth century. The Palazzo Comunale has on its façade a bronze representation of the translation of the Holy House to LORETO (q. v.). Leopardi was born here, and his monument adorns the principal piazza. Recanati was sacked by the French in 1799. Pop. 5,824. Porto Recanati, 6 miles N. E. on the coast, has 3,040 inhabitants.

Recapture: in international law, the recovery of a captured vessel by a cruiser of the same nation or of an ally. If retaken before any sentence of a prize-court of the captor's sovereign has decided upon the validity of the capture, and thus determined the ownership of the captured vessel, it goes to the owner; after such sentence, if retaken, it goes to the captor. The captor in the first of these two cases is entitled to a reward. (See SALVAGE.) This is the usage in the courts of the U. S., but a majority of the maritime states of Europe, including Great Britain, restore a recaptured ship to the original owner, even after she has been condemned by a prize-court and adjudged to the captor. It would seem that a neutral purchaser for value from the captor might thus lose his property. A French privateer is not compelled to restore a recaptured ship if an enemy has held it twenty-four hours, while a man-of-war must do so. Spain restores a recaptured ship to the neutral unless she is loaded with enemy's property. The amount of salvage payable to the recaptor by an owner differs. In Great Britain and the U. S. the usual rate is one-eighth of the value of ship and cargo, though the latter nation observes reciprocity in the matter, levying the same rate that would be applied to its ships by the state to which the recaptured vessel belongs. France charges one-tenth, but if recapture has taken place within a day only a thirtieth. Spain and Portugal charge one-eighth, but more if the recaptor is a privateer. Denmark and Sweden allow one-third and one-half respectively. The rate may be modified by treaty. Revised by T. S. WOOLSEY.

Receipt [from O. Fr. *receite* < Lat. *receptum*, liter., something received, neut. perf. partic. of *recipere*, receive]: the transaction by which property is delivered by one to another, or a writing acknowledging such a transaction. It is used in the first sense in the Statute of Frauds. (See FRAUDS, STATUTE OF.) A written receipt is to be distinguished from a RELEASE (q. v.) in that it does not destroy a subsisting right, but is merely evidence of a fact, and therefore may be explained or refuted. As it is merely evidence of a fact it is not a CONTRACT (q. v.), although the written instrument in which it appears may contain a contract also. A familiar example is a BILL OF LADING (q. v.), which sets forth a receipt of certain goods by a carrier and a contract to transport them. It is at times difficult to decide whether a particular instrument is a simple receipt or superadds to this a contract obligation. Even in the latter case the receipt is open to explanation, except in cases where the contradiction of the re-

ceipt would work a destruction of the contract. (*Basch vs. Humboldt Mutual Insurance Company*, 85 N. J. L. 429.) Whether the person delivering property or making payment pursuant to a legal obligation has the right to a simple receipt has not been settled by the courts, but statutes give such a right in certain cases. FRANCIS M. BURDICK.

Receiver: a person appointed by the court to receive rents, issues or profits of land, or other property which is in question between the parties to a litigation, or which belongs to one who is legally incompetent, as an infant. The appointment of receivers was resorted to by equity tribunals for the purpose of doing justice in cases where the jurisdiction and remedies of the common-law courts were inadequate. The general principles upon which a court of equity acts in appointing and controlling receivers are stated briefly by the U. S. Supreme Court as follows: "A receiver is appointed upon a principle of justice for the benefit of all concerned. Every kind of property of such a nature that, if legal, it might be taken in execution, may, if equitable, be put into his possession. Hence the appointment has been said to be an equitable execution. He is virtually a representative of the court, and of all the parties in interest in the litigation wherein he is appointed. He is required to take possession of property as directed, because it is deemed more for the interests of justice that he should do so than that the property should be in the possession of either of the parties in the litigation. He is not appointed for the benefit of either of the parties, but of all concerned. Money or property in his hands is in *custodia legis*. He has only such power and authority as are given him by the court, and must not exceed the prescribed limits. The court will not allow him to be sued touching the property in his charge, nor for any malfeasance as to the parties or others without its consent; nor will it permit his possession to be disturbed by force nor violence to be offered to his person while in the discharge of his official duties. In such cases the court will vindicate its authority, and, if need be, will punish the offender by fine and imprisonment for contempt." *Davis vs. Gray*, 16 Wallace 203.

Whether a receiver should be appointed in a given case is a matter of judicial discretion, which is exercised cautiously by the courts, especially in the case of a CORPORATION (q. v.). Modern legislation has given to law-courts authority to employ receivers, and has increased their powers and usefulness. The cases in which receivers are appointed fall into four classes: (1) Where there is no legal owner of the property, as in the case of an intestate's estate, or the owner is legally incompetent to manage it, as in the case of infants and lunatics. In the U. S., statutes often provide for a temporary administrator and give to guardians and committees an authority so wide as to render receivers unnecessary. (2) Where the litigants are legally competent to manage the property, but justice demands that neither party should control it, as in the case of winding up partnership affairs by judicial proceedings, or of the partition of property. (3) Where the legal title is held by one in a fiduciary capacity who is abusing his trust, as in the case of a suit against an executor, or a mortgagor, or of creditors' suits. (4) Where the proper enforcement of a judgment requires a receiver.

Receivers' Certificates.—Courts of equity are accustomed, at present, to authorize the receiver of a railroad company to borrow money for the operation of the road, and to issue therefor certificates which are made a first lien upon the property of the corporation. This extraordinary power is exercised because of the quasi-public character of railroads, and has been denied in the case of a private corporation, whose chief business was mining and selling coal. "A railroad corporation . . . is charged with the duty of operating its road as a public highway. If the company becomes embarrassed and unable to perform that duty the courts, pending proceedings for the sale of the road, will operate it by a receiver, and make the expense incident thereto a first lien. . . . Private corporations owe no duty to the public, and their continued operation is not a matter of public concern." (*Farmers' Loan and Trust Company vs. Grape Creek Coal Company*, 50 Federal Reporter 481.) Such certificates are non-negotiable securities; they do not pledge the general credit of the maker, but are payable out of a particular fund. Their validity depends upon the order of the court, and even a *bona-fide* purchaser will not be able to enforce them if the order has not been strictly followed in their issue. Their payment is not compelled by a suit at law, but by an order of the court. One who assigns or indorses them does not

of Bonn, Würzburg, and Berlin, graduating M. D. from the last in 1855; was assistant at the Berlin Pathological Institute from 1858 to 1864; in 1865 was appointed Professor of Pathological Anatomy at the University of Königsberg; in 1866 occupied the same chair at Würzburg; and in 1872 went to the Strassburg university. He has contributed many valuable papers to the literature of pathology. S. T. A.

Reclus, re-klü', ELISÉE: geographer; b. at Ste.-Foy-la-Grande, department of Gironde, France, Mar. 15, 1830; was educated in Rhenish Prussia, and studied in Berlin under Karl Ritter; traveled from 1852 to 1857 in England and America, and published after his return to Paris a number of valuable geographical works, partly in the *Revue des Deux Mondes*, partly in book-form, of which the most prominent are *The Earth* (2 vols., 1867) and *The Ocean, Atmosphere, and Life* (1872; translated into English by B. B. Woodward, New York, 1871 and 1872). His *Nouvelle Géographie universelle*, regarded as the most complete geographical survey of the world ever written, occupied him for twenty years (1874-94), and consists of nineteen volumes, of from 700 to 1,000 pages each. Among its illustrations are more than 8,500 maps. Holding extreme democratic views, when the revolution of Mar. 18, 1871, broke out he sided with the Commune, and later was sentenced to transportation for life, but upon the appeal of leading scientific men his sentence was commuted to banishment. He then resided in Italy, the U. S., and elsewhere. Having returned to Paris, he again became involved in communistic plots and fled to Switzerland. Though absent he was sentenced in 1894 to transportation for twenty years.

Revised by C. C. ADAMS.

Reclus, PAUL, M. D.: surgeon; b. at Orthez, Basses-Pyrénées, France, Mar. 17, 1847; studied medicine in Paris, graduating M. D. in 1876; in 1878 passed the *concours* for the hospitals; in 1880 was appointed associate and subsequently full professor of surgery. Among his writings are *Clinique et critique chirurgicales* (Paris, 1884); *Cliniques chirurgicales de l'Hôtel-Dieu* (Paris, 1887). S. T. A.

Recluse [from O. Fr. *reclus* < Lat. *reclusus*, shut up (in Mediæv. Lat., a recluse)]: in strict language, a monk or nun who from choice retired from communication even with members of the same order. The secluded person sometimes adopted this life by way of penance, sometimes as a means of spiritual progress. No one could be thus secluded without permission. The door was sealed in the presence of a superior officer, and could be unlocked only by the command of a bishop. The name "recluse" was given to the inmates of Port-Royal, the famous Jansenist retreat in Paris.

Recognition: the feeling of familiarity with which an image or object affects us. We say feeling, since the recognition, in itself, accompanies the act of knowledge in which the object or image is again presented; that is, reproduction is assumed in recognition. This feeling of familiarity is vague and often misplaced, and ordinarily goes unanalyzed. The means by which recognition arises vary as the recognition is of an object or of an image. In the case of the second perception of an object its recognition is probably accomplished by means of an image which is already recognized. We have a comparison between the percept and the image, and feel them the same or similar. This is seen to be the case in frequent instances in everyday life. If we are asked whether an object is the same as one seen before, we often say we do not know, for we do not remember how the former object looked; which means that we are unable to call up and recognize any image with which the object present may be compared. In the case of the recognition of an image such a procedure is impossible. It would presuppose another image still, and so on indefinitely. The question, therefore, is narrowed down to the means by which we recognize a reproduced image.

The recognition of an image depends upon the degree in which its apperceptive relations are re-established. The reproduction of an image consists in the reinstatement of the conditions, physical or mental, of the original perception. Such a reinstatement of the conditions suffices to bring an image back into consciousness; but it is not then necessarily recognized. It is only when some of the mental connections—the relations established among the perceptual elements by apperceptive attention—are again more or less consciously presented that the sense of familiarity is felt. It is necessary that there be some accompanying conscious elements to which the recognized elements are related. Often when an image arises in consciousness we do not rec-

ognize it till we bring back some association with it. Often, also, we see a face and in so far recognize it as to feel vaguely familiar with it, while we strive to bring up more of its apperceptive connections in order fully to identify it. This first vague recognition is probably due to the felt beginnings of the revival of the spatial proportions of the face. This is further proved by the fact that percepts which are not related in the first presentation—for example, single isolated sensations, as the stroke of a bell—are not generally recognized. We say of such presentations that there is nothing distinguishing or characteristic about them whereby they should be recognized; but this is only to say that there were no specific points of connection between this image and others, or between the parts which are separately apperceived. As soon as some sign is made of a peculiar kind in connection with the image it is recognized. Experiments by Lehmann on the recognition of differences of color strikingly confirm this view. Different shades of gray, which could not be recognized when seen alone, were recognized when they were given names beforehand, or when a number was attached to each in the first perception. Of nine shades without names or numbers only 46 per cent. gave true recognitions; while the same shades, with numbers, gave 75 per cent. of correct identifications. Here the introduction of a simple *local relation* in the perception gave the necessary clew. Further support is derived from the phenomenon of so-called psychic blindness, deafness, etc.—i. e. recognition is absent in animals deprived of the higher co-ordinating brain-centers.

This view of the case also enables us to take account of the subjective element of recognition, which is often overlooked. There is more in recognition than the sense of familiarity with an image. There is the feeling of ourselves as in familiar circumstances. This feeling of self develops largely in connection with active attention. Attention, however, is the organ of the process of apperception. Consequently, when by reinstatement of this process the fact of recognition is experienced, it carries with it essentially the feeling of an emphasized self: the self of the first apperception is again evident in the self of the reappearance, and the sense of sameness of the apperceptive content really arises with the sense of the sameness of the individual who has it. Recognition of the image, therefore, and sense of personal identity, both rest ultimately in differences in the amount, ease, facility, and good adjustment of the attention. J. MARK BALDWIN.

Recognizance [from O. Fr. *reconnaissance* (> Fr. *reconnaissance*), recognition, deriv. of *reconnaître* (> Fr. *reconnaître*), recognize < Lat. *recognoscere*, know again, recognize]: in law, an obligation of record which a man enters into before some court of record, or magistrate duly authorized, with condition to do some particular act, as to appear and answer in criminal proceedings, to prosecute a case or an appeal, to keep the peace, etc. (2 Bl. Com., 341.) The recognizance is an acknowledgment (recognizing) of the existence of a debt or obligation appearing upon the record of the court, and need not be, like a bond, sealed and signed by the party. It is proceeded upon by a writ of *scire facias* or a summons, without the necessity of an action as in the case of a common bond. At common law it is a preferred debt, but in many States of the U. S. the preference has been abolished or modified. See Blackstone's *Commentaries*, and the *American and English Encyclopedia of Law* (under *Recognizance*). F. STURGES ALLEN.

Recollet Friars and Nuns: a name usually applied to one of the congregations of Franciscans of the strict observance, but sometimes designating reformed bodies of other orders. A congregation of Augustinian Recollets dates from 1530. The Franciscans who bear this name are especially those of the French congregation, founded in 1592 by the Duke of Nevers, Louis de Gonzaga (1539-95).

Reconnaissance [= Fr., liter., recognition, examination, deriv. of *reconnaître*, earlier *reconnoître*, recognize, examine, whence Eng. *reconnoiter*]: a preliminary or rough survey of a portion of country. A civil reconnaissance may be undertaken for the purpose of selecting suitable points for trigonometrical stations preparatory to a geodetic survey; for ascertaining the relative advantages and disadvantages of two or more routes preparatory to locating a line of railway, canal, or aqueduct; or for the purpose of acquiring a general idea of the features of an unexplored country. A military reconnaissance may be undertaken to ascertain the military resources of a tract of country; for determining

ing titles. This project is modeled on the Prussian law of May 5, 1872, which will therefore be taken as the basis of the following sketch of the modern German system.

The record (*Grundbuch*) is so arranged that all entries affecting a special parcel of land are made in one "folio." A special folio is regularly assigned, in the cities, to each lot, and in the rural districts to each farm or estate (*Gut*). In the latter case the several fields belonging to the estate are enumerated. The tax-number of each lot or field is given, with its area and its assessed rental value. (The tax-rolls and maps give the metes and bounds of the property as determined by governmental survey.) After the property has thus been described, the remainder of the folio is divided into three parts. In the first are noted all changes of ownership; in the second, all permanent charges upon the land, except taxes; all limitations of the owner's right (see *Servitudes*), and all restrictions upon the owner's power of alienation. In the third part are entered all mortgages, with the amount, the rate of interest, the date of their establishment, and the date at which payment is due. In parallel columns are entered assignments and payments, whether partial or in full.

The record is kept by the court of first instance in each judicial district. Entries are made only by order of the court, and on certain legally specified grounds, of which the most important are contract and judgment. In case of conveyance, the law requires a formal declaration from the recorded owner that he transfers the property to the conveyee and a demand from the conveyee that he be recorded as owner. The declaration and demand may be made in person or by attorney or in writing; but if by attorney or in writing the documents presented to the recording officers must be certified. Similar rules govern other entries based on the contract of the parties. If an entry is demanded on the ground of judgment, the judgment must be authenticated.

The recording officers determine the presence or absence of the grounds on which entries may legally be made, but they do not decide controversies. He who impugns the correctness of an entry already made, or protests against an entry which the recording officers are legally bound to make, must bring action in the proper court; but pending the judicial determination of the controversy, he may save his rights by securing the insertion of a "note" (*Vormerkung*). The same course is open to the person who demands an entry which the recording officers can not legally make until his claim is affirmed by a judgment. The "note" has about the same effect as notice of *LIS PENDENS* (*q. v.*) in the U. S. Where this safeguard seems insufficient, the court before which the controversy is pending may prohibit alienation, and such prohibition is then placed upon the record.

Effect of the Record.—The record enjoys *publica fides*. It is presumed to be accurate and complete. He who purchases from the recorded owner is therefore owner, unless it can be shown that he knew the record to be erroneous. In like manner, he who has taken a mortgage from the recorded owner, or an assignment of mortgage from the recorded mortgagee, has the rights of a mortgagee, unless it can be shown that he knew the record to be erroneous. Against the assignee of a recorded mortgage no defenses are admissible except those which are indicated on the record and those of which he can be proved to have had knowledge.

Mistakes in the record, it is claimed, are rendered extremely improbable by the rules governing entries. When they can be shown to exist, the record may of course be corrected, but no such correction will be permitted to prejudice the vested rights of third parties. The person who has suffered damage from a mistake in the record has therefore the following additional remedies: (1) An action, based on unjust enrichment (see *QUASI-CONTRACT*), against the person primarily benefited; (2) a subsidiary claim against the recording officers, when they are chargeable with willful wrong or negligence; and (3) if the recording officers are liable but insolvent, a claim against the State.

Modifications of the Law of Mortgage.—The German system of recording has led to important changes in the whole law of real property, some of which have already been indicated. Special innovations in the law of mortgage are as follows:

(1) *Specialty.*—No lien can be imposed upon the entire estate of a debtor, nor even on all his realty. Judgment liens, for example, can be made effective only by having special mortgages recorded against special pieces of property.

(2) *Owner's Mortgage.*—When the owner of property pays off a mortgage he may elect to have the mortgage assigned

to himself. In such case no *MERGER* (*q. v.*) takes place; the mortgage, whether it remains in the name of the owner or is assigned by him to a third person, retains its validity and its priority.

(3) *Land-debt.*—A lien on the land which operates like a mortgage may be created without any accompanying personal obligation upon the part of the mortgagor. Such a lien the Germans call a "land-debt" (*Grundschild*). No such defenses as are derived, in the case of the ordinary mortgage (*Hypothek*), from the invalidity of the personal claim can be pleaded against the land-debt, for it is not a collateral but an independent claim. On the other hand, the land-debt is not enforceable against the person who created it except while he holds the land.

(4) *Owner's Land-debt.*—The land-debt may be established in favor of the owner himself. This rule enables the owner of realty to give a second mortgage and at the same time to reserve a first.

(5) *A letter of mortgage* (*Hypothekenbrief*) is an authenticated extract from the record, issued by the recording officers, attesting a particular mortgage, and showing all the facts that are of importance to the holder. In the case of the ordinary mortgage such an extract may be issued with the consent of the mortgagor, and its issue is noted on the record. In the case of the land-debt such an extract is always issued (*Grundschildbrief*). The purpose of the extract is to facilitate assignment by avoiding the necessity of entering each successive assignment upon the record. Any person who presents the extract and shows that it has come into his hands in the manner provided by law (certified transfer) is entitled to receive interest, and, in case of default, to foreclose. The original creditor, of course, can exercise none of these rights unless he is still in possession of the extract. The extract is thus practically a secondary record, separated from the parent record but enjoying the same *publica fides*. The lien on the land is put into circulation after the fashion of a negotiable instrument. In the case of the land-debt, where most of the defenses available against the ordinary mortgage are excluded, the analogy to commercial paper is particularly obvious, and the German jurists describe the "letter of land-debt" as "a bill of exchange on the land."

It is claimed, and with apparent justice, that the German system makes the ascertainment of title simpler and the security of title greater than any other system yet devised; and that it therefore gives a safer basis to credit than any other system.

See Gide, *Le Régime Hypothécaire en Prusse* (1873); and Achilles, *Grundeigenthum und Hypothekenrecht* (1881).

MUNROE SMITH.

Recoupment [from Fr. *recouper*, cut again, cut off]: a species of defense in actions brought to recover damages for the non-performance of a contract, whereby the defendant alleges that he has himself sustained damages by the plaintiff's breach of the same contract, or by the plaintiff's fraud in procuring him to enter into it, which he seeks to cut off or "recoup" from the amount that would otherwise be recovered against him. The doctrine of recoupment has become established by judicial decision both in England and in the several States of the U. S., although there are some slight differences in the extent to which it has been carried by the various courts. Like the defense of set-off, it is confined to actions upon contract, and must itself arise from contract, but here all resemblance ends. A set-off must be for a debt, a certain fixed sum; recoupment is of damages often entirely unliquidated; a set-off is necessarily a demand arising upon a different contract from the one in suit; recoupment is necessarily of damages arising from a breach of the very same contract sued upon; in set-off the defendant may sometimes recover a balance from the plaintiff; in recoupment this can never be done. Recoupment (as is indicated by the etymology) can strictly be used only as a defense, and can do no more at most than defeat the plaintiff's recovery; even if the defendant's damages should exceed those of the plaintiff, he can have no judgment for such excess. In this last-mentioned particular the doctrine of recoupment has been greatly enlarged by the reformed system of procedure prevailing in the U. S. in many of the States, which permits the defendant by means of a counterclaim to recover an affirmative judgment for damages against the plaintiff when the grounds for such recovery have been established by the proofs. See Sedgwick on the *Measure of Damages*. Revised by F. STURGES ALLEN.

Red Cross: the name applied to the international treaty arranged by the Geneva convention of 1864, as well as to the various societies organized to carry out its aims. These center in the cause of humane and merciful treatment of wounded, sick, and dying soldiers in time of war. The Red Cross is the distinctive flag designated in the treaty, by which all hospitals (field or permanent), ambulances, persons, materials, and appliances employed in the relief service are known as such; and whenever the flag is displayed accompanied by the national flag to which the hospital, etc., belongs, it is treated, respected, and protected as neutral. Under the treaty soldiers disabled by wounds or sickness who have fallen into the hands of the enemy may be sent through the lines; if healed in the hands of the enemy and incapable of bearing arms, they must be delivered to the outposts to be sent to their homes, upon request; if capable of further military service, they may be sent to their homes on condition of not again bearing arms during the war. Thus the spirit of the Red Cross treaty makes of a wounded or sick soldier a neutral, a non-combatant. The Red Cross movement is civil in its origin, and the various national committees, societies, or associations organized to carry into effect the objects of the treaty are purely civil. They place themselves in communication with their respective governments, and in time of military activity they co-operate with, and become auxiliaries and aids to, the medical and surgical departments of the armies. In time of peace they variously employ themselves in preparing for emergencies.

At the battle of Solferino, Italy, June 24, 1859, the terrible and needless suffering and loss of life caused by days of neglect to care for the wounded and dying were witnessed by a philanthropic Swiss gentleman, Henri Dunant, of Geneva. He personally aided the insufficient medical forces of the armies, and realizing that such conditions ought not to exist, and need not, if the humanitarian impulse and efforts of the people could prevail, he conceived the idea of pledging the nations of the earth to regard and protect as neutral all sick and wounded combatants, and all persons and means engaged in giving them succor. He elaborated these ideas and feelingly described the scenes on the battlefield in a book which he wrote, *Un Souvenir de Solferino*. The cause was warmly espoused by La Société Genevoise d'Utilité Publique, of which Dunant was a member, and through the co-operation of the Swiss Federal Council an international conference was assembled at Geneva in Oct., 1863. This meeting was attended by delegates from sixteen governments, and continued in session four days. It was followed by a convention, to which all nations were invited to send representatives, and which convened in Geneva, Aug. 8, 1864. Twenty-five delegates representing sixteen governments attended. The session continued until Aug. 22, and culminated in the agreement to nine "articles of the convention for the amelioration of the condition of wounded in armies in the field." These articles were signed by twelve governments before the convention adjourned, and the treaty was left open for the accession of others. The signatory powers have reached forty in number.

The treaty designates "a red cross on a white ground" as the distinctive and uniform flag and arm-badge that shall be adopted for all hospitals, ambulances, and personnel; and provides that it must on all occasions be accompanied by the national flag; also that the delivery thereof (in time of action) shall be left to the military authority. The red cross on a white ground was adopted as a well-merited compliment to the Swiss confederation, whose national flag is the reverse—a white cross on a red ground.

The Geneva conference stipulated that each treaty nation shall have one national committee or society, civil in character and functions, which shall be the medium of communication with its government, and shall alone possess the right to use the red cross, and to authorize its use at its discretion. The national committees are usually composed of the most distinguished philanthropic persons in public and private life, with the chief magistrate or ruler frequently at the head.

To prevent desecration of the insignia by unauthorized use, severe governmental prohibitive measures have very generally been adopted.

A committee at Geneva, Switzerland, of which Gustave Moynier is president, is recognized as the international committee, through which all international communication is had. An international bulletin is published by that committee, and many other national committees publish journals or other literature of their work, which are inter-

changed. Many of the societies have been permanently endowed with large sums of money. Others receive the direct patronage of their royal heads or members.

Similar articles pertaining to naval warfare were formulated at Paris in 1868, but have not been generally adopted and ratified.

Upon the formation of the American National Red Cross, its president, Miss Clara Barton, perceiving a far wider usefulness for its work by applying it to the relief of great national calamities other than war, such as famine, pestilences, fires, or cyclones, incorporated such a feature into the charter of the association which she formed. The innovation received unanimous sanction by the international and other national committees, and the broader scope thus inaugurated was denominated the "American Amendment." Money, food, clothing, buildings, agricultural implements, seed, and other means aggregating over \$1,000,000 in value have been distributed on thirteen fields of relief by the American National Red Cross under the "American Amendment"; notably at Johnstown, Pa., after the flood, in Russia during the famine, and on the South Carolina Sea islands devastated by cyclone and tidal wave. No money estimate can be made of the practical benefits educationally, as particularly exemplified in teaching the colored sufferers on the Carolina islands the advantages of frugality, of concentrated action in reclamation of their ruined lands, and of self-reliance generally.

CLARA BARTON.

Redding: city; capital of Shasta co., Cal.; on the Southern Pac. Railroad; 170 miles N. by W. of Sacramento (for location, see map of California, ref. 8-C). It is in an agricultural, lumbering, and mining region, and contains 2 State banks with combined capital of \$175,500, and 2 weekly newspapers. Pop. (1880) 600; (1890) 1,821.

Reddle, Raddle, or Red Chalk: an argillaceous oxide of iron exported from Germany and England. It is used for carpenter's chalk, for marking sheep, for drawing on paper, and in the case of fine grades for polishing spectacle-lenses.

Redemptionists, called also Mathurins, Fathers of Mercy, and Trinitarians (Ordo Sanctissimæ Trinitatis): a brotherhood of the Roman Catholic Church founded by John de Matha and Felix of Valois at Cerfroi in France for the deliverance of Christian captives in Barbary. It was approved by Innocent III. in 1199.

Redemptorist Fathers, or Liguorians (Congregatio Sanctissimi Redemptoris): a congregation of missionary priests founded in 1732 by Alfonso de' Liguori at Scala in Italy. They are most numerous in Italy, Austria-Hungary, and the U. S. They devote themselves chiefly to the holding of "missions" for the increase of religious activity among the people. The original rules of the congregation were unusually severe, allowing only sacks of straw for beds, hard bread and soup at table, and imposing long seasons of worship every night, self-flagellations three times a week, and missionary activity among the very poorest classes. In addition to the usual vows of poverty, chastity, and obedience, a fourth vow was enjoined, by which the member was obliged to refuse all honors and benefices outside of the order, except upon the express command of the pope. In course of time, however, the rules have much relaxed. The congregation has twenty houses in the province of Baltimore, and seven in that of St. Louis.

Revised by J. J. KEANE.

Redfield: city; capital of Spink co., S. D.; on the James and Turtle rivers, and the Chi. and N. W. and the Chi., Mil. and St. P. railways; 41 miles S. of Aberdeen, 87 miles N. by W. of Mitchell (for location, see map of South Dakota, ref. 6-F). It is in a wheat and stock-raising region, and contains Redfield College (Congregational, chartered in 1887), a national bank with capital of \$50,000, and a monthly and two weekly periodicals. Pop. (1890) 796.

Redfield, WILLIAM C., A. M.: meteorologist; b. at South Farms, near Middletown, Conn., Mar. 26, 1789; was in early life a mechanic; conceived the fundamental idea of his famous "law of storms" as early as 1821; soon afterward established a line of steam towboats on the Hudson; issued many essays and pamphlets in favor of steamboat navigation; was subsequently an active promoter of railways, especially such as would connect the Hudson with the Mississippi; published at different times forty essays upon meteorology; promulgated his *Theory of Storms* in 1831, and his views upon hurricanes in 1833; devoted much attention to

and before 1890; was the first president of the American Association for the Advancement of Science. He is New York, Feb. 22, 1900. See his *Biography*, by Thomas Wilson (1901).

Redgrave, William H. A., painter; b. in London, Eng., Apr. 26, 1804; studied at the Royal Academy; became celebrated for his genre pictures and subsequently for his portraits; was head master of the Government school of art, was one of the most efficient promoters of the South Kensington art museum; superintended of art schools, and director of crown pictures. Author of *An Elementary Manual of Colors* (1866) and with his brother Samuel of *A Course of Instruction in the English School* (1866). He was one of the six jurors in the Universal Exposition of 1861; and was continued, superintending the department of English art in the second Universal Exposition of 1867, and selected as director of the art section in the British Universal Exposition of 1873. D. Dec. 14, 1888. Among his later pictures are *Remond in a Snow-strewn Forest*, *Trouper*, *Samuel Cutting the Sheep in Fold*, and *A Wellspring in the Forest*.

Redia—a vermiform embryo produced asexually within a nematode. The redia is of worm-like form, and has a mouth, digestive tract, and an aperture for the excretion of gaseous waste within it, which may develop into either male or female. See *Platyhelminths and Trematodes*.

Redf. Pasha: Turkish general; b. 1827. In 1871 he was promoted with the command of the army sent to Yemen, and afterward employed in the ministry of War at Constantinople. He was actively engaged in the events which brought Murad V. to the throne of the empire, and in the Russo-Turkish war of 1877. With the fall of his superior, Sultan Murad Pasha, he was banished, first to Larissa, and then to Adrianople. D. G.

Redf. J.: name; born; patriot; b. in the canton of Schwyz, Switzerland, in 1768; entered the Spanish military service, was returned to Switzerland in 1798 and became representative of his native canton. He was a zealous supporter of Swiss independence and the old Federal constitution against the Helvetic republic established through French influence; he repulsed the French republicans at Morgarten Pass in May, 1798, thereby securing an honorable capitulation for the canton. His opposition to the Helvetic government continued, and after the departure of the French he called a meeting of the Federalists at Schwyz, but French interference prevented the re-establishment of the confederation. Redf. became chief magistrate of Schwyz in 1803 and again in 1808. D. Feb. 5, 1819.

Red Jacket: village; Houghton co., Mich.; on the Michigan Central Railroad, 12 miles N. of Houghton, the county-seat. Location, see map of Michigan, ref. 3-K. It is in the great Lake Superior mining region, adjoins the celebrated Kalamazoo and Hopedale copper mines, and has a weekly newspaper. Pop. (1890) 2,140; (1898) 3,072.

Red Jacket, or *Sagoyewatha*: a chief of the Seneca nation; b. at Okauchee, near the foot of Seneca Lake, N. Y., in 1701; did not originally rank as a sachem, but obtained that dignity through his activity on the British side in the war of the Revolution, being noted as a swift runner, and especially as an eloquent orator; derived his English name from a richly-embroidered jacket given him by a British officer; opposed the treaty of Fort Stanwix (1784), and the conclusion of the treaty of peace between the U. S. and the Six Nations in 1793; visited President Washington, from whom he received a silver medal; gave in 1810 the agency of the U. S. Government valuable information upon the hostile plans of the Ohio Indians under Tecumseh; visited Washington on the same subject 1819; was a lieutenant of the U. S. during the war on the Niagara front 1812-13. His last years were spent on the Seneca reservation near Buffalo, but he lost much of his influence on account of intemperance, and was more degraded from the friendship, but soon restored. He was an inveterate opponent of Christianity, of schools, and of missionaries. D. Seneca Reservation, Jan. 20, 1860. His life was written by Follen (A. S. Mearns (Albany, 1867).

Redlands: town; San Bernardino co., Cal.; on the Southern and the Southern Pac. railways, 5 miles E. by S. of San Bernardino, the county-seat (for location, see map of California, ref. 19-4). It is in an agricultural, fruit-growing and potato region, is the center of the orange belt of the state, and contains a national bank with capital of

\$100,000; 2 daily books with combined capital of \$50,000, and a daily and 2 weekly newspapers. Pop. (1890) 1,294; (1898) estimated, 4,401. Editors of "Daily Facts."

Red Lead, or Minium. See *Lead (Compounds of Lead)*.

Red Oak: city (founded in 1857), capital of Montgomery co., Ia.; on the Neodessema river, and the Chi., Hart and Quincy Railroad; 33 miles E. of Plattsmouth, 30 miles S. E. of Council Bluffs (for location, see map of Iowa, ref. 7-K). It is in an agricultural and stock-raising region, and contains 12 churches, 3 schoolhouses, four hotels (cost \$100,000), 2 national banks with combined capital of \$150,000, a State bank with capital of \$50,000, and 3 weekly newspapers. Pop. (1890) 5,753; (1898) 5,221. Editor of "Express."

Redoubts: small forts or fortified works (usually) without banking defenses, generally auxiliary to some larger work or defensive system. In permanent fortification the term is applied to small works or intrenchments within a larger position—e. g., "redoubt of the battery," "of the rear flank place of forts," etc. In the latter sense, however, the French more commonly use the word *reduit* (read *Re-dyit*).

Redpath, James, journalist; b. at Herwick-on-Tweed, England, Aug. 14, 1802; emigrated with his parents to Michigan 1848; became a printer, newspaper correspondent, and editor; was long connected with *The New York Tribune*, for which he reported the border warfare in Kansas 1855-57, and the famine in Ireland 1879-80; visited Haiti; became emigration agent of the Haitian Government in the U. S., and afterward consul at Philadelphia; was a war correspondent during the civil war; became superintendent of education at Charleston, S. C., where he founded schools for negro children and an orphan asylum; established at Boston in 1858 a lyceum bureau; established a newspaper syndicate at Washington, D. C., in 1877; edited for two years a weekly newspaper in New York; assisted Jefferson Davis in preparing his history of the Southern confederacy. He was the author of *The Rising Edithe* (1859); *A Handbook to Kansas Territory* (1859); *The Life of Capt. John Brown* (1860); *Sketches of Harper's Ferry* (1860); *A Guide to Hayti* (1860); and *Talks about Ireland* (1881). D. in New York, Feb. 10, 1891.

Revised by H. A. BEERS.

Red River: the last great tributary of the Mississippi. It derives its name from the color of the sedimentary matter with which it is freighted at all times except during very low water. It takes its rise in the great Staked Plain in the Pan-Handle of Texas, flows eastward, and forms the southern boundary of Oklahoma and Indian Territory. It enters Arkansas, but soon bends abruptly S., and flows through Louisiana to its junction with the Mississippi. Its length, measured roughly from one bend to another, is about 600 miles; including all its windings, the total length is estimated at 1,550 miles. Its source is 2,450 feet above the sea. For about 400 miles it traverses a series of canyons and descends 3-75 feet per mile; thence its grade gradually decreases, and in much of its lower course is scarcely perceptible. Its general grade may be judged from a map showing its windings; where swift, the channel is much straighter than where sluggish.

Area of Basin.—The basin drained by Red river is about 97,000 sq. miles in area. This region is mostly fertile, but presents all degrees of diversity, from the arid and saline plains where the river rises to the rich alluvial lands bordering its lower course.

The navigable channels are as follows: Red river proper in high water, 1,246 miles, and its own tributaries, not including Washita, 700 miles; Washita proper, 600 miles, and its tributaries, 800 miles; the total navigable channels reaching the Mississippi through the mouth of Red river amount to 3,346 miles. Large sums have been expended by the national Government in improving navigation. The appropriations for Red river alone up to 1862 were over \$1,500,000.

Timber Rafts.—One of the most interesting features in connection with Red river is its tendency to form immense accumulations of floating timber. The banks of the river, in its middle course, are heavily forested, and during floods vast numbers of trees are swept away and accumulate lower down where the current slackens. These obstructions sometimes increase until rafts many miles long are formed. When undisturbed by man they grow by additions to their up-stream ends, while the logs decay and are washed away at their lower extremities. For this reason the obstructions

slowly move up stream. In 1854 the lower end of such a raft was located at a point 53 miles above Shreveport, La., extended 13 miles up-stream, and was forming at the rate of $1\frac{1}{4}$ to 2 miles a year. It is stated that at an earlier date this raft was 200 miles lower down the river. Vegetation takes root on the older portions of the rafts, and what are termed "floating forests" are formed. In 1873, when a navigable channel was opened in the raft above Shreveport, it was 32 miles long. This great raft, before it was disturbed, formed a dam, which checked the flow of the river, and produced a lake-like expansion from 20 to 30 miles long above it. When a channel was opened through it the water above was lowered 15 feet. In recent years the river has been patrolled by "snag-boats," and thousands of trees, stumps, and other obstructions removed annually.

Owing to the timber-dams formed naturally in Red river, and to the abundant silt deposits left on its immediate banks during high-water stage, natural levees are formed along its borders which deflect tributary streams and frequently cause them to form lakes.

Consult *Physics and Hydraulics of the Mississippi River*, by Humphreys and Abbot (1861), and the Annual Reports of the Chief of Engineers U. S. Army. ISRAEL C. RUSSELL.

Red River of the North: a river which rises in Western Minnesota, near the source of the Mississippi, flows northward for 250 miles through the so-called Red river valley, and empties into Lake Winnipeg. Its source is at an elevation of 1,600 feet, where it enters Canada it is 767 feet, and at its mouth 710 feet above the sea. Its drainage area, not including that of the Saskatchewan with which it unites, is between 43,000 and 44,000 sq. miles, of which three-fourths are S. of the U. S.-Canadian boundary. The region it traverses is a nearly level plain, once the bed of Lake Agassiz, and is famed for the abundance and excellence of its wheat harvests. The river has cut a narrow channel from 20 to 50 feet deep through lacustral deposits, and furnishes a typical example of recent drainage on a nearly horizontal, new land area. The river is navigable from its mouth to near its source. During high-water stages it is connected by way of Lakes Traverse and Big Stone with the Mississippi, and steamboats can occasionally pass from the Mississippi to Lake Winnipeg. ISRAEL C. RUSSELL.

Redroot: See *CEANOTHUS AMERICANUS*.

Red Sea, or Arabian Gulf: a long, narrow inlet of the Indian Ocean; between Arabia on the E. and Abyssinia, Nubia, and Egypt on the W.; separated from the Mediterranean by the Isthmus of Suez, which is only 80 miles across, and communicating with the Indian Ocean through the Gulf of Aden and the Strait of Bab-el-Mandeb, which is only 14 miles broad. The entire length of the Red Sea is 1,450 miles; its greatest breadth is 230 miles; its depth varies from 1,054 fathoms in lat. $22^{\circ} 30'$ N. to 3 fathoms in the harbor of Suez. It is called in the Old Testament "the sea of *soph*," a seaweed resembling wool. Why, in later times, it was called the Red Sea, writers are not agreed. Herodotus (*Hist.*, ii., 11) reports "a flow and ebb of the tide every day." Recent scientific surveys have shown a tide of 5 to 7 feet at Suez, but much less to the southward. Much, however, depends upon the strength of the wind, which blows from the S. S. E. from October to May, and is strongest in February; and from the N. W. the rest of the year, and is strongest in June and July. Near its northern extremity the sea forks into two branches—one, the Gulf of Akaba, length 100 miles and breadth 15, occupies a depression which is the continuation southward of the valley of the Jordan and Dead Sea; the other, the Gulf of Suez, length 200, breadth 20 miles. In the Sinaitic isthmus, lying between these arms, is Mt. Sinai. The Israelites (see Exodus) are supposed to have crossed in April the Gulf of Suez, near the existing town of that name, the sea at that time extending with small depth some 30 miles farther N. On account of the violence of its winds, and the great number of islands, shoals, and coral reefs which lie along its shores, the navigation of the Red Sea has always been considered very difficult; nevertheless, from the very earliest times it has formed one of the commercial highways of the world, being the shortest and most convenient road between Europe and India. After the discovery of the route around the Cape of Good Hope the traffic which first the Egyptians and Phœnicians, and then the Greeks, the Romans, and the Venetians, had carried on with India over the Red Sea, declined greatly, but the construction of the Suez Canal has once more led this commerce back into its old channel.

Red Seaweeds: the *Rhodophyceæ*; a class of aquatic plants (mostly marine) notable for their red or purple color. The many-celled plant-body is of various forms, from a simple flat thallus to a branching, leaf-bearing axis. Sexual reproduction takes place by the fertilization of a carpogone (by non-ciliated antherozoids), this resulting in the growth of carpospores, and sometimes of a pericarp (Fig. 1) also. Asexual reproduction takes place by the germination of tetraspores, which are produced in various places on the plant-body by the subdivision of cells into four parts. The class is equivalent to the *Rhodospiraceæ* of many authors, and includes but one order (*Florideæ*).

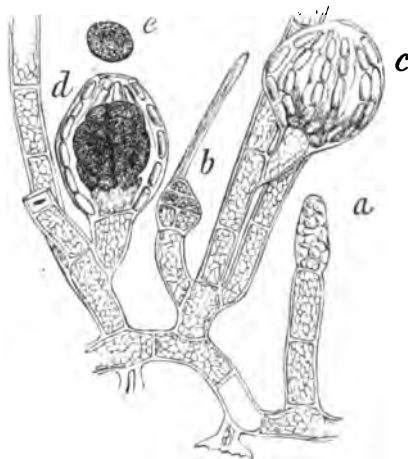


FIG. 1.—A red seaweed (*Lejolinia*): a, antherid; b, carpogone with slender trichogyne; c, sporocarp; d, sporocarp in vertical section; e, an escaped carpospore. Magnified 150 diameters.

According to Agardh, the known species are between 1,500 and 2,000, widely distributed in all seas, and to a limited extent in fresh water (e. g. species of *Batrachospermum*, *Hildenbrandtia*, *Lemanea*, etc.). The plants are never of large size, rarely attaining a length of more than a few inches, and in some cases they are minute. They are frequently of delicate texture and beautiful outline. The red or purple color is due to the presence in the cells of a soluble substance, phycoerythrin, which hides the chlorophyll. Upon immersion in fresh water the red color of many marine species is discharged, thus disclosing the underlying green.

Agardh has arranged the many families in six groups (which he terms "series") upon characters derived from the structure and development of the spore-fruit (cystocarp). Here only a few general characters will be given, to which there are many exceptions.

Series I. GONGYLOSPERMEÆ. Spore-fruits external or immersed in the substance of the thallus, surrounded by a gelatinous envelope; spores irregularly arranged; plant mostly filamentous, sometimes solid or compressed.

Two families, the *Ceramiceæ* and the *Cryptonemiaceæ*.

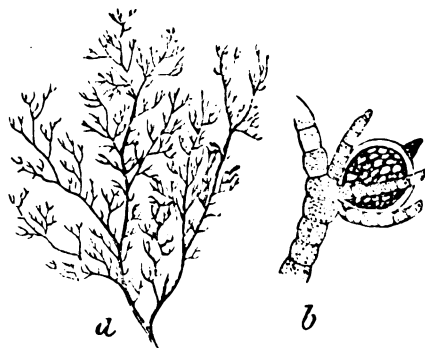


FIG. 2.—*Ceramium rubrum*: a, portion of plant; b, spore-fruit, magnified.

contain many beautiful species—e. g. *Ceramium rubrum* (Fig. 2), very common along the coasts of the U. S., *Phyllosterrata*, and species of *Griffithsia* and *Callithamnion*, the latter often minute and of great delicacy.

Order II. *Phaeoglossales*. Spore-fruits immersed in the epine thallus forming rounded conceptacles; spores leucocarpous, wingless; plant single or branched, fleshy or solid.

These are usually larger and more plants than the previous, having thick, cartilaginous thall, mostly of a



FIG. 2.—Plant of *Chondrus crispus*, reduced.

soft-pulped color. *Chondrus crispus* (Fig. 2) *Chondrus purpuraceus*, *Chondrus mammillatus*, and *Chondrus crispus* are common representatives of the principal family *Chondrusaceae*. The last-named species is the *Chondrus* of our Irish moss.

Order III. *Rhodospirales*. Spore-fruits external, with sessile pericarp, or sometimes immersed in the thallus; spores in chains radiating from a central cell; plant filicarpous, solid, or membranous.

The six families here grouped (*Dilmenaceae*, *Dunaliaceae*, *Sphaerocarpus*, *Arthrocarpidae*, *Champia*, and



FIG. 3.—*Dilmenia americana*: (a), portion of plant; (b), magnified fragment showing a spore-fruit.

Dilmenaceae) contain many beautiful and interesting species belonging to the genera *Dilmenia*, *Ophiodia*, *Champia*, *Rhodospira*, *Phacelium* (Fig. 4), *Rhodospira*, etc. *Rhodospira polystachya* is the *Dilmen* of our Irish moss.

Order IV. *Phaeosporales*. Spore-fruits external or immersed, mostly with a pericarp; spores in short chains or single, plant membranous, cylindrical, or flattened.

The plants here brought together are apparently but little related. In the *Sphaerocarpus* the thallus forms an expanded and densely upon other alga. The *Champia* are cylindrical or flattened, mostly jointed, and branching, and like the preceding are covered with a dense layer of hair, which usually takes most red or purple color. The common *Champia*, *Champia officinalis*, is a familiar representative of this family. The *Sphaerocarpus* include cylindrical or flattened, and cartilaginous plants, while the *Dilmenia* are membranous, of delicate texture, and usually curved. One of the prettiest species is *Grimmia* (Fig. 5) of the eastern coast of North America.

Order V. *Dunaliaceae*. Spore-fruits external or immersed, mostly with a pericarp; spores borne on central or sessile, simple or branching placenta; plant filamentous, membranous, or compressed.

Five small families are here included (*Heterothecaceae*, *Champia*, *Champia*, *Hypocarpus*, and *Sclerocarpus*). In the first, belong the species of *Heterothecaceae* (Fig. 6) which are found in fresh-water ponds and streams. *Nereis* *hutchinsonii* is a common marine form.

Order VI. *Champia*. Spore-fruits external, with 4 pericarp, spores borne on a sessile basal placenta; plant filamentous, or solid and cylindrical.

This large group includes five families (*Wangiaceae*, *Sphaerocarpus*, *Lomentariaceae*, *Chondrus*, and *Rhod-*



FIG. 5.—a, *Grinnellia americana*, reduced; b, spore-fruit, enlarged.

melanica. To the first belongs the European *Leptothoe mediterranea* (Fig. 1). The *Sphaerocarpus* represented by *Polydora rotundus* have cylindrical cartilaginous fronds attached by a disk. The *Lomentariaceae* have tubular fronds and cystocarps with a basal placenta. The last family (*Rhodospirales*) includes about one-fifth of all the species of red seaweeds. Its important genera are *Darya* and *Polydora* (Fig. 7). These include many species of great beauty and delicacy.

LITERATURE.—Agardh, *Species Genera et Ordines Floridearum* (1831-33); *Epicrisis Systematis Floridearum* (1876); *Morphologia Floridearum* (1880); Farlow, *Marine Algae of New England and Adjacent Coast* (1882); Hauck, *Die Meeressalgen Deutschlands und Ge-*

FIG. 6.—Fragment of *Heterothecaceae*, enlarged.



FIG. 7.—a, Portion of plant of *Polydora rotunda*, reduced; b, enlarged spore-fruit.

terreica (1885); Harvey, *Phycologia Britannica* (1846-51); *Nereis* *hutchinsonii* (1852-53); CHARLES E. BERRY.

Red Snow: real snow tinted by the presence of *Hematococcus lacustris* (or *Protothoccus nivalis*), microscopic algae of the order *Protothococcidae*. The cells are sub-globose, and about 50 micromillimeters ($\frac{1}{100}$ inch) in diameter. In 1819 Ross found banks of red snow on the eastern shore of Baffin Bay extending for miles, and these were in some parts 12 feet deep.

Revised by CHARLES E. BESSEY.

Red Sulphur Springs: magisterial district; Monroe co., W. Va.; on Indian creek and a turnpike 12 miles from Lowell Station on the Ches. and O. Railway; 38 miles S. W. of White Sulphur Springs (for location, see map of West Virginia, ref. 11-G). It is in a beautiful valley of the Alleghany Mountains, is a fashionable watering-place, and is said to contain the only springs of their kind in the country. The water contains phosphorus and a peculiar sulphur compound or gelatinous substance, which is its distinctive feature. The curative properties of the water have been known for more than half a century. Pop. of district (1880) 2,557; (1890) 2,845.

Reductio ad Absurdum: a process of reasoning by which the statement in dispute is made one premise of an argument and an acknowledged truth the other, the conclusion drawn from them being so absurd that the falsity of the premise in dispute must be conceded.

Reduplication: the repetition or doubling of a syllable, a root, or even a complete word, as a method of word-formation. It is a widespread phenomenon of language, and serves a variety of purposes in expression; thus it expresses plurality, reciprocity, repetition, continuousness, intensity, superlative quality, completion, imitation of natural sounds, etc., and is characteristic of nouns as well as verbs. The Indo-European languages abound in traces of an extensive use of this method in the primitive stages of the mother-speech, and cases also occur of its use within the separate history of the languages. (1) The reduplication may consist of the doubling of a root; cf. Lat. *murmur*, a murmuring noise, *querquerus*, shivering cold; Gr. *μέμμερος*, marvelous, *βάρβαρος*, unintelligible in speech, *λάλας*, battle-cry, *γάργαρα*, muddle. (2) The doubling appears as incomplete, or one syllable of the reduplicated form is weaker than the other; cf. Lat. *quisquiliæ*, scraps, *memor*, mindful, *momordi*, I have bitten; Gr. *διδασχῆ*, doctrine, *διδάσκω*, teach, *διδόρκα*, I have seen, *δῖπρω*, I have seen, *πορφύρεω*, be in movement, *γύγυλος*, round, *ἀλλήλων*, one another, *γύγνομαι*, become (Lat. *gigno*). (3) A word is doubled; as Lat. *quisquis*, *quidquid*, *quaque*, *jamjam*, *quamquam*, *quotquot*, *meme*, *sese*; Gr. *πρόπρω*, *πλέον*, more and more; Sanskr. *āharahar*, day by day, *padē-padē*, step by step. See K. Brugmann's *Compar. Grammar of the Indo-Germanic Languages*, vol. ii., §§ 51-54, 465-476; A. F. Pott, *Doppelung, als eins der wichtigsten Bildungsmittel der Sprachen, beleuchtet aus Sprachener aller Welttheile* (1862).

BENJ. IDE WHEELER.

Red Water, or Black Water: a disease of cattle, sheep, and goats, characterized by the passage of reddish, brown, or black urine. This disease is most frequently observed among cattle at pasture on low lands, new fields, or soils imperfectly drained. It is thought to be caused by irritating plants which grow in such localities; it may usually be prevented by the amelioration of the soil.

L. P.

Red Wing: city (founded in 1853); capital of Goodhue co., Minn.; on the Mississippi river at the head of Lake Pepin, and on the Chi., Mil. and St. P., the Duluth, Red Wing and Southern, and the Minneapolis and St. L. railways; 41 miles S. by E. of St. Paul, 63 miles W. N. W. of Winona (for location, see map of Minnesota, ref. 10-F). It is situated on a plain between the river and bluffs that rise to a height of over 300 feet above tide-water, and is one of the most important wheat-shipping points in the U. S. It is substantially built; has water, sewerage, electric-light, and street-railway plants; and contains flour and saw mills, boot and shoe factories, stoneware, sewer-pipe, and lime works, and furniture-factories. There are 14 churches, 4 collegiate institutions, Evangelical Lutheran Seminary (chartered in 1878), State Reform School, Library of the State Board of Health (founded in 1873), a national bank with capital of \$100,000, 2 State banks with combined capital of \$111,000, a savings-bank, and a daily and 5 weekly newspapers. Pop. (1880) 5,876; (1890) 6,294; (1894) estimated, 8,300.

EDITOR OF "REPUBLICAN."

Red-winged Blackbird: See BLACKBIRD.

Redwitz-Schmölz, OSKAR, Freiherr von: poet; b. at Lichtenau, Bavaria, June 28, 1823; studied law at Erlangen

and Munich, and later on German philology at Bonn; was for a short time Professor of Literature at the University of Vienna, but resigned his position and devoted himself entirely to literature. He gained a wide reputation by his first work, *Amaranth* (1849), an epic poem written in praise of the Roman Catholic religion, and filled with sentimentality. His later works, *Das Lied vom Neuen Deutschen Reich* (1871), *Odilo* (1878), and his novels *Hermann Stark*, *deutsches Leben* (1869), *Haus Wartenberg* (1884), and *Hymen* (1887), are the productions of a genuine poet. He died July 16, 1891.

JULIUS GOEBEL.

Redwood: the *Sequoia sempervirens*, a noble coniferous timber tree of California, second in size to the *Sequoia gigantea*, or big tree, alone among North American trees. It occurs in great forests upon the coast mountains of California, and often attains a height of 275 feet and a diameter of 15 feet. It is extensively sawn for building purposes. When fresh its wood is of a fine red color, but it slowly fades when exposed to light. (See *SEQUOIA*.) The redwood sometimes used by dyers is from *Adenantha pavonina*, a large leguminous East Indian tree.

Redwood City: town (founded in 1849); capital of San Mateo co., Cal.; on Redwood creek, navigable for vessels of light draught to this point, and on the Southern Pac. Railroad; 28 miles S. of San Francisco (for location, see map of California, ref. 8-B). It is in an agricultural, lumbering, and grape-growing region; contains 4 churches, a public school, a State bank with capital of \$102,800, and 2 weekly newspapers; and is an important shipping-point for redwood lumber. Pop. (1880) 1,383; (1890) 1,572; (1894) estimated, 3,000.

EDITOR OF "TIMES-GAZETTE."

Redwood Falls: city; capital of Redwood co., Minn.; on the Redwood river, and the Chi. and N. W. and the Minneapolis and St. Louis railways; 26 miles N. N. W. of Sleepy Eye Lake, 110 miles S. W. of Minneapolis (for location, see map of Minnesota, ref. 10-C). It is in an agricultural region, and contains Methodist Episcopal, Protestant Episcopal, Presbyterian, Christian, Roman Catholic, and Adventist churches, a handsome graded school building, county court-house that cost \$30,000, 3 State banks with combined capital of \$100,000, and 2 weekly newspapers. In the vicinity are mines of coal, gold, and mineral paint. Pop. (1880) 981; (1890) 1,238; (1894) estimated, 2,200.

EDITOR OF "GAZETTE."

Reed [O. Eng. *hrēod* : O. H. Germ. *riot* > Mod. Germ. *ried*, *reed*] : a name proper to certain tall woody grasses smaller than canes and bamboos. The common reed (*Phragmites communis*) of North America, Europe, and Asia is employed on the Eastern continent as thatch, as a material useful in clay walls and floors, etc. The more extensively grown reed of Europe is *Arundo donax*, the woody stems of which are used for a great variety of purposes, especially by the horticulturist and in making musical instruments, fishing-rods, canes, etc. The smaller cane of the U. S. (*Arundinaria tecta*) is often called a reed. Its chief use is in making stems for tobacco-pipes.—**REED** is also the vibrating tongue or spring, fixed in a narrow slit, which produces musical tones in many wind instruments, such as the melodeon. It was once made of the reed (*Arundo donax*), whence the name. See **REED INSTRUMENTS**.

Reed, DAVID BOSWELL, M. D.: chemist; b. in Edinburgh, Scotland, in 1805; educated at the High School of Edinburgh, and in medicine at the university of that city, where he was an assistant to Prof. Sir John Leslie; was elected president of the Royal Medical Society and member of the Royal College of Physicians and of the Royal Society of Edinburgh; became instructor in chemistry in the university, teaching that science also to private classes; superintended the improvements in ventilation made in the House of Commons 1836, in the House of Peers 1839, and had charge of the ventilation department in the construction of the new houses of Parliament 1840-45; afterward applied his principles to public buildings in Liverpool and other large cities; visited Russia for a similar purpose; settled in the U. S. 1856; was for some time Professor of Applied Chemistry in the University of Wisconsin; became a resident of St. Paul, Minn.; became medical inspector to the U. S. Sanitary Commission 1863. D. at Washington, D. C., Apr. 5, 1864. He was the author of many books and publications upon chemistry and ventilation.

Reed, Sir EDWARD JAMES, K. C. B.: chief constructor of the British navy; b. at Sheerness, Kent, Sept. 20, 1830;

United St. He has held all positions and Naval Commission. He was attached to the dockyard at Devonport, was afterwards called to the *Medicine Museum*, became secretary of the Institute of Naval Architects. He was called to the Admiralty for reducing the dimensions of the ships, and they remained in building until he was called to the Admiralty. Within a few years he had reduced the whole of the fleet of the British navy. He designed also an ironclad ship for the Turkish navy. He was commander of a frigate sent to the Indian Ocean, and numerous smaller vessels. He was also called to the Admiralty. After seven years as chief naval constructor, Mr. Reed, who did not approve the construction of vessels carrying ironclad ships, found them too much to bear, and he resigned his office in June, 1869. In 1874 he was elected to Parliament as a Liberal, and was returned at each election until 1890. He is a member of the Council of the Institution of Civil Engineers, having become a member of the institution in 1859. He has been elected an honorary freeman of the city. In 1878 he was made a Knight Commander of the Bath. He is the author of *Notes on Shipbuilding*, *Ironclad Ships*, and *Notes on the Construction of Ships*, *His History, Construction, and Armament of Ships*, 1870. **WILLIAM K. HAYES.**

Reed, Darius: scholar; grandson of Col. Joseph Reed; b. at Portsmouth, Pa., July 1, 1809; graduated at the University of Pennsylvania 1831; was admitted to the bar 1839; was elected to 1861 Assistant Professor of English Literature and also of Moral Philosophy in the University of Pennsylvania, and in 1865 Professor of Rhetoric and English Literature; married a granddaughter of Bishop White; was the father of his grandfather for Sparks's *American Biography*; edited with valuable prefaces and notes Wordsworth's *Poetical Works* (1837); Arnold's *Lectures on Modern History* (1843); Alexander Reed's *Dictionary of the English Language* (1845); Lord Mahon's *History of England* (1856); and other works and contributed essays and notes to several literary periodicals. On his return from a tour to Europe he was lost to the steamer *Arctic*, Sept. 27, 1868. His biography, William D. Reed, edited his *Lectures on English Literature* (1890), to which he prefixed a biographical sketch. *Lectures on English History as Illustrated by Shakespeare's Chronicle Plays* (1855), and *Lectures on the English Poets* (1857), all of which were republished in England.

Reed, JOSEPH: patriot; b. at Trenton, N. J., Aug. 27, 1734; graduated at Princeton 1757; studied law in England 1758-61; became deputy secretary of New Jersey 1767; settled at Philadelphia 1771; was a member of the committee of correspondence 1774; president of the first provincial convention at Philadelphia Jan. 1775; delegate to the Continental Congress in May; served as a volunteer at the battle of Brandywine, Germantown, and Monmouth; was elected to Congress Sept. 1777; signed the Articles of Confederation in 1778; was elected president of the supreme executive council of Pennsylvania; was an earnest opponent of slavery and of the proprietary system of government; visited England for his health in 1784, but without beneficial result. D. in Philadelphia, Mar. 5, 1795.

Reed, THOMAS BRACKETT: party leader; b. at Portland, Me., Oct. 19, 1802; graduated at Bowdoin College, Maine, 1820; was sailing assistant paymaster in the U. S. navy 1820-25; was admitted to the bar in 1825, and commenced practice at Portland; was member of the Maine House of Representatives 1828-30, and of State Senate in 1870; alternate governor of Maine 1870-72; city solicitor of Portland 1873; and representative from Maine in Congress since 1875. He was elected speaker of the House of Representatives Dec. 3, 1897, and soon entered on a course that aroused bitter opposition, but resulted in revolutionizing the parliamentary procedure of the House. He insisted on placing as present those members who in order to prevent a quorum refused to vote. His rulings were sustained, and it was decided that he continued for was sustained in the new rules adopted Feb. 14, 1898. **P. M. COLBY.**

Reedville: see **BOROUGH.**

Reed City: village; Oshtemo, Mich.; on Hersey creek, on the Detroit and Lake Huron and the Gr. Rapids and Ind. rivers; 4 miles N. W. of Marquette, and 69 miles N. of Grand Rapids. (See location; see map of Michigan, ref. 5-11.) It is in an agricultural region; has excellent water-power, sev-

eral mills and important manufactories; and contains a national bank with capital of \$30,000, and two weekly newspapers. Pop. (1880) 1,301; (1890) 1,775.

Reed Instruments: the generic name of a large class of musical instruments, of which the melodium, the harmonium, and reed-organ are the most important. The tone of these instruments is produced by means of a thin tongue of wood or metal vibrating within a cover or aperture (sometimes called a reed), and vibrated by means of a current of air. Instruments of this class were found among the Chinese several hundred years ago, but most of them are comparatively modern inventions. The first reed-organ was constructed in the U. S. about 1818; they were improved in 1821, 1825, and 1828, since which time the modifications have been too numerous for separate mention. The accordion was invented in Germany about 1800; the harmonium, first constructed in France soon afterward, was later much improved by the introduction of the exhaust valves, and the bending and twisting of the tongue of the reed, termed *corona*, was developed. These two improvements have been the main features which have brought such changes in the modern reed-organ.

Reedburg: city; Sauk co., Wis.; on the Rock River and the Chicago and N. W. Railway; 15 miles W. N. W. of Beloit, the county seat; 32 miles W. of Portage (the location, see map of Wisconsin, ref. E-D). It is an important lumber, potato, and hog market; has brick, saw, and wooden mills, machine-shops, and other manufactories; and contains waterworks, two electric-light plants, a State bank with capital of \$10,000, a private bank, and two weekly newspapers. Pop. (1880) 1,351; (1890) 1,737.

EDITOR OF "FREE PRESS."

Reefs, Coral: see **CORAL ISLANDS AND CORAL REEFS.**

Ree Indians: a tribe of **CARIBBEAN INDIANS** (q. v.).

Rees, JOHN KENN. A. M., B. M.: astronomer; b. in New York, Oct. 27, 1851; graduated from Columbia College 1872, and School of Mines 1875; appointed Professor of Mathematics and Astronomy at Washington University, St. Louis, Mo., 1876; director of the observatory and Adjunct Professor of Practical Astronomy and Geodesy at Columbia College, New York, 1881, and managing editor of *The School of Mines Quarterly* 1884; Professor of Geodesy and Practical Astronomy and director of the observatory, Columbia College, New York, Oct. 1, 1884, and has published *Report on Total Solar Eclipse* (July, 1878); *International Time System* (1882); *Observations of the Transit of Venus, Dec. 6, 1882, made at Columbia College Observatory, Standard Time* (1884), etc.

Reese, TAPPING, LL.D.: jurist; b. at Brookhaven, L. I., in Oct., 1744; graduated at Princeton 1763; began to practice law at Litchfield, Conn., 1772, and opened there in 1784 a law school, long the only institution of the kind in the U. S., which he conducted alone until 1798, and with Judge James Gould until 1820. He was a staunch Federalist in politics; was judge of the Supreme Court of Connecticut 1788-1814, and originated the movement for more equitable legislation concerning the property of married women. D. at Litchfield, Dec. 13, 1823. Author of *The Law of Burns and Femmes, of Parent and Child, of Guardian and Ward, of Master and Servant*, etc. (New Haven, 1816; 4th ed. 1838), and of *A Treatise on the Law of Descents in the Several United States of America* (New York, 1823).

Revised by F. STURGES ALLEN.

Reeves, JOHN: law-writer; b. in London in 1752; studied law and was admitted to the bar; was appointed commissioner in bankruptcy 1784; chief justice of Newfoundland 1790; clerk to the bureau of commerce and of the colonies in 1792, and afterward superintendent of foreign affairs. He was inspired with a bitter hatred of republican institutions, and organized an anti-republican and an anti-French society. He advanced in a brochure the statement that the monarchy had no need of the assembly of the legislative chamber, and was denounced in Parliament for this, and tried before a jury, which acquitted him but denounced his opinions (1795). After the death of Pitt, who was his protector, Reeves retired upon a large pension. D. in London in 1829. He wrote a *History of the English Law from the Time of the Romans to the End of the Reign of Elizabeth* (American ed., 5 vols. 8vo., Philadelphia, 1850), a *History of the Law of Shipping and Navigation* (London, 1792), and a *History of the Government of Newfoundland* (1793), besides minor works. **F. STURGES ALLEN.**

Reeves, JOHN SIMS: singer; b. at Shooter's Hill, in Kent, England, in Oct., 1822; son of the organist of the village church. At eight years of age young Reeves could read any music at sight. At the age of fourteen he himself became the organist and the choir-master of the village church. Under Calcott and Cramer and other masters he became proficient in harmony and counterpoint. Under the name of "Johnson," at Newcastle-on-Tyne, he made his first real public appearance in June, 1839, singing the part of the Gypsy Boy in *Guy Mannering*. His voice at this time was looked upon as barytone, and it was not until 1847 that he sang as a tenor. After studying in Paris and in Milan he made his Italian *début* at La Scala Opera-house, Milan. He appeared, Dec. 6, 1847, at Drury Lane, London, as Edgardo in *Lucia di Lammermoor*, and was enthusiastically received. In 1848 he was engaged with the company at her Majesty's theatre, London, but owing to a dispute with the management appeared but once. He then attempted sacred music, with which his fame and memory must always be associated. Singing in *Judas Maccabæus* at Exeter Hall he astonished the critics, who had not suspected his versatility. He afterward devoted himself entirely to concerts, sacred and secular. In July, 1892, he retired from the stage and accepted a professorship in the Guildhall School of Music, London. B. B. VALLENTINE.

Re-exchange: in the usual application of the term, the loss resulting from the dishonor of a bill in a country different to that in which it was drawn or indorsed. (Chalmers's *Bills of Exchange*, 4th ed. 193.) A New York merchant wishes to pay a debt in London. He buys a bill on London; it is dishonored at maturity; he is entitled to the amount of money called for by the bill in London; he would not be indemnified by recovering in New York the amount of the bill with interest and protest fees; he has a right to draw in London a re-draft on the drawer or indorser in New York for an amount which will put him at once in possession of the money called for and promised to him by the original bill: this re-draft is called re-exchange. It will include not only the sum promised by the original bill, but the exchange on New York, the interest, and necessary expenses of the transaction. (*Suse vs. Pompe*, 8 Common Bench, N. S. 538; *Bank vs. U. S.*, 2 Howard 737.) Although this re-exchange bill is seldom drawn, the right to draw it fixes the damages recoverable by the holder in case of the dishonor of the original bill, unless the terms of the bill limit the damages, or a statute prescribes them. (See N. Y. Revised Statutes, 8th ed., p. 2501; Mass. Public Statutes of 1882, ch. 77.) The term re-exchange is used to signify, also, the loss on a particular transaction occasioned by the exchange being adverse, and the course of exchange itself. For further information, see Chalmers's *Bill of Exchange*, 4th ed., p. 194; Daniels, *Negotiable Instruments*, ch. xlv.

FRANCIS M. BURDICK.

Referendum [Lat., neut. of *referendus*, gerundive of *referre*, refer]: the practice of submitting legislative measures to the voters for ratification. It is observed in Switzerland, and favored by many political writers in the U. S., Great Britain, and Belgium. See LAW-MAKING, METHODS OF (*Switzerland*).

Reflecting Circle: an astronomical instrument for measuring angles by the reflection of light from two plane mirrors which it carries. It differs from the sextant chiefly in having an entire circle. See SEXTANT.

Reflection [from Lat. *reflec'tere*, reflect; *re-*, back + *flec'tere*, bend, turn]: the act of the mind whereby it examines itself or looks upon its own states as its objects. It is one of the most unique activities of the mental life. It is different from simple consciousness, in that in the latter there is no such thing as self-examination, and no act of setting up a conscious relation between the subject, or thinker, and the object, or what he thinks about. Reflection in its full sense seems to characterize man alone in the range of animal life; although wherever there is the beginning of the notion of self, there is also probably the beginning of this function of thinking about self which constitutes reflection.

This mental act is the great resource of self-observation and analysis, upon which the psychologist depends for most of his information. As a method, its use is called "introspection." In philosophy, reflection has always been the function upon which idealistic thought has based itself: for there is in nature nowhere else than in consciousness the fact of one kind of event setting itself over against another

and criticising it. The inference is that this relation can not be accounted for in terms of the play of objective forces in nature, and so must be an ultimate kind of activity or reality. The theory of reflection is closely allied to that of JUDGMENT and KNOWLEDGE (qq. v.). J. MARK BALDWIN.

Reflection of Light: that bending which occurs in the path of a light ray when it is turned back from a surface upon which it falls. When a light-ray falls upon an unpolished surface, it is irregularly reflected or scattered in consequence of the different inclinations of the innumerable facets of which such surfaces are composed, as may be seen under the microscope. Non-luminous bodies are made visible by the scattering of light from their surfaces. When a ray falls upon a perfectly smooth surface, it is regularly reflected, and a virtual image of the illuminating body is seen behind the reflecting surface. Most surfaces which reflect regularly also reflect irregularly to some extent. The two portions of a reflected light-ray, before and after bending, are called respectively the incident and reflected ray. If a perpendicular or normal be erected to the reflecting surface at the point of incidence, the angles made with this normal by the incident and reflected ray are called the angles of incidence and reflection. The law of reflection is: *The angles of incidence and reflection are equal, and the incident and reflected rays and the normal lie in one plane.*

From the law of reflection it is evident that all rays diverging from a point and reflected from a plane surface appear to emanate from another point situated at the other side of the surface, and at an equal distance from it. Hence when an object is placed in front of a plane mirror the apparent image is of the same form and magnitude and at an equal distance from the other side of the mirror; but all the parts are reversed, like the negative of a photograph, the right hand of the object appearing on the left in the image and *vice versa*. For parabolic reflection, see LIGHTHOUSE (*Lighthouse Illumination*).

The intensity of reflected light varies with the nature and the position of the reflecting surface, the reflecting powers of various substances being greater for small angles of incidence than for large ones, and depending upon the index of refraction between the surface and the medium in which the light is traveling. See REFRACTION.

The phenomenon of reflection takes place equally with ether vibrations of all kinds, such as those of radiant heat and electro-magnetic undulations, and its laws are the same as in the case of light. Revised by R. A. ROBERTS.

Reflex Action [*reflex* is from Lat. *reflexus*, perf. partic. of *reflec'tere*, bend or turn back; *re-*, back + *flec'tere*, turn]: direct response of the nervous system to external stimulation—for example, the winking of the eyes when an object approaches, moving when tickled, etc. These actions are contrasted in physiology and psychology with "voluntary actions," those which owe part of their stimulus at least to central processes. Reflex actions are regular, definite, beyond control, inherited, and presided over by the lower centers of the brain and spinal cord. J. M. B.

Reformation: the name usually given to the religious revolution of the sixteenth century which divided the Western Church into the two sections known as Protestant and Roman Catholic. This movement was not an isolated event, but was closely connected with the intellectual and social changes which marked the transition from the Middle Ages to the modern era of civilization. It was also long in preparation. The disaffection with the hierarchy which disclosed itself in the rise of sects like the Waldenses, and within the Church in the reforming councils of the fifteenth century held at Pisa, Constance, and Basel; the rise of radical reformers, "forerunners" of Protestantism, as Wickliffe and others; the spiritual doctrine of the Mystics; political opposition to the Roman see, dating from the old contests of the empire with the pope; and especially the influence of the revival of learning in promoting general culture, in hastening the downfall of scholastic theology, and in producing a diligent study of the Bible and of Christian antiquity—these are antecedents of Protestantism which deserve special mention. Under this last head the work of Erasmus is very important. Protestantism, as a religious system, had two main principles—viz., the exclusive authority of the Bible as the rule of faith, as opposed to the normative authority of the pope or the Church—a principle that involves the right of private judgment; and the doctrine of justification by faith alone, in contradistinction to salvation

to the or human mind. Protestantism claimed for the Gospel a direct access to the blessings of the Gospel, without the mediatorial intervention of the Church or priest. In opposition to the doctrine of a particular power, it asserted the universal priesthood of Christian people.

1. *The Reformation in Germany.*—The movement began with the discovery of the theses of Martin Luther, an Augustinian monk and a professor in the University of Wittenberg, who attacked the sale of indulgences, which in the sacred relics and objects was a source of flagrant abuse. Luther's attack was limited in consequences. Luther was denounced by Pope Leo X. in 1520, but his publicly burnt the copy of bull, with the book of canon law, which he deemed equally objectionable to him. By proscribing and by burning publications, with the aid of Melfentation and other measures, he gained but a temporary success among all classes. Luther's appeal to the overwhelming of Rome remained in effect. At the Diet of Worms in 1521, however, he was declared heretic and outlawed. Among his varied labors which contributed to build up his cause one of the most important was the translation of the Scriptures. His adherents were too powerful to be suppressed. The churches of Germany were his ardent friends. At the Diet of Speyer in 1526, when a vote was declared against the Reformation, the "Protest" was given rise to the name "Protestants" assigned by the Elector of Saxony, the Margrave of Brandenburg, the Duke of Brunswick-Lüneburg, the Landgrave of Hesse, the Prince of Anhalt, together with fourteen cities, including Nuremberg, Strassburg, and Constance. At the Diet of Augsburg in 1530, in the presence of Charles V., the Protestants presented their famous Confession, but a decree was issued condemning their cause. The measure involved in this dispute led to the formation of the Protestant States of Germany. The execution of the Augsburg decree by Charles V. was long prevented by political complications, and often proved costly to Protestantism. Especially notable those of the reign of Charles V. and Francis I. of France. In 1546, after the death of Luther, the Schmalkden League was formed, which resulted disastrously for the party of Charles V. About 1550 was restored after Maurice, Duke of Saxony, forced against the emperor. The Peace of Augsburg (1555) was a virtual acknowledgment of defeat on the part of the emperor, and secured to Protestantism a legal position. After the terrible Thirty Years' war in the seventeenth century the Treaty of Westphalia (1648) completely abolished the legal privileges of Protestantism as one of the religious of the German empire. The final result of the Reformation in Germany was mostly Protestant, while Roman Catholicism, after the Catholic reaction and the failure of the Jesuits, became predominantly Roman Catholic in German Germany.

2. *The Reformation in Germany Switzerland.*—The origin of the Protestant movement here was Ulrich Zwingli, who became pastor at Zurich in 1519. Influenced with humanism culture, but a robust and fervent advocate of the Reformation, he was chiefly concerned in reducing the city of Zurich to abolish the Catholic and become a separate Protestant Church (1524). His doctrines, as well as sermons from the pulpit, and treatises and pamphlets, were agencies employed in Switzerland, as elsewhere, for the dissemination of the Reformed faith. Basel (1529), Bern (1528), St. Gall (1528), and Schaffhausen (1530) followed the example of Zurich. The Reformation revolution was also a political one; the movement for reform in the Church was identified with republican principles and patriotic efforts for the improvement of the people, and in opposition to the corrupting foreign influences which had drawn the Swiss away from their homes to become mercenary soldiers. As the consequence of disputes between the Protestants and Catholic cantons, war broke out, and Zurich itself fell in battle in 1531. The cause of Protestantism received a severe blow by its defeat in the struggle, but afterward, in a great degree, recovered its former position, especially after Geneva espoused the Reformed faith. The Zwinglians differed from the Lutherans on the doctrine of the Lord's Supper, the former considering it a mere commemorative feast, intended to call vividly to mind the death of Christ; the latter holding that while transubstantiation was to be denied, Christ is actually received in the sacrament, even by the unworthy communicant. The dispute occasioned by this controversy, and by the vehement opposition of Luther to the Zwinglian opinions, divided and weakened the Protestant power at a critical epoch.

3. *The Reformation in the Scandinavian Kingdoms.*—Protestantism spread northward, largely through the influence of German and of Swedish and with from the great Protestant academy of Wittenberg. Christian II., King of Denmark, first favored Protestantism, but afterward drew back from its support. Under Frederick I. (1534-50), by whom he was supplanted, the Reformation extended itself, and it acquired a legal establishment in Denmark under Christian III. The Lutheran doctrine and a constitution with bishops superintendents, which Luther had approved, were accepted. Protestantism was introduced into Norway in 1537 in connection with the subjection of the country to Denmark. The Reformed doctrine was first preached in Sweden in 1520; it was favored by Gustavus Vasa (1523-60), and was formally adopted at the Diet of Westman in 1527. The ecclesiastical property fell for the most part into the possession of the nobles. Subsequent efforts to restore Roman Catholicism proved abortive.

4. *The Reformation in the Baltic Countries.*—Lutheranism was favorably viewed by the Rectors of Bohemia. Protestantism was strongly established in that country. The refusal of its adherents to join Ferdinand of Austria in the Smolensk war brought upon them, especially after the defeat of the Protestants at Muhlberg, severe persecution. Persecution was confined only to the anti-Lutheran Hussites. Lutheranism only spread into Polish Prussia and Livonia, also into Poland. In this last country dissension broke out between the Lutherans and Calvinists, and further division was occasioned by the introduction of Unitarianism, which gained many adherents among the higher classes. The various evangelical parties formed a union of Samolmir in 1570. Sigismund II., the king, was favorable to the Reformed doctrine.

5. *The Reformation in Hungary.*—Numerous Germans were settled in this country, who brought in the Lutheran faith, and were aided in diffusing it by the Bohemian Brethren and by Waldenses. The new faith made rapid progress, especially in the cities and among the nobles, but the civil wars that arose, coupled with the doctrinal contests between Lutherans (mostly Germans) and Calvinists (mostly Magyars), checked its growth. It remained strong, however, until it was weakened and reduced by the labors of the Jesuits and the measures of the Catholic reaction.

6. *The Reformation in Geneva.*—The pioneer in the work of introducing Protestantism into Geneva was William Farel, a Frenchman, who preceded Calvin, and by whose influence Calvin was induced to establish himself there (1536). The Bishop of Geneva had been expelled and Protestantism legally accepted in 1535. The intellectual vigor, the scholarship, and indomitable energy of Calvin, in connection with his systematic organizing genius, caused his name to become familiar and his influence to be powerfully felt, not only within the walls of the city, where his tenets were accepted, and where his will became, after long struggles with adversaries, predominant, but also in other countries, especially in France, his native land. He took the leading part in shaping the civil and ecclesiastical institutions of Geneva. His doctrine upon the Lord's Supper was intermediate between that of Zwingli and the theory of Luther, but it was one which the Zwinglian churches could accept. The two streams of Swiss Protestantism gradually mingled in one. Calvin asserted likewise the divine predestination and election—a doctrine on which the Reformers were at first united—in terms which went beyond the view which the Lutherans were inclined to adopt. His doctrine of the Lord's Supper and of election or divine "sovereignty" became the distinguishing features of Calvinism—a system which was defined with great clearness in Calvin's *Institutes of Theology*. These tenets, associated with the Presbyterian polity, which Calvin also founded at Geneva, were accepted by the Protestants of France, Scotland, Holland, and other countries. Thus Protestants were divided under two great classes—the Lutherans and "the Reformed," this last term being specially applied to the adherents of the Swiss type of the Reformation. Numerous foreigners—most of them exiled from other countries for their faith—resorted to Geneva, many of whom were naturalized, and many others, having been instructed by Calvin, returned as missionaries to their own homes. Geneva became to the Roman countries and to the lands which received Calvinism what Wittenberg was to the disciples of Luther and Melancthon. The principal leader there, after Calvin, was his accomplished pupil, Beza.

VII. *The Reformation in France.*—A class of mystics, of whom Lefèvre was the most conspicuous, and among whom were Margaret, sister of Francis I. and Queen of Navarre, and Briçonnet, Bishop of Meaux, sympathized with the doctrine of justification by faith, though they were not averse to the traditional doctrine of the sacraments. Humanism was favorable to reform, and Francis I., who was proud of being styled the "father of letters," encouraged innovation up to a certain degree, when his interests prompted him to lend it assistance. On other occasions he was a cruel persecutor of Protestantism at home, even when, out of hostility to the emperor, he was giving help to Lutheranism in Germany. His vacillation was productive of great mischief. Yet Protestantism, mainly from the influence of Calvin and of Geneva, gained a foothold in France in his reign. His successor, Henry II., was inimical to the Reformed faith, especially after the Treaty of Cateau-Cambrésis with Spain. Nevertheless, Protestantism in his reign made great progress. In 1558 it was estimated that there were 2,000 places of Reformed worship scattered over France, and congregations numbering 400,000 organized after the German pattern. In 1559 they ventured to hold a general synod in Paris. The Huguenots, as they were called, became, by the force of circumstances, a political party. The family of Guise gained such ascendancy in the Government during the reign of the young Francis II., and eventually under Charles IX., as to come into inevitable conflict with the great houses of Bourbon and Châtillon, and at the same time the Guises set themselves up as intolerant champions of the old religion. The consequence was that the political and religious elements of opposition coalesced. The Protestants found leaders in Condé and Coligny, who adopted their faith, and the latter of whom honored it by a signally pure and elevated career. Anthony of Navarre first espoused, but finally deserted, the Protestant cause. His heroic wife, Jeanne d'Albret, the mother of Henry IV., was their steadfast defender. The history of the Reformation in France would include a full narrative of the civil wars. The edict of St.-Germain in 1562 granted a measure of toleration to the Huguenots; but the massacre of Vassy shortly after opened the long and bloody struggle which went on, with intervals of peace, down to the accession of Henry IV. and the Edict of Nantes (1598). The massacre of St. Bartholomew in 1572, when Coligny and thousands of his co-religionists were slaughtered, was due to Catherine de Médicis as its main contriver, and sprang out of the mingled motives of political, religious, and personal hostility. The Huguenots were always a minority of the nation, but, besides the nobles who were attached to their side, they comprised a multitude of the sober and intelligent middle classes and of the inhabitants of towns. The Edict of Nantes, following upon the abjuration of Henry IV., reduced them to the condition of a stationary or declining party, but one furnished as a means of defense with political privileges of an extraordinary character, which they continued to hold until the time of Richelieu. There were times in the course of the sixteenth century when the Protestant cause seemed likely to triumph in France. Its failure to achieve the victory in that country was the tragic event of the Reformation.

VIII. *The Reformation in the Netherlands.*—The inhabitants of the Low Countries were highly prosperous and intelligent. The contiguity of the country to Germany and France facilitated the incoming of Protestant opinions. Merchants and emigrants brought them over from England. In 1523 two persons were put to death at Brussels as heretics—an event that called forth a stirring hymn from the pen of Luther. The persecuting edicts of Charles V. led to the destruction of a great number of Protestants in the Netherlands. Grotius makes the whole number who perished in this reign 100,000—probably an exaggerated estimate. Philip II., who was unpopular in this part of his dominions, set about the strict enforcement of the laws against heresy. The cruelties of the Inquisition, in connection with the evident purpose to destroy the liberties of the country and subject it to Spanish absolutism, provoked armed resistance. The hero of the great revolt, which was a struggle for political and religious freedom, was William of Orange. In the course of the protracted conflict a Protestant state grew up in the north under the lead of Orange, while the southern provinces finally submitted to Spain and retained the old form of religion. The Dutch republic confronted the whole power of Spain and achieved its independence. At first, Lutheranism had been

introduced into Holland, but the Calvinistic type of doctrine and polity prevailed, and was incorporated in the ecclesiastical institutions of the country. The *Confessio Belgica* was composed in 1561, and was revised and adopted by a synod at Antwerp in 1566.

IX. *The Reformation in England and Scotland.*—The Lollards, a remnant of the followers of Wickliffe, were numerous in England at the beginning of the sixteenth century among the lower classes. The revival of learning prepared the ground for ecclesiastical change. The friends of the "new learning" had a spirited contest with the devotees of scholasticism. More, Colet, and Erasmus during his stay in England, exerted themselves in behalf of letters and against superstition. The writings of Luther found readers, especially among young men at the universities. Tyndale's translation of the Bible was eagerly perused, notwithstanding the efforts of the authorities to suppress it, and the martyrdom of its author. The Reformation in England had two distinct sources, which at times worked in conjunction with one another. The first was the moral and religious feeling, which was enlisted in favor of the Protestant movement. The second was the *quasi* political opposition to the foreign rule of the papacy, which was reinforced by the difficulties encountered by Henry VIII. in attempting to procure a divorce from Catharine of Aragon. The reluctance of Clement VII. to comply with the king's petition moved Henry to reduce the power of the clergy and to oblige them to declare him the head of the Church of England. Finally, he cut the knot by marrying Anne Boleyn without the papal permission in 1532. This was followed by the Act of Supremacy, which put an end to papal authority in England. In 1536 followed the act for abolishing the monasteries and confiscating their property. The king still professed the Catholic dogmas. There was a Protestant and a Catholic party in the Church, the leader of the former being Cranmer, Archbishop of Canterbury, a man of pure and upright intentions, but of a timid nature. The Protestants were led in the council by Thomas Cromwell, the king's vicegerent in ecclesiastical affairs. The Ten Articles (1536) were, on the whole, favorable to the Protestant side; but the bitter matrimonial experiences of the king, taken in connection with the Catholic rebellion in the North, led to the issuing of the Six Articles (1539), which were more in the Roman Catholic interest; and the same circumstances caused the fall of Cromwell (1540). Cranmer was saved from the vengeance of the opposing faction by the king's personal favor. On the death of Henry VIII. and the accession of young Edward VI. (1547) the Protestant party obtained complete control. In his brief reign, under the auspices of Cranmer and his associates, the Protestant Church of England received its constitution, liturgy, and creed. Evangelical theologians from the Continent filled the chairs of theology in the universities. Under Mary (1553–58), the successor of Edward, the old order of things, the papal supremacy included, was restored. Her matrimonial connection with Philip II. and subservience to Spain, and the popular sympathy excited by the martyrdom of Cranmer, Ridley, Latimer, and others, prepared the nation for the restoration of Protestantism under the auspices of Elizabeth, in 1558. During her long reign the Protestant religion took firm root in English soil. The defeat of the Spanish Armada (1588) rendered it certain that the authority of the papacy could not be reinstated by foreign intervention. The conservatism of Elizabeth in matters of religion provoked into activity the Puritan sentiment, which was anxious to assimilate English Protestantism to that of the Continent, where numerous English exiles had lived during the preceding reign. The Puritans likewise demanded a greater independence for the Church in relation to the state than the Tudor love of power and a widespread feeling of repugnance to ecclesiastical control would allow. The result was the division of the Church of England into two great parties whose contests fill many a page of English history for the century that followed the accession of Elizabeth.

In Scotland, at the outbreaking of the Reformation, the clergy were ignorant and vicious, and the Church was in possession of a great portion of the landed property of the kingdom. The evangelical doctrine, of which John Knox was the most effective apostle, gained a lodgment in the hearts of the people, and the co-operation of the nobles was founded partly in religious conviction and partly in the desire to appropriate to themselves the property of the Church. Protestantism in the Calvinistic and Presbyterian

1560, and legally established by an act of the Scottish Parliament in 1560. The system of the reign of Mary Stuart proved that this new faith was too deeply rooted in the souls of the middle-ages of the British nation to be displaced. The Presbyterian system was fully established in 1560.

3. *The Reformation in Italy and Spain.* Protestantism in these countries had several peculiar characteristics. Its adherents were confined to the higher, cultivated classes, and the Reformation took root among the people at once. Protestantism was also a thing of degrees. Many had the doctrine of justification in the name of the Reformation, but felt little sympathy for the old view of the sacraments and the hierarchical government of the Church. The teaching of professed Protestants was weak. In Italy there was a widespread desire of Church reform, in which humanist Catholics—such as Casella, Contarini, and other members of that Order of Divine Love participated. Some of them were conspicuously leaders of the Catholic reaction, which aimed at the purification of morals and discipline, but at the same time crushed dissent and union with reform. In Naples, Venice, Florence, and other cities there were Protestant churches. Eminent preachers like Octavianus Thesaurius like Peter Martyr privately espoused the Protestant faith. These were driven into exile, and Protestantism was suppressed in Italy by the instrumentality of the Inquisition, the *Index Librorum*, and the other agencies of the strict and hostile party which gained the ascendancy in the Church, and which suppressed also the undisciplined Catholics of the school of Contarini. In Spain there were Protestant churches at Seville and Valladolid. The writings of Luther and of other Reformers were secretly introduced into the kingdom, as they were in large numbers into Italy; but in Spain also the Inquisition, with its numerous *Religiosos*, did its work thoroughly.

4. *Germany.*—The history of the Reformation occupies, of course, a large space in the general history of the Church. Of these we may specially quote Schuler's, Schaaf's, and (on the Roman Catholic side) Allison and Delinger's works. Of the numerous separate writings on the Reformation as a whole, we cannot venture to his own work, *The Reformation, A Short History of the Period of the Reformation* (in all languages, 1874), which is instructive upon the general course of events; d'Aubigne's well-known history, written from a liberal Protestant; Beale's *The Reformation of the Sixteenth Century*, etc. (1884); Schuler's *Key of the Protestant Reformation* (1874), a terse work. In the first rank of authorities on the whole of history of the papacy and of Augustin, Erasmus, and Vermorel in the sixteenth and seventeenth centuries by Harnack. On the Roman Catholic Ultramontanism side the most useful recent work is Janssen's *Epoch of the Reformation* (1894) and *Das Aufgehen des Mittelalters* (6 vols., 1878-80). The literature relating to the Reformation in each of the several countries is copious. (Grimm P. F. 1894.)

Reformatories: See PENITENT DISCIPLINE.

Reformed Church in the United States: the ecclesiastical body which was formerly known as the German Reformed Church, historically derived from the Reformed Churches of Switzerland and Germany. It may accordingly be regarded as the American representative of the oldest of the series of national churches which spring from the great religious movement in the sixteenth century, of which Germany and Calvin were the most prominent leaders. In its early European history the most important centers were Basel, Geneva, and Zurich. The union of the churches of these two Geneva was effected by the adoption of the *Consensus Tigurinus* in 1549. In 1559 the Palatinate of the Rhine passed over from the Lutheran to the Reformed Church, and a step which was soon followed by several other German principalities. At the direction of the Elector Frederick III., Zacharias Ursinus and Caspar Olevianus prepared the *Heidelberg Catechism*, which was published in 1563. This confession was recognized by the Church in Switzerland, and became a common bond of union for the Reformed churches along the whole course of the Rhine from its source in the Swiss cantons. It is characteristic in its character, being both expounded by Calvin's doctrine of the spiritual and physical, and teaching the doctrine of election, but containing no reference to an eternal decree of reprobation. The Heidelberg Catechism is the only confession of faith which is recognized as of binding authority by the German Church in the U. S.

The American history of the German branch of the Re-

formed Church may be regarded as consisting of five plainly marked periods.

1. *The Pioneering Period (1600-47).*—Though there were members of the German Reformed Church in the U. S. at an earlier period, it was not until about 1700 that they emigrated to that country in large numbers. In that year John Frederick Hager was ordained in London for service "among the Palatines, New York." During this period the most eminent man was the Rev. John Philip Hesham, who began to preach in what is now Montgomery co., Pa., at least as early as 1790. George Michael Weiss founded the Reformed Church of Philadelphia in 1727. Churches were founded in isolated settlements from New York to South Carolina, but they were most numerous in Pennsylvania. An attempt was made to unite them by means of an organization known as the Congregation of God in the Spirit, but it proved a failure. The churches were very poor, and appealed for aid to the Church of Holland.

2. *The Period of the Coetus (1747-93).*—Michael Schlatter (1716-93) was a native of Switzerland, but had been sent to America in 1740, with the rank of missionary superintendent, to organize the Reformed churches. In 1747 he succeeded in establishing an ecclesiastical body, which was known as the Coetus. It was in all respects like a synod, except that its decisions were not final until they had been approved by the synods of Holland. His visit to Europe in 1751 resulted in the collection of the sum of \$12,000, which was devoted for the benefit of the German Reformed churches in Pennsylvania. On his return to America in the following year he was accompanied by six young ministers, of whom Stoy and Offerken became eminent. From the first settled in Europe the Reformed ministers in Pennsylvania received an annual stipend. There were many independent ministers, of whom the most eminent was Dr. John Joachim Zehly, of Georgia.

3. *The First Period of the Synod (1793-1825).*—The connection with Holland, which had been at first a blessing, became an intolerable burden, and in 1793 the Coetus resolved itself into a synod. This ended the period of dependence. The Church was thrown on its own resources, and met with many discouragements. In some congregations the change of language from German to English induced protracted conflicts. There was a great lack of ministers, and most of the churches in New York, New Jersey, and South Carolina were gradually alienated. It was in the main a period of disintegration, but in its later years the fruits of a new life began to appear. Sunday-schools were introduced, and the work of missions began. In 1824 the Classis of Western Pennsylvania resolved itself into the Synod of Ohio. The "mother synod" in 1825 numbered 22 ministers and 25,291 members.

4. *The Founding of Literary and Theological Institutions (1825-63).*—A theological seminary was founded at Carlisle, Pa., in 1825. It was removed to York, Pa., in 1829, and thence to Mercersburg, Pa., in 1837. Marshall College was founded at the latter place in 1835. The two institutions were under the same general management, and the little village of Mercersburg became an important literary center. It gave its name to a system of teaching which was known as Mercersburg theology. The professors in the Theological Seminary at Mercersburg at different times were the Rev. Drs. Lewis Mayer, Frederick A. Rauch, John Williamson Nevins, Philip Schaaf, Bernard C. Wolff, Henry Harbaugh, E. K. Higbee, and Emanuel V. Gerhart. It was here that Rauch wrote his *Psychology*, Nevins published his *Mystical Presence*, and Schaaf began his series of Church histories. In 1853 Marshall College was removed from Mercersburg to Lancaster, and united with Franklin College, which had been founded at that place as early as 1787. The united institution is known as Franklin and Marshall College. Other literary and theological institutions of the Reformed Church are Heidelberg University, Tiffin, O., founded in 1860; Ursinus College, Collegeville, Pa.; Catawba College, Newton, N. C.; Calvin College, Cleveland, O.; and the German Mission House, near Sheboygan, Wis.

5. *The Period of the General Synod.*—In 1863 the two existing synods united in the organization of a general synod. In the same year the tercentenary of the Heidelberg Catechism was celebrated, and several important volumes were published. For some years there were serious conflicts concerning liturgical worship, but these were concluded by the adoption of a *Directory of Worship*. In 1893 the Church appropriately commemorated the centennial anniversary of the organization of its oldest synod.

The Reformed Church in the U. S. publishes 29 periodicals, of which 23 are English and 6 German. It is actively engaged in the work of missions, and has been especially interested in the evangelization of Japan. In the U. S. it has found an extensive field for missionary labor among immigrants from Germany and Switzerland. Several Hungarian churches have recently been founded. The Church sustains four orphanages and a home for deaconesses.

The following are the statistics for 1894: Synods, 8; classes, 55; ministers, 938; congregations, 1,646; communicant members, 221,473; benevolent contributions, \$257,947. See PRESBYTERIAN CHURCH. JOSEPH HENRY DUBBS.

Reformed Church of America: a religious denomination known prior to 1867 as the Reformed Protestant Dutch Church in North America, a name which exactly described it, as *Protestant vs. Roman*; *Reformed*—i. e. Calvinistic in doctrine and non-prelatical in order; *Dutch*, as descended from Holland and inheriting its religious type.

1. *Origin and History.*—The first settlers in New Amsterdam brought with them the schoolmaster and the visitor of the sick, and in 1628 a church organization was formed. The emigration from Holland followed the Raritan, the Hudson, and the Mohawk rivers and their affluents, and at first was considerable, but after the English conquest in 1664 fell off rapidly. Still, the Hollanders held the ground they had taken, and everywhere multiplied ministers and churches. Their subsequent growth was hindered by three great causes—too great tardiness in relinquishing the Dutch language in public worship; a bitter controversy among themselves on the question whether they should act independently of the mother-Church in supplying their pulpits; and the waste of the Revolutionary war, whose chief scenes of conflict in the Middle States lay in the territory occupied by the Dutch; but after the return of peace the denomination consolidated its institutions and set to work repairing the desolations of the past. It increased its funds for educational purposes, enlarged its corps of theological professors, prosecuted in various directions missionary enterprises at home, and also engaged in the same work abroad—at first, in connection with other denominations, afterward independently. It numbers (1894) 612 churches, 614 ministers, and over 100,000 communicants, who are organized into 34 classes, 4 particular synods, and 1 general synod. The strength of the denomination lies at the East, but seven classes have been formed among the many thousands of Hollanders who have settled in various Western States from Michigan and Illinois to the Dakotas.

2. *Doctrine and Worship.*—The Church is eminently confessional. It owns five creeds—the Apostles', the Nicene, the (so-called) Athanasian, the Belgic Confession, and the Canons of Dordrecht. It requires the Heidelberg Catechism to be taught in families and schools, and also to be regularly explained from the pulpit on the Lord's Day. A short compendium of this catechism is the standard of doctrine for all who seek full communion; and ministers are required to pledge themselves in writing not to promulgate any change of views they may make without previously consulting the classis to which they belong. There is a Liturgy, which is mostly optional, but the forms for the administration of the sacraments, of ordination, and of church discipline are of imperative obligation. No psalmody may be used unless it has been approved by the General Synod.

3. *Polity.*—The affairs of each congregation are managed by a consistory, consisting of elders and deacons chosen for two years, but in such a way that only half go out of office at once. The elders, with the pastor, receive and dismiss members and exercise discipline; the deacons have charge of the alms. Both together are trustees of the church, hold its property, and call its minister. Ex-members of this body constitute what is called the "great consistory," who may be summoned to give advice when necessary. The minister and one elder from each congregation in a certain district constitute a classis, which supervises spiritual matters in that district. Four ministers and four elders from each classis in a larger district make a particular synod, with similar powers, and representatives from each classis, proportioned in numbers to the size of the classis, constitute the General Synod, which has supervision of the whole, and is a court of the last resort in judicial cases.

Educational and other Institutions.—Rutgers College (1770), New Jersey, Hope College (1865), Michigan, Northwestern Academy, Orange City, Ia. (1883), and Pleasant Prairie College, German Valley, Ill. (1893), are controlled by

members of this Church, but are unsectarian in teaching and influence. The chief theological seminary, at New Brunswick, N. J., has five professors and a library of over 40,000 volumes. There are two others—one at Holland, Mich., the other at Palmaner, India—each with three professors and a respectable library. Foreign missions are maintained in Japan, China (Amoy), India (Madura), and Arabia. There are 23 ordained missionaries, 55 churches, 6,226 communicants, and an annual outlay of about \$112,000. The board of domestic missions aids in sustaining over 150 churches and expends about \$65,000 yearly. The board of education aids over 100 students in preparing for the ministry and expends \$30,000 yearly. A board of publication, organized in 1854, besides other good work, issues two monthly journals. The salient characteristics of the Church are zeal for doctrine, order, and a learned ministry, unyielding attachment to its own views and usages, and a large charity for all other Christians.

LITERATURE.—Demarest, *History and Characteristics of the Reformed Dutch Church* (2d ed. 1889); Corwin, *Manual* (3d ed. 1879). T. W. CHAMBERS.

Reformed Church of Scotland: See SCOTLAND, CHURCH OF.

Reformed Episcopal Church: a religious body founded Dec. 2, 1873, by a few clergymen and laymen who left the Protestant Episcopal Church of the U. S. under the leadership of the Right Rev. George David Cummins, D. D. Unwilling longer to share responsibility for what he believed to be the Romeward tendencies of that church, he resigned his bishopric in it, and was chosen the first presiding bishop of the new Church under the following resolution: "That we, whose names are appended to the call for this meeting as presented by Bishop Cummins, do here and now, in humble reliance upon Almighty God, organize ourselves into a Church, to be known by the style and title of 'The Reformed Episcopal Church,' in conformity with the following declaration of principles, and with the Right Rev. George David Cummins, D. D., as our presiding bishop:

"I. The Reformed Episcopal Church, holding 'the faith once delivered unto the saints,' declares its belief in the Holy Scriptures of the Old and New Testaments, as the Word of God, and the sole rule of faith and practice; in the creed 'commonly called the Apostles' Creed'; in the divine institution of the sacraments of baptism and the Lord's Supper; and in the doctrines of grace substantially as they are set forth in the Thirty-nine Articles of Religion.

"II. This Church recognizes and adheres to episcopacy, not as of divine right, but as a very ancient and desirable form of Church polity.

"III. This Church, retaining a liturgy which shall not be imperative or repressive of freedom in prayer, accepts the Book of Common Prayer as it was revised, proposed, and recommended for use by the General Convention of the Protestant Episcopal Church, A. D. 1785, reserving full liberty to alter, abridge, enlarge, and amend the same, as may seem most conducive to the edification of the people, 'provided that the substance of the faith be kept entire.'

"IV. This Church condemns and rejects the following erroneous and strange doctrines as contrary to God's Word:

"(1) That the Church of Christ exists only in one order or form of ecclesiastical polity.

"(2) That Christian ministers are 'priests' in another sense than that in which all believers are 'a royal priesthood.'

"(3) That the Lord's Table is an altar on which the oblation of the body and blood of Christ is offered anew to the Father.

"(4) That the presence of Christ in the Lord's Supper is a presence in the elements of bread and wine.

"(5) That regeneration is inseparably connected with baptism."

At its General Council in New York in May, 1874, it revised the Prayer-book of 1785 to meet the needs of the changed times, but without making any variations of principles or doctrines. The use of the Prayer-book was made obligatory at Sunday morning services and optional at other times. At the same time it adopted its first constitution and canons. At its third General Council at Chicago a year later it adopted its Articles of Religion, based substantially upon the Thirty-nine Articles of the Church of England.

The Reformed Episcopal Church is governed by a general council, its president being the presiding bishop for the time being, meeting annually, biennially, or triennially as

comes more striking as the eye recedes from the glass, the divergencies being more noticeable at a distance. Most optical instruments are dependent upon refraction, and are constructed in accordance with its laws. See ABERRATION, LENS, MICROSCOPE, and TELESCOPE. For the different refrangibilities of each colored ray in the spectrum, see ABERRATION, INTERFERENCE, LENS, LIQUIDS, SPECTRUM. For the history of discovery, see OPTICS. Revised by R. A. ROBERTS.

Double Refraction.—That particular case of refraction in which a ray of light on entering a medium is divided into two rays. One of these, called the ordinary ray, is propagated in accordance with Snell's law. The other, called the extraordinary ray, is propagated in accordance with a much more complex law, which was first shown by Huyghens in 1690 to be a necessary consequence of the assumption that the luminiferous ether in the medium is unequally elastic in two directions, each perpendicular to the other. The phenomena of double refraction are seen to the best advantage in the mineral calcite, a crystalline variety of calcium carbonate. (See OPTICS.) In other double refracting bodies the separation of the two rays is not wide enough to be easily perceptible, but by special contrivances (see POLARIZATION) they may be made to interfere, and many of the most brilliant color effects are thus attained. By such means it has been ascertained that the property of double refraction is exceedingly common in transparent media, being absent only from those homogeneous bodies which are uniform in density, non-crystalline, or isometrically crystallized. (See CRYSTALLOGRAPHY and MINERALOGY.) The two beams are always polarized, the plane of polarization of one being perpendicular to that of the other, except in the case when they coincide in the direction of the principal optical axis of the crystal. In calcite this direction is equally inclined to the three faces whose intersection forms an obtuse trihedral angle. The widest separation of beams is in a plane perpendicular to this axial direction. Under this special condition each ray is propagated in accordance with Snell's law, the index of refraction of the ordinary ray being 1.658 for monochromatic yellow light (D line), while that of the extraordinary ray is 1.486. Since the velocity of propagation varies inversely as the index of refraction, the velocity of the ordinary ray is not quite nine-tenths of that of the extraordinary at maximum separation. In the case of quartz under similar conditions the velocity of the ordinary ray slightly exceeds that of the extraordinary. On this basis double refracting crystals are divided into two classes, negative and positive, calcite being a typical example of the negative and quartz of the positive. Calcite and quartz, moreover, have each but a single axis, along which there is no double refraction, while in many other crystals, such as niter, there are two such directions. On this basis, therefore, crystals are still further divided into two classes—uniaxial and biaxial. It was shown by Fresnel that in transmission through biaxial crystals both rays fail to meet the requirements of Snell's law; each therefore may be properly called extraordinary. In certain varieties of mineral, such as mica, some specimens are found to be uniaxial and others biaxial.

For Huyghens's determination of the direction of either ray in a double refracting medium, see POLARIZATION.

Index of Refraction.—The constant ratio of the sine of the angle of incidence to the sine of the angle of refraction when a ray of homogeneous light passes through the bounding surface between two media. Thus if a ray of monochromatic yellow light (D line) at a temperature of 15°C. pass from a vacuum into water at an incident angle of 60°, the angle of refraction will be found to be 40° 20'. The index of refraction, n , under these conditions is

$$n = \frac{\sin 60^\circ 00'}{\sin 40^\circ 20'} = 1.3339.$$

If the first of these media be air instead of a vacuum, since the index of refraction of air is 1.000294, the relative index of refraction of water with respect to air is found by dividing the former result by the latter, giving 1.3335. Since ordinary measurements are made in air rather than in a vacuum the refractive index referred to a vacuum is usually called the absolute index by way of distinction.

The index of refraction affords a convenient means of comparing the refracting powers of different media. For the indices of refraction of different kinds of glass and several liquids, see LENS and LIQUIDS. For a full table of refractive indices for various media, the reader is referred to Landolt and Börnstein's *Physikalisch-Chemische Tabellen* 2d ed., pp. 384 to 447. W. LE CONTE STEVENS.

REFRACTION OF SOUND.—The change in direction of sound-waves on passing from one medium into another. A beam of sound—regarded as any very small segment of an advancing spherical wave-front—moves normally in a radial line, but it is bent from its rectilinear course whenever it undergoes an unequal acceleration or retardation, necessarily turning toward the side of least velocity and from the side of greatest velocity. In other words, the direction of acoustic impulse is always perpendicular to the wave-front of sound, whether it continues as an expanding spherical surface, or, by reason of unequal velocity, becomes in any way deformed.

There are four ways in which sound-waves may be subjected to an unequal disturbance of velocity, and the sound-beams become thereby refracted: 1. By variation of *elasticity* in the medium. If the density be unchanged, the velocity of sound varies directly as the square root of the elasticity. 2. By variation of *density* in the medium. If the elasticity remain unchanged, the velocity varies inversely as the square root of the density. 3. By variation of motion, or *current*, in the medium. Sound traveling with the wind is propagated a little more rapidly than against the wind. 4. By variation of *temperature* in the medium. If other elements remain unchanged, the velocity of sound in air varies directly as the square root of the absolute temperature. The effect of heat on a gas is to increase its elasticity if confined, and to diminish its density if unconfined; in either case equally it accelerates the velocity of propagation.

(1) Perhaps the only practical example of acoustic refraction by differences of *elasticity* is furnished by the passage of sound from water into air or from air into water. Sound moves more swiftly through liquids (and still more so through solids), not in consequence of their greater density, but in opposition to their density, and by virtue of their far greater energy of resilience or elasticity, measured in intensity, not in quantity. The concentric sound-waves sent upward by a submarine explosion to the level surface of the water there suffer a large amount of internal reflection, with a reverse curvature, giving the sound-beams the same amount of divergence downward that they previously had upward. A portion of each of the sound-waves, however (with greatly diminished amplitude of vibration), is propagated into the air. These have their convex fronts very much flattened, by reason of being reduced to less than one-fourth of their previous velocity. The radii of these deformed surfaces, representing the directions of the sound-rays, are thus bent or refracted upward (or toward the vertical) at the surface of the air, and have a focus of divergence much more distant than the position of the origin of the sound-waves. In the case of an aerial sound, as the discharge of a gun, the descending sound-waves are largely reflected upward from the surface of the water; but a small portion of the impulse passing this plane, the convex wave-fronts, acquiring suddenly more than four times their previous velocity, are hurried into greatly increased convexity, and the sound-rays are refracted toward the horizon, with a divergence representing a much lower or nearer focus than the origin of the sound. Those sound-rays which by refraction would coincide with the horizontal plane or water-surface would necessarily suffer total reflection.

(2) The refraction of sound resulting from differences of *density* was first demonstrated by Carl Sondhauss in 1852 by means of a convex lens of carbonic-acid gas confined in an envelope of collodion film. The ticking of a watch was heard, with the lens interposed, most distinctly at a focal point where it could not be heard on the removal of the lens. (*Poggendorfs Annalen*, 1852, lxxxv., 381.) In this case the wave-front on entering the convex surface of the lens is so far retarded by the denser gas (commencing at the axis of the lens) as to have a concave form impressed upon it, and on emerging from the second surface of the lens in reversed order becomes still more concave by being accelerated first at the outer annulus. The normals of these concave waves converge to a focal point.

(3) The refraction of sound by inequality of *wind* was first suggested by Prof. Stokes in 1857. Winds, being ordinarily more retarded near the earth than aloft, would act unequally upon the concentric sound-waves advancing against them, by retarding the upper portion of the wave-fronts more than the lower portion. Being thus tilted backward more and more as they advanced against the wind, these wave-fronts would have their lines of impulse, representing the acoustic beams, bent gradually upward from the surface, so as to leave a sound-shadow at no great distance on a plane. On the con-

very small waves advancing in the direction of the wind would, for the same cause, have their fronts more tipped forward above than below, and the line of acoustic effect would be bent downward, bringing continuously some of the upper sound-waves to the observer's ear at great distances. This sound-waves are usually heard with so much better effect and to so much greater distance in the direction of the wind than in opposition to it. In those exceptional cases where the upper wind is blowing with less velocity than the lower, wind sound will be heard to a greater distance against the wind.

The refraction of sound from differences of temperature was first pointed out in 1874 by Prof. Reynolds who showed that during the heat of a still summer's day, when the lower air had a higher temperature than the upper air, loud sounds could be heard to great short distances, but that in the evening, when the lower air became cooler, the same sounds were heard distinctly several times the former distance. (Proc. Roy. Soc., 1874.) The difference of sound-velocity due to the temperature is about 1 foot for 1° F. Hence when the lower strata of air are the warmest the sound waves are accelerated and are deflected below, causing the sound waves to curve upward, as in the case of light rays. This explains why the sound of waterfalls is heard so much farther and more distinctly at night than during the day, even in the most silent of rural districts. When the lower strata of air are cooler than the upper (as was usually the case), the advancing sound-waves are tipped forward, always bending downward the sound-waves, and the gravity favouring audibility at a distance. This explains the facility with which sounds can sometimes be heard to great distances in Arctic regions. See Acoustics.

Revised by W. L. GORTON SERVICES.

Refrigerants (from Lat. *refrigerans*, refrigerantia, cool, power of refrigeration, and aff. again, make cool; *refrigerare*, to cool, derive of *refrigere*, to cool, cold): a term sometimes used in medicine to designate collectively various medicines given in fever which produce a grateful feeling of relief from the distress of the febrile symptoms, such are cooling drinks in general—solutions of potassium iodide, or the citrate or citrate; effervescing draughts, acid menses and solutions of purgative salts. The term has no precise scientific significance.

Refrigerating Processes: the means of producing artificial cool by machinery for the purpose of cooling the interior of buildings to a temperature below that of their natural surroundings. Such processes consist in the applica-

(7) anhydrous ammonia, the substance most extensively employed in commercial refrigeration; (8) water. The first two of these substances are available for refrigerating purposes only by means of what is termed the compression system, but the last two may be utilized either by a compression system or what is termed the absorption system.

Compression System, Brine Circulation.—Fig. 1 illustrates the essential features of a compression system for a cold-storage warehouse. D is a gas compressing pump, driven by any form of steam engine. E is a nest of pipe connecting with the outlet from the compressing pump, which is kept drenched or surrounded with cold water at about 32° F., constituting the condenser. A is a closed tank communicating with the outlet from the condenser, constituting the liquid ammonia reservoir. C is a nest of pipe immersed in a bath of brine or other fluid, non-congealable at the lowest desired temperature, constituting the cooler, the end of this nest of pipe connects with the reservoir A by means of a valve, B, termed the expansion-cock, and the other end connects with the inlet, or suction end, of the compressing pump. H represents cold-storage chamber or rooms having insulated walls, within which it is desired to maintain a low temperature by circulating cold brine through the nests of pipe C. This is accomplished by means of the brine pump K, which draws brine from the bottom of the bath and forces it through the pipes C, whence it returns to the top of the bath, or brine tank.

The operation of the apparatus is then as follows: The expansion-cock being closed, a tank of liquid anhydrous ammonia is connected so as to discharge into the cooler, and the compressing pump is operated so as to prevent the accumulation of more than the desired pressure—say, 12 lb. above the atmosphere—in the cooler. The lack of liquid anhydrous ammonia in the condition in which it is received from the manufacturing chemist is at the temperature of the atmosphere—say, 70° F. At this temperature the ammonia can exist as a liquid only when it is under a pressure of about 115 lb. per square inch above the atmosphere. The ammonia therefore flows from the tank into the cooler; but in the latter the pressure is only 12 lb., and at this pressure the ammonia can not exist as a liquid unless its temperature is about 5° F., which is the boiling-point corresponding to the pressure. Hence, as its temperature on entering the cooler is about 70°, it is in the condition of a liquid heated above the boiling-point due to its pressure. Vaporization will therefore occur until the latent heat of the portion vaporized equals the heat represented by the difference between 70° and 5°, when the ammonia will have

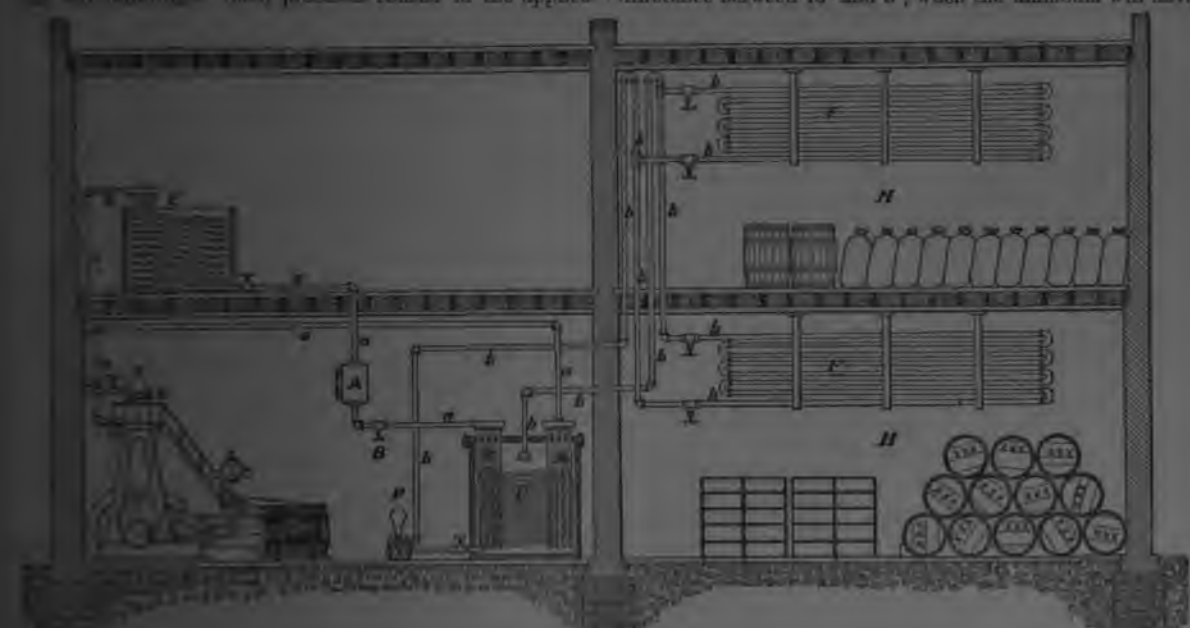


FIG. 1.

tion of heat through the medium of steam to cause a series of changes with one of the following substances: (1) Air; (2) ammonia; (3) sulphur dioxide; (4) sulphur dioxide; (5) ammonia; (6) carbonic acid; (7) anhydrous ammonia; (8) water.

cooled itself to the latter temperature. About 10 per cent. of the weight of ammonia will have vaporized as a consequence of the fall of temperature, or, in technical terms, 10 per cent. of the ammonia is vaporized by free expansion.

sion. Ninety per cent. of the ammonia is therefore in the liquid state when it has attained the temperature of ebullition corresponding to the pressure existing in the cooler, and if no heat could be supplied from surrounding bodies it would remain liquid; but it is practically in direct contact with the brine, whose temperature is so much higher than that of the ammonia that the latter must receive heat from the brine, and, as the compression-pump by its suction prevents the pressure in the cooler from increasing, the effect of the heat received will be to evaporate the liquid ammonia without increasing its temperature. The brine may therefore be cooled by an amount equivalent to the latent heat of 90 per cent. of the total ammonia introduced into the cooler. All of the ammonia is not, however, allowed to vaporize in the cooler in some types of compression-machines, while in other systems particular care is taken to insure its complete vaporization. This difference of treatment gives rise to two classes of apparatus, one known as the wet or cold compression and the other the dry-compression type. In either case all of the ammonia is drawn into the compressing-pump, which forces it into the condenser, where sufficient ammonia is gradually accumulated to cause the pressure to equal that at which it will be liquefied, by means of the cooling water with which the condenser is supplied. When a sufficient amount has liquefied to fill the reservoir A to the desired extent, as shown by a gauge-glass attached to it, the charging of fresh ammonia to the cooler is discontinued, and the expansion-cock B is opened so that liquid ammonia flows into the cooler from the reservoir A at the same rate as the latter receives ammonia from the condenser. This ammonia undergoes free expansion and evaporation in the cooler, and the operations are then continuous, the temperature of the brine gradually approaching that corresponding to the boiling-point of ammonia at the pressure maintained in the cooler by the suction of the pump. When the desired brine temperature is reached its circulation through the cold-storage rooms is commenced. Generally the brine returns to the tank, after passing through the storage-rooms, at about 6° higher temperature than that at which it leaves the tank, and its mean temperature is from 6° to 16° higher than the boiling-point of the ammonia corresponding to the suction-pressure, according to the efficiency and extent of the pipe-surface in the brine-tank. The mean temperature of the brine is about 6° less than that of the storage-space required to be cooled. For the storage of beer a temperature of about 36° F. is required, and this is therefore afforded with a pressure of about 28 lb. above the atmosphere in the cooler. Slaughter-houses require about 25° F. in their storage-rooms, which may be afforded by about 24 lb. suction or cooler pressure; while for the storage of fish, requiring a temperature of about 0° F., a suction-pressure of about 5 lb. above the atmosphere must be used.

Air and Chloride of Calcium Circulating Systems.—Instead of brine chloride of calcium is used as a circulating medium, first, because the corrosion of iron pipes is thought to be less by its use than with brine, and, second, because at temperatures approaching 0° F. brine, unless made from the best qualities of rock-salt, is liable to partly congeal, whereas chloride of calcium is perfectly fluid at temperatures considerably below zero. In cold-storage practice at Boston air from centrifugal fans is blown over the surfaces of the cooler, and by a system of wooden conduits is circulated through storage-chambers. Pipes in the storage-chambers are thus avoided. The expenses of such a system are possibly a little greater than that of a brine system, but by its use a storage-chamber freshly filled with material can be more quickly cooled to a given temperature than by either a brine or a direct-expansion system.

Direct-expansion Compression Systems.—If instead of using cold brine in the pipes in the storage-chambers the liquid ammonia is circulated through them, we have what is called a direct-expansion system. The storage-chamber piping then constitutes the cooler. If it is desired to refrigerate spaces at long distances from the compressor, this system is necessary, as the liquid ammonia from the condenser can be conveyed to an expansion-cock at any point without the expensive insulation necessary on conduits for cold brine. In St. Louis and Denver, for example, areas of half a mile radius are successfully refrigerated by ammonia conveyed in underground pipes. Where, however, the refrigeration is confined to a part of a building near by or containing the compressor, the use of brine is by many regarded as a desirable safeguard against damage of stored

material by the accidental escape of ammonia from the circulating pipes, notwithstanding the fact that the cost for piping is less for the direct-expansion system, and that it saves in cost of operation to the extent of most of the power consumed by the brine-circulating pump, and by permitting the suction-pressure to be from 5 to 10 lb. higher to secure a given temperature in a storage-space than is possible with brine as a medium of transmission between the ammonia and the material to be cooled.

"Wet" versus "Dry" Compression System.—In the wet system, which is known also as the Linde system, the presence of some liquid ammonia in the compression-cylinder limits the highest temperature in the latter to about the boiling-point, corresponding to the highest pressure produced by compression, whereas with the dry system the maximum temperature in the compressing-cylinder is upward of 100° F. higher. If the compressing-cylinder was absolutely non-conducting, the wet process should be more economical than the dry method, but the influence of the cylinder-walls appears, by tests, to make the two systems practically equal in economy. See the table near the end of this article.

Ammonia-absorption System.—If instead of being drawn into the compressing-pump the ammonia gas leaving the cooler is led into contact with hydrate of ammonia surrounded by a bath of cooling water, it may be dissolved or absorbed by the hydrate as rapidly as it would enter the cylinder of a compressing-pump. The resulting hydrate of ammonia being then withdrawn by an ordinary pump from the vessel, called the absorber, in which the absorption has occurred, and forced into a still or closed vessel containing a steam-coil, the ammonia absorbed may be distilled from the hydrate as a gas at the same pressure which could be given it by the compressing-pump—that is, the liquefying pressure corresponding to the temperature of the cooling water available for the condenser, the hydrate resulting from the distillation being meanwhile returned to the absorber to react upon more gas from the cooler. The distilled gas being led to a condenser produces liquefied anhydrous ammonia, which can be used through an expansion-cock and cooler like that coming from a condenser of a compression system. Such a series of operations constitutes the ammonia-absorption system. In other words, for the compressing-pump, with its steam-engine in a compression system, there is substituted a vessel called an absorber, a common liquid-pump, and a steam-still. All the other elements, namely, the condenser, liquid-ammonia reservoir, expansion-cock, and cooler, Fig. 1, are identical for the two systems.

A section of a leading absorption refrigerating-machine is given in Fig. 2. G is the still or generator containing the steam-coil c, which is supplied with steam by pipe e and drained by a steam-trap, I. The distilled gas leaves the generator at J after passing over the baffle, or separating-plates K, to be freed of entrained water. It then passes to the condenser E, which is in two sections, arranged so that water-vapor condensed in the part L can be drained back to the generator. The hydrate or weak liquor resulting from the distillation sinks by its increase of specific gravity to the bottom of the generator, and thence passes by the pipe a to the absorber D to reunite with gas entering the latter by the pipe d from the cooler C. Simultaneously the recharged hydrate or strong liquor from the absorber is delivered to the generator by the pump P and pipe e. In the vessel called the interchanger the weak liquor at about 270° gives up heat to the strong liquor, which leaves the absorber at about 130°. The cooling water which is supplied to the condenser E acts afterward to cool the absorber, the chemical union of the gas and weak liquor being accompanied with generation of heat. A is the liquid-ammonia reservoir, B the expansion-cock, and C the cooler and brine-tank.

All the above remarks regarding the brine, chloride of calcium, air, or the direct-expansion methods of circulation apply as well to the absorption as to the compression system.

Ammonia Compression versus Absorption System.—If a compression system is driven by an ordinary non-condensing Corliss engine affording an indicated horse-power with 3 lb. of fuel, tests of performance show that its economy of fuel is about equal to the best absorption systems when the efficiency of the boiler is equivalent to the evaporation of 11.1 lb. of water per pound of combustible from and at 212° F., and the suction-pressure is about 20 lb. above the atmosphere—that is, when the temperature of the material to be refrigerated is required to be about 20° F. For higher temperatures or higher suction-pressures the compression-machine is superior in economy of fuel, but for lower tempera-

and heavy machinery that the absorption-machine affords in other respects, where the compression system employs sulphur dioxide or carbon dioxide. Tests indicate that absorption machines require less cooling water than the

others, but they are not now utilized. The physical properties of both of these substances would afford about the same economy of fuel for refrigerating purposes as is available for ammonia. The dimensions of the compressing-

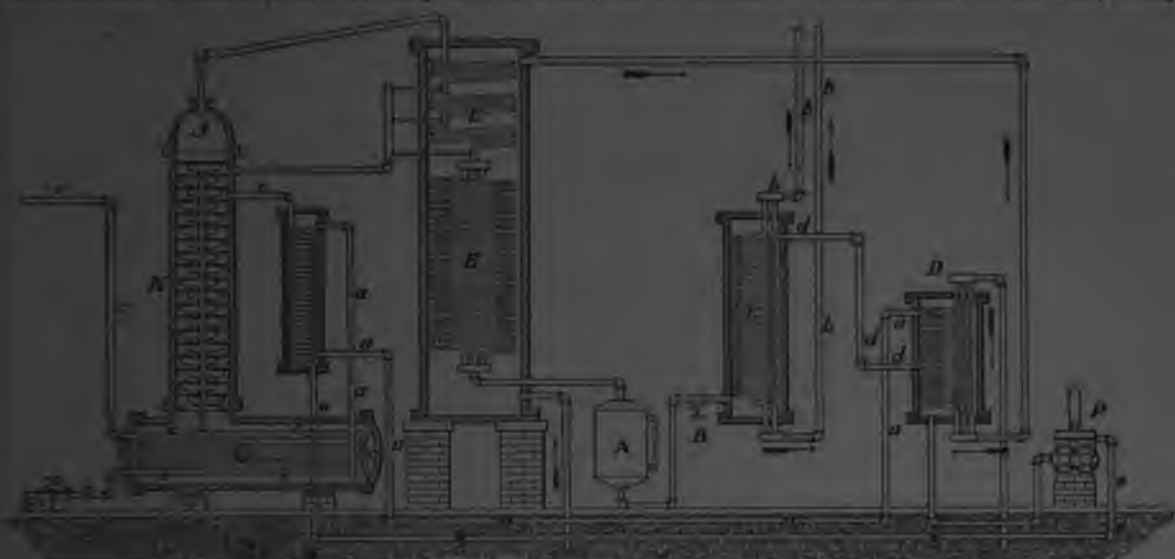


Fig. 2

ing compressed vapours, apparently, because the ammonia among the cold or pressure can not be entirely freed from residual water in the liquid.

Water sulphuric acid, sulphur dioxide, carbonic acid, hydrochloric acid, and ethylene can be used in compression systems like those described above for anhydrous ammonia. In the case of water, temperatures in the cooler less than 32° F. require the absolute surface-pressure to be less than 20 lb. per square inch, or within about 10 inch of mercury of a perfect vacuum. The fuel required for a given refrigerating effect is about 20 per cent. more than for ammonia, but the dimensions of the compressing-cylinder must be upward of 100 times that required for ammonia. The use of water in a compression system is therefore impracticable, except for making artificial ice very much as explained under the various (p. 15). Sulphur dioxide was the first substance practically applied in refrigeration in the compression system. It affords 5° F. in the cooler when the absolute surface-pressure is 1.7 lb. per square inch, and the condenser-pressure, for ordinary temperatures of cooling water, about 2 lb. absolute. The volume of this would be nearly equal to that with ammonia, so the volume of the compressing-cylinder must be up to the maximum times that required for ammonia. The condenser is therefore smaller. Sulphur dioxide affords temperatures of 3° F. in the cooler, with about 12 lb. absolute surface-pressure, and about 30 lb. absolute condenser-pressure. The economy is practically identical with that of ammonia, but the compressing-cylinder must be about three times greater in volume than with the latter substance. Absorption-machines using sulphur dioxide are still manufactured to a limited extent in the U.S., where they are kept in the "Pictet" system. The same system in Europe has a mixture of sulphur dioxide and about 9 per cent. of carbonic acid, which forms what is known as the "Pictet" gas. This has a pressure and density for a given temperature are about 50 per cent. greater than those of sulphur dioxide, but the fuel economy resulting from its use is not much affected. Carbonic acid affords 5° F. in the cooler with a condenser surface-pressure of 342 lb. and a condenser-pressure of about 300 lb. per square inch. The fuel required for a given refrigerating effect is about 50 per cent. more than for ammonia, but the volume of the compressing-cylinder is only 15-20 times that required for ammonia. Sulphur dioxide is not yet in use to a limited extent, but its small specific compressions and inoffensive character are owing to its recommendation for service on ships where safety is of prime necessity. Nothing very definite is known regarding the application of methyle ether and the various gases to refrigeration in practical refrigerating service. A few machines have been operated with these sub-

stances but they are not now utilized. The physical properties of both of these substances would afford about the same economy of fuel for refrigerating purposes as is available for ammonia. The dimensions of the compressing- pump would probably be for ethylene intermediate between sulphuric ether and sulphur dioxide, and for methyle ether intermediate between sulphur dioxide and ammonia. Atmospheric air used as a refrigerating substance requires that for the expansion-cock (Fig. 1) there should be substituted a cylinder and piston. If the air at the pressure of the condenser entered the cooler simply by means of an expansion-cock the temperature would not fall, and hence no refrigeration could be effected. In order to lower the temperature the air must be made to perform work against a piston while its pressure falls from that in the condenser to that of the cooler. Hence an expanding as well as a compressing cylinder must be provided. The work done by the air in the expanding cylinder is available to assist in compressing the air, but the losses by friction due to the presence of the extra cylinder considerably reduces the economy. If the air is drawn from and exhausted into the atmosphere at each stroke of the compressor, then in order to secure 5° F. as the minimum temperature a condenser-pressure of 22 lb. per square inch absolute would be necessary with perfect action. The fuel for a given refrigerating effect would be about twice that required for ammonia, and the volume of the compressing-cylinder would have to be about sixty times that needed for ammonia. To secure smaller dimensions a condenser-pressure of about 60 lb. per square inch is used, which makes the volume of the compressing-cylinder only about twenty times that needed for the same refrigerating capacity with ammonia; but as the theoretical temperature in the cooler is then nearly 100° F. below zero, the consumption of fuel for a given refrigerating effect is about six times that for ammonia. If instead of drawing air from and discharging it into the atmosphere a closed system is used, so that the lowest air-pressure is about 40 lb., the volume of compressing-cylinder necessary is only about six times that required for ammonia, but the economy is about the same as in the atmospheric system. Air-machines are in extensive use in ships, because the use of air incurs no such risk of destruction of provisions preserved by the artificial cold as exists from danger from leakage when such chemicals as sulphur dioxide or ammonia are used. Many ships are now successfully refrigerated by ammonia compression, brine systems, however.

The table on the next page, abstracted from *Lectures on Ice-making Machines*, shows the best results of tests of performance of current types of refrigerating-machines. The relative economy is shown by the figures in column seven, and the capacity by those in column fourteen. Both the economy and capacity may be observed to vary considerably with the surface-pressure, which is the controlling thermodynamic element. See *Transactions of the American Society of Mechanical Engineers*, vol. xii, p. 363.

The absorption principle described above can be applied with water or brine as the refrigerating substance, and sulphuric acid as the absorbent. The water or brine is fed into a chamber or cooler in which a vacuum of about .16 inch of mercury, or less, is maintained by an air-pump. A portion of the liquid evaporates by free expansion, and temperatures

as improbable, and making use only of Fourier's mathematical theory of heat has arrived at some important results. He assumes that at a certain critical epoch a superficial layer of rocks became solidified, at a temperature of about 7,000° F., and shows that it is probable that the amount of heat of the crust went on diminishing by a quantity pro-

ACTUAL PERFORMANCE OF ICE-MAKING MACHINES.

CLASS OF MACHINE.	Authority.	Dimensions of compressing-cylinder, in inches.		Absolute pressure, in lb. per square inch.		Temperature corresponding to pressure, in degrees Fahr.		Temperature of brine, in degrees Fahr.		Revolutions per minute.	Horse-power of steam-cylinder.	Per cent. of indicated power of steam-cylinder lost in friction.	Ice-melting capacity, in tons per 24 hours.	Ice-melting capacity, in lb. per lb. of coolant, per hour per horse-power of steam-cylinder, and as evaporation of 1 lb. of water per lb. of coolant from and at 212° F. of the absorption-machine.		Theoretical, no cylinder testing during aspiration.	Actual		
		Bore.	Stroke.	Con- denser.	Suc- tion.	Con- denser.	Section.	Inlet.	Outlet.					No friction.				With friction.	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.			
Ammonia wet compressor.	Schröter.	9.9	16.5	135.4	55.3	72.3	26.6	42.8	37.2	44.9	17.9	14.4	26.2	58.67	50.23	40.5			
" " " "	"	9.9	16.5	131.4	41.9	70.5	14.3	28.4	23.0	45.1	18.0	16.7	19.5	45.14	37.59	30.0			
" " " "	"	9.9	16.5	128.0	30.3	69.2	0.5	14.0	8.8	45.1	16.8	16.0	13.8	35.04	29.44	22.0			
" " " "	"	9.9	16.5	126.4	22.2	68.5	-11.8	-0.3	-5.5	44.8	15.5	19.5	9.0	28.29	22.76	16.1			
" " " "	"	9.9	16.5	109.5	41.9	95.5	14.4	28.3	23.0	45.0	24.1	10.5	16.5	29.79	26.68	19.0			
" " " "	"	9.9	16.5	135.8	60.0	72.4	30.2	43.7	37.2	45.2	17.9	10.7	29.8	64.74	57.85	46.2			
" " " "	"	9.9	16.5	131.4	45.1	70.6	17.8	28.3	23.0	45.1	18.0	12.1	21.6	48.40	42.56	33.2			
" " " "	"	9.9	16.5	125.6	23.7	68.2	-9.4	-0.4	-5.8	44.7	15.6	18.0	9.9	29.83	24.46	17.5			
" " " "	"	9.9	16.5	116.9	41.0	64.2	18.1	28.4	23.0	45.0	16.4	13.5	20.0	50.53	43.70	33.7			
" " " "	"	9.9	16.5	130.0	60.8	70.0	30.7	42.8	37.3	81.7	12.0	14.8	19.5	69.40	59.09	45.0			
Pictet fluid dry compressor.	"	11.3	24.4	56.7	30.9	77.3	28.5	43.0	37.5	57.0	31.5	22.9	25.6	55.01	42.48	33.0			
" " " "	"	11.3	24.4	55.6	14.9	76.2	14.4	28.5	23.0	56.8	20.6	22.9	17.9	41.05	31.71	24.1			
" " " "	"	11.3	24.4	54.6	9.7	75.2	-2.5	14.1	8.8	57.1	18.5	24.0	11.6	30.22	23.36	17.4			
" " " "	"	11.3	24.4	60.4	6.7	80.6	-15.9	-0.8	-5.7	57.6	15.7	25.7	5.7	22.29	16.50	10.1			
" " " "	"	11.3	24.4	90.9	14.9	104.4	14.4	28.3	23.0	59.3	27.2	16.9	15.7	25.16	20.88	16.1			
" " " "	"	11.3	24.4	61.0	22.3	81.2	31.5	43.5	37.5	57.3	21.6	14.0	28.1	54.32	46.67	36.1			
" " " "	"	11.3	24.4	59.3	15.6	79.6	16.2	28.4	23.0	57.5	20.5	12.8	19.3	40.13	35.01	26.1			
" " " "	"	11.3	24.4	58.7	6.7	79.1	-15.9	-0.4	-5.6	57.8	15.9	21.1	6.8	22.72	17.90	11.5			
" " " "	"	11.3	24.4	54.3	22.3	74.9	31.3	42.8	37.5	35.3	12.4	22.3	17.0	62.83	49.17	39.5			
" " " "	"	11.3	24.4	88.7	15.6	102.9	16.2	28.3	23.1	42.9	19.9	14.7	11.9	26.78	22.86	16.6			
" " " "	"	11.3	24.4	62.1	6.5	82.2	-16.9	-0.1	-5.3	34.8	9.9	24.3	8.5	21.51	16.30	9.7			
Air, atmospheric cycle.	"	26.0	26.8	58.8	14.7	64.8*	-52.6*	.....	.....	68.2	83.2	21.9	10.8	12.09	7.94	3.4	
Air, closed cycle.	Renwick, Jacobus.	10.0	18.0	175.0	53.7	81.3*	-40.2*	.....	.....	93.4	38.1	32.1	4.9	14.8	8.1	3.6	
Ammonia dry compressor.	Denton.	12.0	30.0	166.0	42.7	84.2	15.0	36.8	28.9	58.1	35.0	22.7	78.9	35.91	27.36	24.1			
" " " "	"	12.0	30.0	167.0	22.9	84.6	-10.8	6.3	2.0	57.7	72.6	18.6	37.9	28.18	18.78	14.1			
" " " "	"	12.0	30.0	163.0	27.7	82.7	-3.2	14.3	2.3	57.9	73.6	19.3	46.5	26.94	21.56	17.1			
" " " "	"	12.0	30.0	176.0	42.2	87.7	14.5	36.4	28.5	58.9	38.6	19.7	74.4	33.54	26.94	23.1			
Ammonia absorption.	"	.....	.....	152.3	40.4	79.1	12.6	20.7	15.7	.....	.....	.....	42.2	38.5	.....	29.1	

* Temperature of air at entrance and exit of expansion-cylinder.

as low as 32° are produced with water, or as low as 14° with brine. The unevaporated liquid is frozen to ice if it is water, or circulated through the spaces to be refrigerated if it is brine. The vapor is drawn into a vessel or acid-chamber, adjoining the cooler, containing anhydrous sulphuric acid, which absorbs it. The resulting mixture, or dilute acid, is pumped into the still or generator, which frees it of water, and it is then returned to the acid-chamber to reabsorb the vapor. Experiments with the apparatus on a small scale indicate that the economy of the process for general refrigerating purposes may be superior to that in which ammonia is used, and that it may afford a means of making ice with considerably less expense and space for plant than by the use of any other of the refrigerating substances. This method is employed in one of the oldest forms of refrigerating-machines, where, by means of a hand-pump, a vacuum is produced in a glass bottle or caraffe filled with water, and ice is formed inside the bottle for table use. One-fourth of the water is vaporized and absorbed by sulphuric acid or other substances having a strong affinity for water, and the remaining three-fourths is converted into ice. D. S. JACOBUS.

Refrigeration of the Earth: the gradual cooling of the earth in the course of ages. According to the NEBULAR HYPOTHESIS (q. v.) the earth was originally a mass of fiery liquid, and known geological facts have established that its surface was at one period much hotter than it is now. The fact that the temperature increases from the surface inward implies that there is a continual loss of heat from the interior by gradual conduction through the outer crust and atmosphere to external space. (See ENERGY, DISSIPATION OF.) This loss is very small, in proportion, compared with that of the sun—owing, doubtless, to the existence of the crust. It has been suggested, however, that the internal heat might be kept up by chemical action—that is, by the transformation of chemical energy of combination into heat, or by the passage of the earth through a hotter region of space, a hypothesis due to Poisson. Lord Kelvin regards these views

portional to the square root of the time from the epoch. Further, his analysis would lead to the inference that during the last 96,000,000 years the rate of increase of the temperature from the surface inward has diminished from about $\frac{1}{10}$ th to about $\frac{1}{100}$ th of a degree F. per foot, and that the thickness of the crust through which any degree of steady cooling has been experienced has increased up to its present thickness from a fifth of that thickness. Lord Kelvin believes also that the earth is not, as is commonly supposed, a mass of fiery liquid covered with a crust of from 30 to 40 miles thick, but on the whole more rigid than a solid globe of glass, or even of steel of the same dimensions, and he reserves that a decided negative should be given to the suggestion that internal heat exerted any sensible effect on climate. See EARTH (Internal Temperatures). R. A. ROBERTS.

Refuge, Cities of: See CITIES OF REFUGE.

Regal'di, GIUSEPPE: poet; b. at Novara, Italy, in Nov. 1809; began the study of jurisprudence in the University of Turin, but failing in his first examinations, and having heard the improvisatore Giustiniani, he resolved to rival him. From 1833 to 1856 his course was a continual triumph; he improvised in all the principal cities of Italy, in France, in Switzerland, in Germany; visited Greece, Asia Minor, Mt. Lebanon, and Egypt, and there gathered fresh inspirations. In 1860 he was appointed Professor of History in the Lyceum of Parma; then (1862) in the University of Cagliari; and finally, in 1866, in the University of Bologna. D. at Bologna, Feb. 1883. Among his volumes of verse are *La guerra* (1832); *Poesie estemporanee e pensate* (1833); *Canti* (1840); *Canti nazionali* (2 vols., 1841); *La Bibbia* (1852); *Canti e prose* (1861-65); *Poesie scelte* (1874); *L'eroe* (1878). We have also a volume of travels, *Dora* (2d ed. 1881), and a collection of essays, *Storia e letteratura* (1879). F. Orlando, *Giuseppe Regaldi* (1880). Many illustrated French and Italian poets have written verses in his honor, among others Lamartine. Revised by A. R. MARSH.

Regatta: See ROWING and YACHTING.

Regulation [*laid*, *reg*, *gation* + *gelo* for, a *leading*, *drive*, of *power*, *control*]: the leading together, without the application of outward push, of gregarious surfaces (as ice or of other solid bodies, or the melting point) when subjected to pressure with them united.

This phenomenon, which was discovered by Faraday in 1851 in connection with osmotic pressure, which increases in volume with pressure. It has been studied chiefly in the case of wax, in which the process is of particular interest because of the part which it plays in the motion of faults.

Regulation depends upon a principle stated by James Thomson, viz., that any substance the volume of which is greater in the solid state at the melting point than when melted at the same temperature will have its melting temperature lowered by pressure. The effect, even in the case of wax, is very small, amounting to a reduction of only one atmosphere. By means of it, however, Montan and his associates have proved that liquid iron freezes even at 100° C. The pressure necessary to the purpose was 10,000 atmospheres. This minute change in the melting-point is sufficient to enable regulation to take place.

The explanation of the phenomenon is as follows:

Two iron bars, in contact, are subjected to pressure, a slight lowering of the melting-point occurs, and a certain amount of ice is liquefied. To convert ice into the liquid form, pressure, free of temperature, requires, however, a large amount of heat (heat of fusion = 79 calories per gramme). This is obtained at the expense of the temperature of the liquid and of the surrounding ice masses, which contract enough to below the normal melting-point. As soon as the pressure is removed, freezing takes place and the contact surfaces of the two bars are united.

Since the conditions of an ordinary laboratory experiment the range of temperature changes is very minute, but now we come to consider glacial action, where immense pressures are brought to bear, we find in regulation an agency which, taken in connection with ordinary friction, is quite sufficient to account for the extraordinary action of the ice.

R. F. KENNEDY.

Regeneration [*from* *lat*, *re*, again + *genero* *re*, beget]: a theological term used to express the initial stage of the change wrought by one who enters upon the Christian life. It is derived from the New Testament, where the "new birth" (*1 Joh. 1, 3, 26*; *Titus* *iii, 5*; *John* *iii, 3, 7*) is the beginning of that "newness" which produces the "new creature." In the history of theology the term has been used with varying faculties of meaning. Among the Jews it was confined to an external sense to express the change of relationship to God when a heathen became a Jew; from him it was adopted in this sense by many of the Fathers, and still so used by many advocates of "baptismal regeneration." It is used in the Latin Church to express the time and change which corresponds to this external change. The Reformers separated justification by faith from regeneration wrought on, not in the sinner, and applied regeneration to express the whole process of inner freedom in all its stages. In the development of Protestantism the term has been still further narrowed: to designate the opening stage of this subjective work as distinguished from the continuance in sanctification; and to mean the seventeenth century, to express the initial stage of this opening stage itself, as distinguished from the whole inner process, which includes, along with the initial stage, justifying grace, also the act of man in turning to God.

The nature of regeneration is of course variously understood by different authors, according to their various views of the nature of the soul and its relation to that of original sin, and of divine grace.

1. Pelagius in accordance with their view of freedom of grace, necessarily regard regeneration as a self-determined action on the general moral course of man's life, as well as man himself, without any gracious assistance necessary either looked to instruction and reprovable precepts. This was the teaching of Pelagius in the second or the fifth century; and although not adopted by the Western Church, it has been reproduced in various modifications by Rationalists and Unitarians.

2. The great Pelagian doctrine taught by John Calvin was, however, that divine grace (*monition*) is necessary to enable man to receive into him and live, yet holds the true view of the human will, man may first

spontaneously, of himself, desire and attempt to change and obey God. They deny the necessity of prevenient but admit the necessity of cooperative grace and sensitive regeneration as the product of this co-operative grace.

3. The Medival and Papal doctrine, which is practically that of Thomas Aquinas, and is hence often called "Thomism," admits original sin and the necessity of prevenient grace, but places the efficacy of grace in the non-resistance of the subject. (see the *Summa of Thom.*, *sec. II, can. 4, obs. 1, and II, and sec. 7, can. 6 and 8, 1*). But this grace is supposed to be extended only through the instrumentality of baptism, which acts as an *opus operum*, as a *notitia* species effecting regeneration and the entire removal of sin, and consequently of guilt, from every infant, and from every adult who does not willfully resist (see *penitentia* *adversus*). *Summa of Thom.*, *sec. 7, can. 6*; *De Sententia*, *De Sacramento*, *3, 1*.

4. The Arminian view of regeneration admits total depravity and consequent moral impotency, yet holds that man is not really responsible until there be redemptively bestowed upon him for Christ's sake sufficient grace to re-endorse him with ability (gracious, substituted for natural) to do right, which grace becomes efficient when the sinner cooperates with it, and thus effects the end intended.

5. The Syncretistic view was held by a party among the Lutherans, under the leadership of Melancthon. At the Leipzig Conference (1549) Melancthon said: "There exist three causes of a good action—the word of God, the Holy Spirit, and the human will assenting, not resisting the word of God." *See* *Can.*, *p. 96*.

6. The Lutheran standard, the *Formula Concordia*, teaches that: (1) Human nature is spiritually dead; and (2) the Holy Ghost is the sole efficient agent who quickens the dead soul to life, without the least co-operation of the will of the subject; but the non-regeneration of the unbeliever is referred not to the absence but to any deficiency of grace, but to the positive resistance of the man himself. *Formula Concordia*, *pp. 662, 666, 667, 677*.

7. The Reformed doctrine teaches as follows: (1) As to the nature of regeneration: (a) There are in the soul, besides its several faculties, habits or dispositions, innate or acquired, which lay the foundation for the soul's exercising its faculties in a particular way. (b) These dispositions (innate) are inferior to moral action, and determine its character as good or evil. (c) In creation that made the dispositions of Adam's heart holy. (d) In regeneration God renews the governing dispositions of the regenerated man's heart, holy. Regeneration is therefore essentially the communication of a new spiritual life, and is properly called a "new birth." (2) As to its efficient cause: It is effected by divine power acting supernaturally and immediately upon the soul, quickening it to spiritual life, and implanting gracious principles of action. (3) As to man's action: Conversion (*conversionis actus*) instantly follows, as the change of action consequent upon the change of character, and consists in repentance, faith, holy obedience, etc. *Thirty-nine Articles*, *art. 10*; *Can. of Synod of Dort*, *ch. III, art. 3*; *Westminster Confession*, *ch. 2*.

What is called baptismal regeneration is held by members of the Church of England and others in various senses. (1) Some hold that the Holy Spirit through the instrumentality of baptism implants a germ of spiritual life in the soul, which may long remain latent, and may be subsequently developed (in conversion) or blasted. (2) Others hold that there are two regenerations—one a change of state or relation, and the other a change of nature; the first is baptismal and the second moral, though both are spiritual, since both are wrought by the Holy Ghost.

A. A. HENGE.

Revised by R. B. WARFIELD.

Regensburg: See Ratisbon.

Regent-bird: a name given to one of the heron-birds (*Ardeola melanocephala*), in honor of the prince regent, afterward George IV., because the black and golden yellow plumage of the male represented his family colors. It is an inhabitant of New South Wales.

F. A. L.

Reggio di Calabria, red jé-dee-kah-laah rée-dá (anc. *Regium*, *Regium*): city of Italy; in the province of Reggio; on the Strait of Messina (see map of Italy, ref. 9-6). The ancient name, signifying rearing, probably refers to some great natural convulsion, and possibly to that which separated Sicily from the mainland in prehistoric times. Reggio was first colonized by Chalcidians, whom fugitive Messenians joined about 733 B.C. Toward the end of the

fifth century B. C. it lost its republican organization; after an obstinate resistance it was captured by Dionysius the Elder, tyrant of Syracuse (387 B. C.). Under the Romans it became again wealthy and magnificent. The Castor and Pollux with St. Paul on board entered the harbor (63), and, according to tradition, St. Paul landed and founded a church. The ecclesiastical history of Reggio is interesting and somewhat important. The city shared all the vicissitudes of Southern Italy during the Middle Ages. It was burned by Alaric (410), captured by Totila, King of the Goths (549), by the Saracens (918), by the Pisans (1005), by Robert Guiscard (1060), and by the Ottomans (1552 and 1597). Nevertheless, it was flourishing and opulent when in 1783 it was utterly overthrown by earthquake. Though suffering from earthquakes often since, it has been partially rebuilt and presents a modern appearance with handsome and spacious streets. The city now rises in amphitheatrical form upon a gently sloping hill; its suburbs are attractive and it enjoys splendid sunset views over the strait, with Etna and Sicily in the foreground. It has a few manufactories and an inconsiderable maritime trade. Pop., with the suburban villages (1893), 43,000. E. A. GROSVENOR.

Reggio nell' Emilia, red'jō-nel-lā-mee'lē-ā (anc. *Rhegium Lepidi*): city of Italy, in the province of the same name; on the railway between Parma and Modena (see map of Italy, ref. 3-C). It is a walled town, with broad streets, many of which are lined with arcades. Some of the churches are imposing and contain precious objects of art. Over the altar of St. Prospero once stood the *Nativity* of Correggio, known as *La Notte*, now in the Dresden Gallery. Reggio contains a fine cathedral, partly of the twelfth century, a spacious theater, a library with 56,000 volumes, an academy of fine arts, and a museum with the natural historical collection of Spallanzani, born here in 1729. The small house in which Ariosto was born (1474) is still seen. The Asylum for the Insane, outside the town, is one of the best-managed philanthropic establishments in Italy. The origin of the town is uncertain, but it is often mentioned by Latin writers. It was captured by the Goths in 409, was oppressed by the Exarchs of Ravenna, and was rebuilt by Charlemagne in the ninth century. It suffered severely during the Guelph and Ghibelline wars. An independent commonwealth in the twelfth century, during the thirteenth it was prominent in mediæval learning. For several hundred years it was generally ruled by the Este and Austro-Este family, and joined the modern kingdom of Italy in 1859. Now it is the commercial center of a fertile province, carries on a large trade in country products, and has some industries of its own, as manufactures of carriages, brooms, and sailcloth. Pop. 18,634. E. A. GROSVENOR.

Regiment [from O. Fr. *regiment*, government, later a regiment of soldiers < Lat. *regimentum*, government, rule, deriv. of *regere*, rule]: a military organization made up of one or more battalions of infantry, squadrons of cavalry, or batteries of artillery. The organization being permanent, its history, records, and traditions become matters of regimental pride and a potent factor in preserving its *esprit de corps*. Regiments are generally designated by numbers; but they frequently have special names, derived from the locality of their enlistment or from some marked service rendered by them.

In the U. S. the infantry regiment is made up of ten companies and varies in strength from about 500 men on a peace footing to about 1,000 men on a war footing. In the more modern organization of the European armies it consists of three, or sometimes four, battalions, of about 1,000 men each on a war footing, reduced to about 600 on a peace footing. The cavalry regiment of the U. S. contains 12 troops, or 6 squadrons, and the artillery regiment 12 batteries. In European armies these numbers vary somewhat widely.

The regiment is commanded by a colonel, or in his absence by its lieutenant-colonel. Each battalion is commanded by a major, and each company by a captain. The regimental staff usually consists of an adjutant, quartermaster, commissary, and surgeon. Some regiments have also a chaplain.

The regiment is the *administrative unit* of the army, the battalion the *tactical unit*, and the company the *unit of combat*. See ARMY. JAMES MERCUR.

Regina [Lat., Queen]: town of Assiniboia, Canada, and capital of the Northwest Territories; station on the Canadian Pacific Railway, 357 miles W. of Winnipeg (see map of Canada, ref. 9-G). It contains fine public buildings, and is

the headquarters of the Northwest mounted police. It is well provided with churches and schools, and has the nucleus of a parliamentary library. Pop. 2,500.

Regiomonta'nus, JOHANN MÜLLER: astronomer and mathematician; b. at Königsberg in Franconia, June 6, 1436; studied mathematics under Purbach at Vienna, and astronomy at Padua; lived for some time at the court of Matthias Corvinus of Hungary, afterward at Nuremberg, and was invited to Rome in 1474 by Pope Sixtus IV. in order to reform the calendar. D. in Rome, July 6, 1476—some say by the plague, others by assassination at the hands of the sons of George of Trebizond, in whose writings he had pointed out some glaring errors. His *Ephemerides ab Anno 1475-1506* (continued by Bernhard Walther) made him very famous among astronomers. Among his numerous other works are *De Reformatione Calendarii* (1489) and *De Triangulis Omnimodis* (1533). See Alexander Ziegler, *Regiomontanus* (Langensalza, 1874).

Registration (of conveyances): See RECORDING.

Regnard, rān-yaar', JEAN FRANÇOIS: dramatist; b. in Paris, France, Feb., 1655. Of a wealthy family, he was well educated, and traveled extensively in Italy, Algiers, whither he was taken as captive by pirates in 1678, Scandinavia, Lapland, Germany, Poland, and Hungary. He settled in Paris in 1684, and began first to write for the Théâtre Italien, but after 1696 wrote entirely for the Théâtre Français. He followed Molière, but at a long distance, naturalness and delineation of character being sacrificed to the comic effect, for which his talent was great. *Le Joueur* (1696), *Les Ménechmes* (1705), imitated from Plautus, and *Le Légataire universel* (1708) are his best-known comedies. D. Sept. 4, 1709. He also wrote an account of his *Voyages* and a partly autobiographical story, *La Provençale*. Editions of his works have been given by Michiels (2 vols., Paris, 1854-55) and Moland (Paris, 1875). A. G. CANFIELD.

Regnault, re-nō', ALEXANDRE GEORGES HENRI: historical, genre, and portrait painter; b. in Paris, France, Oct. 30, 1843. Pupil of Montfort, Lamothe, and Cabanel; grand prix de Rome 1866; painted in Italy and Spain 1866-69, and in Africa in 1870. He returned to France and enlisted in the Sixty-ninth Battalion of the National Guard at the outbreak of the war with Germany, and was killed in a skirmish at Buzenval, Jan. 19, 1871. His works are very fine in color and possess qualities of the highest order. Though only twenty-eight years of age at the time of his death, he had already painted a number of important compositions, one of the most famous of which is his equestrian *Portrait of General Prim*, now in the Louvre. In the Louvre also is his *Execution without Judgment—Granada*. In the Museum of Fine Arts, Boston, is a picture entitled *Automédon with the Horses of Achilles*, which, though not one of his most successful works, gives a fair idea of his power as draughtsman and his ability to handle a large canvas with unity of effect. WILLIAM A. COFFIN.

Regnault, HENRI VICTOR: physicist and chemist; b. at Aix-la-Chapelle, Germany, July 21, 1810; studied at the Ecole Polytechnique of Paris; was appointed Professor of Chemistry at that school in 1840, in Physics at the Collège de France in 1841; chief engineer of mines in 1847, and director of the porcelain-works of Sèvres in 1854. The first work of his which attracted attention was his *Action de Chlore sur l'Éther chlorhydrique* (1840), but his physical researches, especially concerning heat, gained for him his great reputation. In 1848 he received the Rumford medal from the Royal Society of London for his *Experiments to determine the Laws and the Numerical Data which enter into the Calculation of Steam-engines*. His investigations in verification of the law of Mariotte and Boyle were communicated in vols. xxi. and xxvi. of the *Mémoires de l'Académie des Sciences*. His *Premiers Éléments de Chimie* (1850), an abridgment of his *Cours Élémentaire de Chimie* (1847-48) has been translated into several languages. His work on the practical treatment of steam-engines forms vol. xxi. of the *Mémoires de l'Académie des Sciences*. D. Jan. 19, 1878.

Regnault, JEAN BAPTISTE, BARON: painter; b. in Paris, France, Oct. 19, 1754; led for some time a roving life as sailor, and visited Africa and America; entered in 1771 the studio of the painter Bardin, whom he accompanied to Rome; gained in 1774 the great medal for his *Alexander and Diogenes*; became a member of the Academy in 1775, subsequently professor in the School of Art, and stood at the side of David at the head of the French school of paint-

Reid, THOMAS: philosopher; b. at Strachan, Kincardineshire, Scotland, Apr. 26, 1710. His father was a minister. He received his first instruction at home and in the parish school of Kincardine. In 1722 he was sent to Marischal College in Aberdeen, where he graduated in 1726, and occupied a position as college librarian and in studying mathematics and philosophy until 1737, when he was appointed minister at New Machar in Aberdeenshire. His parishioners are said to have opposed his appointment very strenuously, and he had so little confidence in his own powers that he never himself composed the sermons which he preached, but used such as were published by English divines, especially Tillotson and Evans. Nevertheless, his life as a minister at New Machar turned out to the satisfaction of all. In 1740 he married, and in 1748 he published his first philosophical essay, *On Quantity*, in the *Transactions* of the Royal Society of London. It was a criticism of the manner in which the mathematical terminology was used at that time in metaphysics and morals, especially by Hutcheson. In 1752 he accepted the position of Professor of Philosophy at King's College, Aberdeen, where he had to teach mathematics, natural philosophy, and moral philosophy; but in 1763 he moved to Glasgow as the successor of Adam Smith in the chair of Moral Philosophy. Here he published his *Inquiry into the Human Mind on the Principle of Common Sense*, in 1764, and read at the meetings of a philosophical society several papers, such as *Examination of Dr. Priestley's Opinion concerning Matter and Mind and Physiological Reflections on Muscular Motion*. In 1781, however, he resigned his office in order to devote himself exclusively to philosophical studies, and published *Essays on the Intellectual Powers of Man*, in 1785, and *Essays on the Active Powers of Man*, in 1788. D. Oct. 7, 1796. Originally, he was a disciple of Berkeley, but David Hume's *Treatise upon Human Nature*, published in 1740, showed him at once to what consequences idealism might lead, and roused him to independent speculation. In opposition to Hume's skepticism he tried in his *Inquiry into the Human Mind on the Principle of Common Sense* to establish a series of fundamental truths independent of experience and indisputable as primitive facts of the consciousness. On the Scottish school of philosophy, and more especially on the study of psychology, he exercised a powerful influence. This influence has extended to France (Royer-Collard and Victor Cousin); and to America and the British colonies, nearly all professors of philosophy in colleges for thirty years (1830 to 1860) being followers of Reid in all important respects. See ENGLISH LITERATURE (*Philosophy*). Revised by W. T. HARRIS.

Reid, WHITELAW: journalist; b. near Xenia, O., Oct. 27, 1837; graduated at Miami University in 1856; after acting for a year or more as superintendent of the graded schools at South Charleston, O., bought and edited the *Xenia News*; joined the Republican party at its birth and made political speeches in support of Fremont in 1856; advocated in the *News* the nomination of Abraham Lincoln in 1860; became city editor of the Cincinnati *Gazette*; during the civil war served on the staff of Gen. Morris in West Virginia and later on that of Gen. Rosecrans, and was war correspondent of the *Gazette*, writing over the signature of "Agate"; in 1863 was appointed librarian to the House of Representatives; in 1865 accompanied Chief Justice Salmon P. Chase on a tour of the South, undertaken by the latter at the request of President Johnson for the secret purpose of studying the condition and interests of the white and black races, and published *After the War, a Southern Tour* (Cincinnati, 1866); during the next two years engaged in cotton-planting in Louisiana and Alabama, and published *Ohio in the War* (2 vols., Cincinnati, 1868); in 1868 became one of the editors of the Cincinnati *Gazette*; at the invitation of Horace Greeley joined the editorial staff of *The New York Tribune* in 1868, and in 1869 became managing editor. Upon the nomination of Greeley for the presidency in 1872 Mr. Reid became editor-in-chief, and when the former died in the fall of that year he became chief proprietor as well as editor of the *Tribune*. In 1878 President Hayes offered him the U. S. mission to Berlin, which he declined. The offer was renewed under the administration of President Garfield, and again declined. In 1878 he was elected by the New York Legislature regent of the State University, to succeed Gov. Dix. In Mar., 1889, Mr. Reid accepted from President Harrison the appointment of minister to France, and resigned the editorship of the *Tribune*. After securing the repeal of the French decree

prohibiting the importation of U. S. meats, and negotiating extradition and reciprocity treaties, he resigned office and returned to the U. S. in Apr., 1892. In June, 1892, he was nominated for the vice-presidency of the U. S. by the Republican national convention, but failed of election. His time since then has been divided between foreign travel and the direction of the *Tribune*. Among his occasional addresses, afterward published in book form, are *Schools of Journalism* (New York, 1871); *The Scholar in Politics* (1873); *Some Newspaper Tendencies* (1879); *Town-hall Suggestions* (1881). Revised by W. F. JOHNSON.

Reid, WILLIAM, D. D.: minister and editor; b. in the parish of Kildrummy, Aberdeenshire, Scotland, Dec. 10, 1816; was educated at the University of Aberdeen; went to Canada as missionary of the Established Church of Scotland; was pastor at Graton and Colborne, Upper Canada, 1840-48; was one of the founders of the Presbyterian Church of Canada 1843; was pastor at Pictou 1849-53; editor of *The Ecclesiastical and Missionary Record* 1853-75; since 1853 has been clerk of synod and treasurer of the schemes of the Church. Dr. Reid was moderator of the Synod in 1850 and 1873, and of the General Assembly in 1879.

C. K. HOYT.

Reid, WILLIAM JAMES, D. D.: clergyman; b. at South Argyle, N. Y., Aug. 17, 1834; was educated at Union College and Allegheny Seminary; corresponding secretary of the United Presbyterian board of home missions 1868-72; principal clerk of the United Presbyterian General Assembly since 1875; and since 1889 pastor of the First United Presbyterian church, Pittsburg, Pa., and editor of *The United Presbyterian*. Dr. Reid has published numerous sermons and pamphlets; *Lectures on the Revelation* (Pittsburg, 1878); and *United Presbyterianism* (1881; 2d ed. 1883).

C. K. HOYT.

Reidsville: town (founded in 1865); Rockingham co., N. C.; on the Southern Railway; 24 miles N. of Greensboro, and 24 miles S. W. of Danville, Va. (for location, see map of North Carolina, ref. 2-F). It is in the heart of the "bright" tobacco belt, and is a large leaf-tobacco market, selling about 8,000,000 lb. per year. There are 4 large warehouses for the sale of the leaf, tobacco, cigar, and cotton factories, flour and lumber mills, 8 churches, high school for boys, graded public schools, a female seminary, a State bank with capital of \$50,000, an incorporated bank with capital of \$50,000, and 3 weekly newspapers. Pop. (1880) 1,316; (1890) 2,969; (1894) estimated, 3,500.

EDITOR OF "REVIEW."

Reigate: town; in the county of Surrey, England; 21 miles S. of London (see map of England, ref. 13-J). The parish church of St. Mary (mixed Transition Norman and Perpendicular) dates from the reign of Henry VII. It contains a library with MSS. and rare books. Reigate carries on a considerable trade in fuller's earth and sand used in the manufacture of glass. Pop. (1891) 22,646.

Reign of Terror: the name given to that period of the French Revolution which lasted from Jan. 21, 1793, the day of the execution of Louis XVI., till July 27 (9 Thermidor), 1794, when Robespierre was guillotined and the committee of safety broken up. See FRANCE, HISTORY OF.

Reims: a city of France. See RHEIMS.

Rein, rin, JOHANNES JUSTUS: scholar and compiler; b. at Rauenheim, Hesse-Darmstadt, 1835; studied at the University of Giessen, and taught for several years. In 1873 he undertook a mission to Japan on behalf of the Prussian Government for the purpose of studying Japanese industries and commerce, and spent two years in that country. On his return he was appointed Professor of Geography at Marburg, and in 1883 was transferred to a similar post at Bonn, where he succeeded Baron von Richthofen. In 1893 Dr. Rein served as a judge of art industry at the Columbian Exposition in Chicago. The results of his Japanese researches were embodied in his valuable *Japan nach Reisen und Studien dargestellt* (2 vols., Leipzig, 1881, 1886), of which an English translation has appeared under the titles *Japan. Travels and Researches* (London, 1884) and *The Industries of Japan* (London, 1889). A later work treats of Columbus and Spanish subjects—*Geographische und naturwissenschaftliche Abhandlungen* (Leipzig, 1892). J. M. DIXON.

Rein, WILHELM, Ph. D.: professor of pedagogy; b. at Eisenach, Germany, Aug. 10, 1847; studied at Gymnasium, Eisenach, 1857-66, Jena University 1866-68, Heidelberg 1868-69, Leipzig 1870-71; teacher in Realschule, Barmen,

highly gifted of the pupils of Gottfried Hermann, and an inspiring teacher of great learning and critical talent. He died, after occupying the chair of Classical Languages at Halle for a few years, at Venice, Jan. 17, 1829. His principal works, which have not yet lost their value, are *Vorlesungen über Lateinische Sprachwissenschaft* (3d revised and enlarged ed. in 8 vols., 1888); *Coniectanea in Aristophanem*; critical and exegetical edition of Sophocles's *Edipus Coloneus* (2 vols., 1823). Cf. Fr. Ritschl, *Opusc.* (v., pp. 95 ff.); O. Ribbeck, *F. W. Ritschl* (i., pp. 34 ff.).

ALFRED GUDEMAN.

Reiske, ris'ke, JOHANN JACOB: Greek scholar; b. in Zörbig, Saxony, Dec. 25, 1716; matriculated in 1733 at the University of Leipzig, where he devoted himself especially to the study of Arabic. In 1738 he went to Leyden to study the Arabic MSS. in the university library, and eked out a spare living by correcting proof-sheets and by giving private lessons. Amid such hardships he still found time for the study of medicine, graduating in 1746. Soon afterward he returned to Leipzig, and here also he lived in abject poverty for twelve years, when he secured the rectorate of the famous Nicolai Gymnasium. This position he retained till his death Aug. 14, 1774. Reiske is one of the greatest Greek scholars that Germany has produced, and his genius, though depreciated in his lifetime, is now becoming ever more generally recognized. His productivity is astounding; his most celebrated works are editions, commentaries, and translations of Plutarch (12 vols., 1782); Dionysius of Halicarnassus (6 vols., 1777); *Oratores Graeci* (12 vols., 1770-75); Dion Chrysostomos (2 vols.); Libanius (4 vols.); Theocritus (2 vols.); Maximus Tyrius (2 vols.); and many other minor editions. To these must be added a collection of *Animadversiones in Græcos auctores* (5 vols., 1757-66). Many of his works were published posthumously by his wife, ERNESTINE CHRISTINE (1735-98; married 1764). See his *Autobiography*, pp. 818 (1783); M. Haupt, *Opuscula* (iii., pp. 137 ff.); Bursian, *Gesch. der classischen Philologie in Deutschland* (pp. 407-416). ALFRED GUDEMAN.

Reisner-work: See BUHL-WORK.

Reiss, WILHELM: traveler, ethnologist, and naturalist; b. at Mannheim, Germany, in 1838. He graduated at Heidelberg 1864; visited Greece 1866; and from 1868 to 1876 traveled in South America, generally in company with A. Stübel. Their most extended explorations were in Colombia, Ecuador, and Peru, where they ascended and measured many peaks of the Andes, and made valuable archaeological and geological studies. Their most important joint publication was *Das Totenfeld von Ancon in Peru* (3 vols. folio, 1880-87), a magnificently illustrated work on the Indian burial-grounds of Ancon, near Lima. They also published, jointly or separately, many papers in Spanish at Quito; and Reiss is the author of several works in German on South American geology and topography.

H. H. SMITH.

Relapsing Fever, also known as **Famine Fever**, and, technically, as **Febris Recurrens** [*relapsing* is from Lat. *relabi*, *relapsus*, fall back, relapse; *re-*, back, again + *labi*, slide, fall]: a specific infectious and contagious disease due to the action of a micro-organism, the *Spirochæta obermeieri*, which flourishes in the blood. It occurs only at intervals of some years, and generally during seasons of privation and insalubrity, attacking chiefly the lower classes, ill fed and housed. The idea was formerly held that relapsing fever is a dietetic disease pure and simple. This is not the case, though famine makes large masses of people susceptible to the specific germ. Its formative or incubating stage is from four to ten days. Its onset is sudden; the patient, having been perfectly well at the time, is able to fix the exact time of the attack. It begins with an abrupt and severe rigor, or chill with nervous tremor, and immediate sense of extreme weakness. There is sharp frontal headache, pain in the back and limbs; then follow flushed face, thirst, dry tongue, high pulse, and a steady ascent of body heat. The facial expression and temperature are characteristic. The mind is unaffected, and the face, with the sunken but clear and full eyes, wears a pitiable, helpless, appealing look. The complexion has a bronzed hue, and may be slightly jaundiced. The temperature rapidly ascends and during four or five days remains 105°, 106°, 107°, 108° F.—an unusual fever heat unaccompanied by brain symptoms or danger of death. Physical examination may detect enlargement of the liver and spleen; the urine may contain not only albumin and urea in excess, but blood and casts indicative of acute congestion of the kidneys. The fever

and extreme depression last from five to seven days, when, with some critical evacuation, as profuse perspiration, diarrhoea, or urination, a sudden abatement and rapid convalescence set in. Appetite and strength are slowly returning, and the invalid is about, when, on the fourteenth day from the first attack, he is seized by a second or relapse resembling the first. Very rarely, a third, fourth, and even a fifth relapse, occurs. The mortality is not as high as in typhus fever, nor as great as the severe symptoms would indicate. The treatment during the active period is essentially antiphlogistic and expectant—cooling drinks, gentle saline laxatives, sponging, light diet; during convalescence, free use of concentrated liquid diet, tonics, especially liberal use of quinine and brandy.

Revised by W. PEPPER.

Relativity: the principle in psychology according to which all mental states are influenced by preceding and accompanying conditions of consciousness. The principle was formerly a theoretical doctrine of philosophy, and was discussed in all early English philosophy under the phrase "relativity of knowledge." According to this theory, no knowledge was of an object as it really existed outside of the mind, but was only of an "idea" of this object in consciousness, subject to all the modifying influences, both of the nervous system and of the come and go of other impressions and ideas. The historical development of the doctrine is due mainly to Stuart Mill and Sir William Hamilton. The Kantian theory of knowledge, which made the mind's object a construction in certain forms native to the mind, was a further and important development of the doctrine of relativity toward subjective idealism. In current thought the law of relativity has become an established psychological doctrine. It gets its first application in the theory of SENSATION (*q. v.*). It is found that none of the attributes of sensation is constant, but that they all vary with the condition in which consciousness already is when the sensation comes to it. Particular applications are found in the theory of "color-contrast," in the modifying influence of attention on all sensations, in the working of Weber's law (see PSYCHO-PHYSICS) upon the intensities of sensation-states, and in the influence of muscular states and strains at the time that the sensation in question makes its advent in the mind. See the *Psychologies* of James, Höffding, Baldwin, under the heading *Relativity*; Hamilton, *Lectures on Metaphysics*; Mill, *Examination of the Philosophy of Hamilton*; and Lotze, *Metaphysic*.

J. MARK BALDWIN.

Release: in law, the extinguishment of a pre-existing right. It may consist in an agreement upon a legal consideration, or in a sealed contract, or it may result from the acts of the parties or from the operation of law. While there is much authority for the statement that an obligation under seal can be released only by a contract under seal, the better modern view is that a release upon a legal consideration is equally effective in extinguishing an obligation with the common-law release under seal. The voluntary destruction of an obligation, or its surrender by the obligee to the obligor, with the intention of discharging the latter, will operate as a release. The law often works the discharge of an obligor in cases where the parties intended no such result. A contract for personal services is terminated by the death of either party. At common law the death of a joint contractor extinguished the obligation so far as he or his estate was concerned. Likewise the release of one joint obligor worked the legal release of his co-obligors, and the release by one joint obligee was binding on his co-obligees. The language of a release is to be dealt with according to the general rules of INTERPRETATION (*q. v.*).

The right which is extinguished by a release may be a title to real property; hence a release may be a form of conveyance. Here it is classed as secondary or derivative because it presupposes a preceding conveyance. It passes the releaser's right in land to one who has a former estate in possession therein. It is said to inure by way of enlarging an estate, or by way of passing an estate, or by way of passing a right, or by way of extinguishment, or by way of entry and feoffment. (2 Blackstone's *Commentaries*, 324-325; *Miller vs. Emans*, 19 N. Y. 384.) See BARGAIN AND SALE, DOWER, JOINT OWNERSHIP, JOINTURE, and LANDLORD AND TENANT. For Roman law rules, see OBLIGATION.

FRANCIS M. BURDICK.

Relief: in sculpture and some decorative arts, the projection of figures from a background; also a work of sculpture in which the figures stand out from a background, instead of

being produced finished on all sides, be to a statue or statuette. The known and generally of the same kind of mass as the background, that is to say, the wood of the marble is cut out and dug out so as to leave the figures in relief. The background may then be brought to one uniform plane, or even be sunk deeper in one place than in others, or the subject may even provide its own background in places, as from discovery is spread broadly, or where the representation of a building or a hill serves to relieve some of the figures. In the figures, drapery, etc., of the relief may also be executed in a different piece of material and fastened on to the background. Thus in the form of the freestone the background is of dark marble, and the figures of white marble are attached. In many decorative objects, such as gold, silver, shalvans, silverware, and other alloys and metals, designs are raised upon a background of polished metal, the smoothness of silver, or even lacquer or polished wood. Carved wooden panels of subjects and other decorative pieces of furniture are often made by giving a thin piece of chosen wood upon a pine board and carving deeply, so that the more valuable wood is cut away in an openwork pattern, rounded and modeled within itself, but having the appearance of being the pine; the pine being then removed, the completed openwork piece is glued firmly to a panel of the same wood as itself, which has previously been highly polished.

Relief may also be produced in other ways than by carving, as by modeling in clay or in softened paper, or by casting in lead, tin, or thin plates of metal, or by the repoussé process. (See METAL WORK.) Relief produced in these ways, and generally upon thin plates or sheets are pressed or stamped, is more often called *embossing*. Relief may also be got by casting, as metal, sulphur, or plaster; but in this manner the relief must exist first, and is only reproduced in the casting, although after the cast is made it may be smoothed by the casting bed or grater.

Relief is of several kinds. *Baso-relievo*, or *bas-relief*, is that in which the projection of the figures from the background is not great—usually less than half of the rounded form of the human figure, and generally much less than that. *Alto-relievo*, or *high-relief*, is that of which the figures have more projection. In this is often happens that the heads, arms, etc., of some of the figures are wholly detached from the background, and that other parts are much undercut, but as left in apparent separation from the background, but really supported by unseen connecting pieces of the material. As it is impossible to define exactly the limits of low-relief and high-relief, the term *profundissimo* is sometimes used to denote moderate relief. *Concavo-relievo* is relief with no visible background, the solid substance around the figures is left in its original state, the figures being immediately surrounded and outlined merely by a groove. This kind of relief is common in Egyptian sculptures, both on the walls of large buildings and on the sides and top of columns in very hard stones like basalt; it is also seen in Egyptian carvings in ivory and wood. The very low relief of some great models and of some sculptures in marble, especially of the Italian Renaissance, is sometimes called *stucco-relievo* or *stuccato-relievo*—that is, crusted or crusted relief.

It is to be observed, that the artist in modeling a relief is very limited in the actual curves of the natural surface which he is representing, not even to a uniform reduction of these curves to a proportionate greater flatness. Very often the artist where the figure quits the background is steep, becoming very much more gradual and subtle on the front surface; that a head will be modeled in almost perpendicular modifications of the surface, convex curves so much as to be hardly distinguishable from plane surfaces, but brought out from the flat background by a sudden sharp bend or even by an undulating introduced in order to form a steep line of shadow to mark out the profile.

Construction in relief is that which is most used for architectural decoration, especially in Assyrian, Egyptian, Greek, Roman, and modern classical architecture. It is much used also in the medieval styles. ROBERT STUBBS.

Relief Presbytery, or Relief Church: the name of the body of Presbyterians in Scotland which joined with the United Presbyterian Church to form the United Presbyterian Church, the Presbyterian Church.

Religion, Comparative: the term commonly used either for the comparative study of religions or for the science of religion in general. Here it is taken in the first-named

sense, including the comparative study of myths, dogmas, religious ethics, forms of worship, in short, of all the phenomena of religion. Considered as such, it is one of the two principal departments of the science of religion and the indispensable basis of the other—viz., the philosophy of religion.

Time of the Comparative Study of Religions.—When the sacred writings of the principal civilized nations of the East—the Chinese Classics, the Veda the Avesta, and a great many of more recent origin, but scarcely less interesting—could be studied in the original, when the key to the Egyptian hieroglyphics and the Babylonian and Assyrian cuneiform writing had been found and afforded a means of acquiring a knowledge of the two most ancient civilizations; when the epigraphical studies were pursued after a strictly philological method; and the already known and newly discovered inscriptions of the Assyrians, Phoenicians, and kindred nations could be better understood, a comparative study of religions was not only to be aimed at, but became indispensable for the solution of all the problems due to the new discoveries. The basis of comparative religion is the special study of the history of religions as living organisms of their rise and growth, their spread and decline, till they are superseded by other forms of worship, either the result of internal reforms or of the preaching of a new doctrine by foreign missionaries. Attention must be paid to their relation to philosophy, science, and arts, to the state, to society, and to ethics; and their mutual historical relation and their place in the universal history of religion must be acquired. To this historical inquiry must be added a comparative study of the constituent elements of religion, myths, dogmas, and sacraments, none of which must be separately regarded as religion itself, since they are rather its necessary manifestations, never wanting where there is a living religion. As a result of these comparative studies of religions and of their elements, there have been several attempts at a twofold classification of religions, one called the genealogical, in which they are grouped after their proved or probable descent and affinity, the other called the morphological, in which they are grouped after the degree of development they have reached, even though they are neither historically related nor contemporary.

The Genealogical Classification.—From the fact that by nearly all the Indo-European or Aryan nations the supreme God of heaven was called by the same name (Dyaus, Zeus, Jupiter, Xao (Ty); that with nearly all of them also the same general name for "god" was used; that many names of divinities, common to several Aryan nations, though varying in form, are derived from the same root, by which the original unity of their conception is proved—from these and several other facts the conclusion was drawn that all Aryan religions have sprung from one primitive old Aryan religion, and that therefore, however much they may differ as in their standpoint of development, they belong genealogically to the same class, their relationship being like that of cousins, though twice or three times removed. With the religions of the so-called Semitic peoples, the same conclusion was arrived at from the absolutely general use of the name Ilu, El, Allah for "god," and the all but general use of other divine titles, as Ba'al, Bel, Adon, Malik, etc. It was not so easy to find arguments of the same kind for the common origin of the Polynesian, of the Ural-Altaic, the Mongolian and their relation to the Chinese religions, and it was quite impossible to prove the primitive unity of, let us say, the Nigerian, the American, and other religions of uncivilized and barbarous nations.

Still the philological argumentation was thought positively to hold good for the two most important families of religions, the Aryan and the Semitic, from which have sprung the two universalistic religions, Buddhism and Christianity and the widely spread, semi-universalistic Islam. Some scholars, however, have raised grave objections against the value of this reasoning and of the generally admitted comparative method, on the ground that the use of the same names for the divinity does not prove the common origin of the religions in which it belongs. But, even if we admit that the results of etymological and glottological research have not that great value for the comparative study of myths and religions which has been attributed to them, the science of language can not be dispensed with as an auxiliary for the science of religion, and affords at least one of the standards by which the relationship of myths, dogmas, religious systems, and forms of worship must be determined.

Classification after the Tendency of Development.—We

shall now endeavor to classify the religions of the world first after the line or tendency, then after the degree of their development. To determine the line or tendency of development which a family of religions has followed in the course of history, the principal characteristics of such a family must be found out. That which really characterizes a religion or a group of religions is the notion they have formed of the relation between God and the world, God and man, and of the manner in which the Deity chooses to be worshiped. By applying this method to the religions with which we are best acquainted, some distinct families can be marked out with certainty even now, and by applying it to those which are not so well known, the documents and information from which they must be studied being less abundant, less clear, or less accessible, some probable hypotheses about their mutual relationship may be drawn.

Just as there are an Aryan and a Semitic family of speech, there are two corresponding great families of religions, which provisionally and only for convenience' sake may be called the Aryan and the Semitic religions. Studying these two groups we find that each of them develops, with marked and growing oneness, one of the fundamental ideas of religion without totally denying the other—viz., the Aryans the kinship between God and man, the Semites the eminence of God above man; the former regarding the Deity as the father of gods and men, the divine protector of the human race and of the same nature with it, though higher and mightier; the latter venerating their gods as lords, masters, and kings, whose obedient servants, nay, whose slaves, they are; the former laying the greatest stress on that which is dogmatically called the immanence, the latter on that which is dogmatically called the transcendence of the Godhead. The former or Aryan religions may be called theanthropic; the latter or Semitic may be called theocratic.

Theanthropic Religions.—The principal theanthropic religions are—(1) the Vaidic religion in India and its offshoots; (2) the religion of the ancient Iranians, Medes, Persians, and Bactrians, of which the Zarathustrian Mazdeism was a reform, protected by the Achaemenids and re-established under the latter Arsacids and the Sassanids, though perhaps partly altered under foreign influences. These two are branches of the same stem, as is proved by the many divinities, religious ideas and rites, especially the Soma-Haoma worship, which they have in common, but they have developed quite independently, and have really evolved into decided antagonists, the one led by uncontrolled theosophic speculation to the utmost limits of monistic pantheism, and even atheism, the other founding on a rather superficial dualism a practical system of religious observances and sober morality. Originally not less closely related are the religions of (3) the ancient Greeks and of (4) the Romans; but the Greek or Hellenic religion, under the high pressure of various Eastern creeds and cults, grew into that most attractive, but from a moral standpoint dangerous, humane polytheism, the worship of beauty and genius, while the Roman religion was organized to a cold and formalistic ritualism, till it was totally reformed by a gradual infiltration of Hellenic gods, ideas, and rites. Next come (5) the nearly allied Germanic religions, including the Scandinavian and the Teutonic, which, if the moral dualism of the *Edda* can be considered as old and original, show a great resemblance to the Iranian religious system; (6) the rather primitive but vaguely poetical Windic or Slavonic, and (7) the Celtic religions, which are still imperfectly known, but as far as they are known seem to represent the most ancient form of theanthropic religion, dissimulating its barbarous myths and bloody rites under a veil of magical mysticism.

Theocratic Religions.—The theocratic religions of Western Asia are much more closely related than are the theanthropic religions, the former covering a limited area, while the latter are spread from the Ganges to Iceland. The more primitive forms of worship belonging to this family must be sought among the Arabians and among other nomadic tribes of the desert. A marked theocratic character is shown by the Babylonian religious system, of which the Assyrian is an offshoot, only slightly differing from it in detail, though grafted on the really heterogeneous religion of the older inhabitants of the country, the so-called Sumerians (Accadians), and having borrowed from it not a few gods and rites. The same may be said of the religions of the Arameans, the Canaanites and Phœnicians, and the Hebrews. In the religion of Israel the same fundamental idea, combined with the conception of God's holiness—by which

originally is meant that the heavenly Sovereign is inaccessible—has been developed by the Mosaic reform and the preaching of the prophets into that ethical monotheism which stands unequalled among the religions of antiquity. Even Islām, the religion founded by Mohammed under the influence of imperfectly understood Judaism and Christianity, though semi-universalistic, must be regarded not only as a theocratic religion but as the one in which the conception of the Deity as an absolute sovereign has been worked out to its utmost consequences. In Christianity, on the contrary, the two currents meet; it is constantly struggling to maintain a kind of balance between the two principles, or even to combine them in a higher unity. It is only fair to say that the younger Judaism, which preceded it, had already prepared the way, as it had weakened the old, one-sided theocratic doctrine by its moral dualism and its belief in personal immortality.

The Egyptian Religion.—It might be expected, as the Egyptian language contains so many Semitic elements, that the religion would likewise be theocratic; but, though decidedly theocratic, it is theanthropic as well, and so represents a stage of development at which the two principles were still equally acknowledged. Perhaps the pre-Babylonian religions of Western Asia were more or less closely related to the Egyptian religion; certain it is that some of the oldest Egyptian gods and myths show a great resemblance to gods and myths probably borrowed by the Babylonians and other Western Asia nations from their predecessors. All this, however, is hypothetical.

Some other Families of Religions.—It would be impossible to give a complete classification of all religions with the present data. However, mention may be made of the *patriarchal* religions, in which the divine beings, worshipped as "elders, old ones, grandparents," are mutually related in the same way as the heads of different tribes or families, of whom one is superior to the other inasmuch as he is mightier, but each of whom exercises authority independently and in his own sphere. To these belong the religions of the Ural-Altaic peoples (Finns, Lapps, Estonians, and their relatives, though the first named have borrowed much from the Germans), and perhaps also some religions of North American nations. The Chinese religions that are known are of another kind. They might be called *anthropocentric*, as the human spirits (*shin*) constitute the middle class between the two other classes, viz., the heavenly and the earthly, strictly distinguished from both of them, but just as well venerated by the living. Probably also these have formed a group or family with the religions of some kindred peoples, but of the latter little is known.

As to the remaining religions only the classification which corresponds to the ethnological and the glottological one can be given.

Classification after the Degree of Development.—To classify the religions according to the degree of their development, which is usually, but not quite correctly, called the morphological classification, one must observe them at the highest standpoint they have reached—not in their growth nor in their decline. It is true that of some religions we must assume that, having had their development checked by adverse causes, they have remained stationary on a lower level than was possible for them to attain, and that of other religions we may suppose that they have fallen into decay through isolation, oppression, general degeneration of a people; but as it is no longer possible to gather information concerning their better state otherwise than by guessing from some vague traces, we are compelled to classify them only by what we know of them with certainty. According to this standard of comparison religions are divided into the two great categories of nature-religions and ethical religions.

Nature-religions.—By nature-religions we mean those whose highest divinities, be they spirits, fetishes, or man-like beings, are mighty powers of nature, connected in some way with a definite natural object or phenomenon. From these religions the ethical element is by no means excluded. On the contrary, from the remotest times moral qualities have been attributed to the gods or have been deified themselves, and this has been done more and more according as the deities have become more anthropomorphized. The ethical element, however, remains subjected to the nature-gods, and the latter are by no means bound by it.

Different Degrees of Nature-worship.—Among the nature-religions there is a great difference as to development, though all of them, even the highest, are still dominated by the same principle. On the lowest plane stands what has

unrealized behavior, a misapprehension of natural phenomena, and powers of nature, or beings endowed with magical powers, supposed to be the most part as artificial monsters, personified natural forces, will be as still observed in later development. This stage of development may be better named the *phantasy*. We are not able to point out any religion that is still standing on this low degree. Polytheism is however very often prevalent in more basal formations, and it is a good hypothetical hypothesis.

Polytheistic-Magic Religions under the Control of Animism.—As soon as man has begun conscious of the superiority of the spirit in the body and of his relative inferiority. Arising by, as it were, a kind of original phantasy dominating his whole life and also religion. It is a belief in spirits or souls, truly living in heaven and on earth, and subject of their own free will of under compulsion, conscious, permanently or temporarily, in all sorts of objects, especially strong in its lower stage to be living creatures and animism. One has at once considers himself dependent on them and stands in awe before them, they become the objects of his religious worship. In these beings, in the first place, the souls of the dead, which continue to live after leaving left the body and which he tries to appease, and the higher spirits, to whose agency he especially attributes the natural phenomena on which depend his existence and his well-being. In this stage arise the *polytheistic-magic religions*, with their not unessential, continually varying mythology, they belief in a magic power, not bound by any law, which belongs not only to the worshiped spirits, but also to privileged human beings, sorcerers, and fetish priests, and, in accordance with this belief, their magic rites, in which the magician uses most powerful spells. All the religions of the so-called savage or uncivilized nations belong to this category. Though they no longer offer a complete picture of what religion must have been when animism flourished.

Theranthropic-polytheistic Religions.—The religions which as to their degree of development, come next to the polytheistic-magic religions, standing under the influence of animism, are the *theranthropic-polytheistic*. From the multitude of deities a number of select ones have emerged, superior to the others not only in rank, but also as regards their nature: these are called gods. Lower spirits and creatures are no longer worshiped independently, but only as connected with these gods as their servants or their instruments. The gods themselves are mostly represented theranthropically, in shapes partly human and partly animal, though the old test and some fictions are still preserved (as, indeed, they are even in a more advanced stage of the religion, but as being animated by the gods, as a kind of heroic avatars). For now myth arises; the old now is sacred, purified, and part of them are already contained in sacred history. It would be interesting to inquire what caused the rise of the theranthropic religions is connected with the origin of the animism and with the so-called *fantasy*.

These religions may still be divided into them of a lower, unorganized stage, as the Assyrian (Babylonian) of Southern India, those of the Finns and Eskimoes, the oldest Greek (so-called Pre-greek) and the oldest Baltic cults and others, and those of a higher, organized kind, to which belong the religions of the so-called peoples of America (Maya, Aztecs, Incas, etc.), Mexico and India, the Egyptian, most ancient, the oldest Babylonian, and perhaps also the old Chinese religions.

Theranthropic-Anthropomorphic-polytheistic Religions.—Amongst among the nature-religions stand the *theranthropic-anthropomorphic*. Man has become conscious of his superiority to the animal. The gods, though supernatural beings, are by their nature only in a human shape. The myths concerning their temporary metamorphoses are but a survival from former periods, and serve only as proofs of their still active human power and as subject-matter for wondrous poems. The myths formerly their embeddings, have now become their metaphors and metaphors, or, together with the trees and animals, their attributes and symbols. Hence theranthropic religions still occur, but only in beings of a lower order or as elements of the gods. The latter have all the human qualities together with the human shape ascribed to them, and thus the way is paved to the ethical element. Hence we may call these religions *anthropistic*, but only *anthropistic*, for we cannot ethically standpoint they have not yet reached. The gods, although really vested with all kinds of moral qualities and although anything less already long worked around a great world-strain are still moved by passions and

animal actions which, when viewed as descriptions of the conflict among the powers of nature, can not give offense, but yet are not in keeping with their superhuman, though man-like nature. In accordance with their origin, all of them, even the highest, remain nature beings. When the ethical element gets the upper hand, the whole semi-ethical pantheon, together with the religion of which it constituted the basis, is doomed to annihilation.

The religions that belong to this category do not all stand at the same degree of development. Lowest, as far as we know them, are the Celtic and Old German (with the exception of the Old Norse, at least as far as can be ascertained by the picture the *Edda* gives of it) superior to them are the Vedic religion and the religions of Asia Minor (Armenians, Assyrians, Chaldeans, etc.); the highest standpoint was reached, along different ways, by the Babylonians and the Greeks, in whose wake followed the Assyrians and the Romans.

Ethical Religions.—By *ethical religions* are meant those called by others *monotheistic* or *supernaturalistic*—those, that is to say, in which the ethical element dominates the naturalistic although not all the naturalistic ideas and elements have been abandoned. The old nature-gods have been preserved as messengers (*dywans*), servants, beings worthy of being worshiped (*patrons*), and sometimes also as saints. If not all ethical religions are purely monotheistic or even pantheistic, yet they are much more so than the nature-religions, which are mostly polytheistic and can at best get to monotheism. The principal characteristic of the ethical religions is that they are not based on a national tradition, but on a doctrinal salvation, preached either by one prophet, reformer, messenger from God, or by a community of reformers. The ethnic and national elements are not wholly wanting, but they are subordinate. Most of these whose religion community is based on the preaching of such a doctrine ascribe to this doctrine a divine authority, which all have to consider as binding under penalty of being ejected. From the original preaching the divine authority is transferred to the oldest records in which it is contained; all ethical religions have a Holy Writ (which, considered as such, is wanting in nature-religions, however different may be the conceptions formed about it).

The Two Principal Categories of Ethical Religions.—The ethical religions have to be distinguished into at least two principal categories: (1) Those which may be called *nationalistic* (monotheistic) or *law-religions* (*Rechtsreligionen*), and whose sacred writings, at least part of them, are framed like laws, as the Chinese Confucianism, the religions of the Brahmanical and Jains, etc., primitive Buddhism, Manichaeism, Mosaicism, and Judaism; (2) those which are based upon more or less broadly conceived, universally human principles, and which might be called *missionary religions*, viz., Islamism, the younger Buddhism, and Christianity. The first-named are, as a rule, confined to a definite nationality, for even if they try to spread among other nations, as the Zoroastrian Manichaeism and Judaism have done, the alien peoples are never regarded as the equals of the native adherents. One can not belong to such a religion without at the same time adapting one's self to the civilization and the customs of the nation with which it has originated. The last named have more or less completely relinquished the principle of nationality, and consider all believers as equals, whatever may be their language or their nationality. Hence the two categories might also be called *particularistic* and *universalistic* ethical religions. The term world-religions, applied to the latter, has been objected to, and, strictly speaking, there can be only one world-religion, though the word may continue to be used for practical purposes, referring to those religions which at least strive after conquering the whole world. Another objection, to the effect that the distinction made here is not a fundamental one, is unreasonable. There is a fundamental difference between law and principle; and moreover, the religions of the first-named category are, as to their development, at a lower standpoint than those of the other. C. P. TIELE.

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SAMUEL MACAULEY JACKSON.

Religious Liberty: See LIBERTY, RELIGIOUS.

Religious Orders: See MONACHISM.

Remainder [from O. Fr. *remaindre*, deriv. of *remaindre*, remain < Lat. *remane're*; *re*, back + *mane're*, stay, remain]: in law, a future estate in land to take effect immediately upon the termination of a prior, limited estate upon which it depends, and with which it was created. As is explained in the articles ESTATE and PROPERTY, the estate in fee simple is conceived of at common law as being susceptible of infinite subdivision. When a tenant in fee simple grants a present, limited estate, as an estate for years, for life, or in tail, the residual interest not thus disposed of is itself an estate capable of being separately dealt with. If by the same conveyance the grantor parts with this residual estate or any part of it to a third person, it is called a *remainder*; if he does not part with it, it "reverts" to him, and is known as a *reversion*. (See LANDLORD AND TENANT.) The present or "particular" estate, as it is called, may be followed by any number of future estates in remainder until the whole fee simple has been taken up. Thus if a tenant in fee simple gives lands, by deed or will, to A for ten years or for life, then to B for life, then to C in fee tail, then to D and his heirs, A is the particular tenant, and B, C, and D are remaindermen. If the last limitation (to D and his heirs) had been omitted the remaining estate in fee simple would have, after the termination of the last remainder (to C), reverted to the grantor and his heirs.

It was a peculiarity of the remainder at common law, which was inflexibly maintained by the courts, that it could be created only as a true remnant of a fee simple to follow a prior estate which was less than the whole estate of the grantor. In other words, a remainder could not take effect in derogation of or in substitution for a preceding estate. Thus if a tenant in fee simple should make a conveyance of his land to A in fee, but with the proviso that if A should die without surviving issue then the estate should go to B in fee, the limitation to B would be void and the estate belong absolutely to A. The whole estate of the grantor had become vested in A, and it could not be divested and transferred to any one else by the creation of a remainder. The result aimed at could, it is true, be secured by the creation of a shifting use (see USES), or by executory devise (see WILL), but it could not be accomplished by any form of limitation known to the common law. By legislation in many of the U. S. remainders have lost this artificial character. In the State of New York, for example, it is expressly provided by statute that any future estate which is dependent on a precedent estate may be called a remainder, and that a remainder may be limited upon a contingency which will operate to abridge or determine the precedent estate. 1 R. S. 723 (sec. 11), 725 (27).

In the remainder proper, as above described, the interest of the remainderman was said to be "vested"—that is, the remainder, although its enjoyment was postponed to a future time, and although it was described as a future estate, was really regarded as a present interest in the lands affected by it, and was accordingly real property, capable of alienation, or, if a remainder in fee, of transmission by will or descent. Like reversions, remainders were regarded as incorporeal interests, and were, like easements and other "incorporeal" rights in land, alienable only by grant. See HEREDITAMENTS (*Incorporeal*).

Originally this "vested" remainder was the only form of future or "expectant" estate which could be created at common law, but in the course of time a gift to take effect in the future in favor of a person not now existing, or not yet ascertained, or upon an event which might or might not happen, acquired recognition under the description of a "contingent" remainder. Such a remainder was not, properly speaking, an estate, inasmuch as it could not be alienated or devised, and would not descend to the heir of the contingent remainderman. It was, moreover, an interest of a most precarious character, as it was liable to destruction by any one of a variety of accidental or intentional circumstances. If the event upon which the contingent estate was limited to depend had not happened at the time when the preceding estate came to an end, the contingent remainder was destroyed. So also a release of the reversion to the particular tenant or the surrender of the estate of the latter to the reversioner, whereby the reversion and the particular estate were merged (see LANDLORD AND TENANT), had the effect of destroying the intervening contingent remainder. This process may be illustrated by supposing A to have a life-estate, with remainder to the (unborn) son of B for his life, with remainder to C in fee. If B's son has not come into being when A's life-estate comes to an end, the contingent remainder of the former is destroyed forever, and the estate vests at once in C. So if, before the birth of B's son, A should convey his life-estate to C, or C his vested remainder to A, the estate would be lost to the contingent remainderman forever. If, however, B's son should be born before any of the events above suggested have happened, his interest would at once become vested, and would from that time on be wholly unaffected by such contingencies. By legislation, whereby contingent remainders are preserved from destruction by the events above enumerated, and whereby they may be alienated or may descend to the heir of the contingent remainderman, these interests have been very generally assimilated to vested remainders both in England and in the U. S., and have thus in a greater or less degree acquired the character of true estates.

For further information, consult Digby, *History of the Law of Real Property*; Fearne on *Remainders*; Leake's *Law of Property in the Land*; the *Commentaries of Blackstone* and Kent, and the statutes of the several States.

GEORGE W. KIRCHWEY.

Remarque Proofs: See ENGRAVING.

Rembang: a Dutch residency of Java, East Indies, comprising 2,600 sq. miles, with (1888) 1,241,093 inhabitants, of whom about 18,000 are Chinese and 700 Europeans. The capital, Rembang, on the flat, hot, northern shore of Java (see map of East Indies, ref. 8-E), has 25,000 inhabitants and some ship-building.

Revised by C. C. ADAMS.

Rembrandt (full name, *Rembrandt Harmenszoon Van Rijn*): painter and engraver; b. at Leyden, Holland, July 15, 1606. He first studied painting with Jacob von Swanenburgh, and then under Peter Lastman, at Amsterdam. He returned to Leyden in 1623 and gave himself up to studying from nature and painting portraits. About 1629 he settled in Amsterdam, where he remained till his death. His fame was great, his studio crowded with scholars, and his works in great demand, yet in 1656 he became insolvent. It is supposed this may have been owing to the impoverished state of the republic, and to his reckless extravagance in collecting works of art. Sufficient data exist contradicting the oft-repeated tales of his miserly habits. Rembrandt was the greatest genius among Dutch painters, and his influence in the art of his country is paramount. He was married twice, and had in all four children. His son Titus by his first wife became a painter, but did not distinguish himself, and died in his father's lifetime. Among Rembrandt's best-known works are *The Presentation in the Temple*, at The Hague; a portrait of a young man in the royal collection at Windsor; the portrait of Coppenol at St. Petersburg; *The Anatomical Lecture* painted in 1632, at The Hague; *The Night Watch*, at Amsterdam, a prominent example of his maturer work, dated 1642; the portraits of the Syndics, also at Amsterdam, dated 1661, which shows his later manner. He is supposed to have been painting on *The Betrothed Jewess*, now in the Rijks Museum, Amsterdam, the year of his death, 1669. He was buried in the Wester Kirk, Oct. 8 of that year. Of his engravings the most famous are *Jesus Christ Healing the Sick*, six portraits of himself done between 1630 and 1654, *Burgomast-Sir, Adam and Eve in the Garden of Eden*, *The Flight*

sculptor. In the same year Giotto was thirty-four years old, and had painted the Arena chapel at Padua and the chapel of the Florence Bargello, in which works are still to be seen the plain evidences of a combined realism and skill—a desire to think for himself, and a power to express thoughts in painting—which are at the bottom of later progress in painting. These early dates show that the Renaissance in fine art was well under way before any influence from the humanists or the restorers of classical learning had reached the painters and the sculptors. Those artists were thinking out for themselves the great question why the antique sarcophagi and the Græco-Roman engraved gems showed an art so much more learned and complete than theirs. Before Petrarch died, leaving the literary and philosophic Renaissance alive and in progress, if not yet assured, Andrea Pisano had completed the present south doors of the baptistery at Florence, Balduccio had put up his three or four important tombs at Milan, and Orcagna had adorned the Or San Michele at Florence with his marvelous work, ahead of its time and reaching on toward another century, the shrine of the Madonna. Then indeed there seemed to come a pause, and it is hard to understand why so little important art was produced between 1360 and the year 1420 or thereabouts, when Giacomo della Quercia and Lorenzo Ghiberti had come to the front, and Donatello was a promising young sculptor—when, in painting, Fra Angelico and Gentile da Fabriano were gradually leaving missal books and bridal chests for wall-pictures, and the great innovator Masaccio was fairly at work. The year 1425 may be taken as a good date for the triumphant establishment of the new wisdom and power in fine art. Then Masaccio's frescoes in the Brancacci chapel at Florence were well advanced. Then Giacomo della Quercia, who had completed the lovely recumbent figure of Ilaria del Carretto a year or two before, began his sculptured work at San Petronio at Bologna—sculptures associated with a mediæval-seeming doorway, but as far as need be from mediæval in character: indeed modern in conception and in modeling. Then, too, Lorenzo Ghiberti, who had just completed the present north doors of the Florence baptistery, had begun the more elaborate east doors—not necessarily superior to the earlier ones in real merit, but immensely in advance of them and of other previous sculpture in power over material, and in boldness and grasp of subject. And at that time Donatello, whose work is often less easy to date, had certainly completed the noble statues of the exterior of Or San Michele at Florence, the St. Peter and St. Mark, and the admirable St. George. Little had the Renaissance artists learned from the classical scholars up to this time, and yet modern sculpture and modern painting were begun, their possibilities shown, and their future course well indicated.

The Fully developed Renaissance.—The year 1475 is the central point in the century of greatest artistic achievement of the Italian Renaissance, excluding the Venetian painters. The one noticeable effect of the revival of letters upon fine art, the suggestion of subjects from classical antiquity, was then as noticeable as it was to become. This is not of great importance, for the great artists of that time, as of all times, cared little what stories their work was to tell to non-artistic beholders, and painted an allegory of the *Garden of Cupid* as cheerfully as a martyrdom. The important thing is the extraordinary variety of artistic power possessed by the men who were then at the head of the fine-art movement. In Florence Fra Filippo Lippi had been dead seven years, leaving behind him a large number of somewhat prosaic but vigorous and animated pictures. Berozzo Gozzoli was about fifty years old, and had painted his remarkable frescoes in the Pisan Campo Santo. Sandro Botticelli was twenty-eight years old; he had painted those wonderful round Madonna pictures which are now seen in the Louvre and the Uffizi; and either had painted or was on the point of undertaking that *Triumph of Spring* or *Flora*, the famous allegorical picture of the Florence Academy of Arts. The great Ghirlandajo was of about the same age, and had not quite reached his mature power. The two brothers Pollajuolo were at the height of their joint career. Luca della Robbia had done all his best work, both in marble and in glazed terra-cotta, and was an old man. Mino da Fiesole had finished the tomb and the altar of Fiesole cathedral and the noble compositions of the Florence Badia. Verocchio, painter and sculptor, forty years old, was at work upon the *David* of the Florence National Museum. His great pupil, Leonardo da Vinci, was twenty-three years old and at work, but destined to so long a career that he belongs

rather to a later epoch than this. In the north, where Leonardo was to labor the most, Mantegna was forty-five years old, and had finished his work at the Eremitani at Padua and the castle at Mantua, besides a host of separate pictures and his principal engravings. Of the Venetian painters, even, later to reach greatness and destined to hold it longer, the founder of the school, Giovanni Bellini, was thirty years old. He had painted the splendid altarpiece of the Church of SS. Giovanni e Paolo, Venice, which was burned in 1867, and the gigantic altarpiece at Pesaro, which still remains, and had perhaps reached his greatest strength though he was to retain it long. These pictures are worth to rank with those of Central Italy; it is not because of unmatched achievements of the later Venetians surpassing them that they should be depreciated. The Renaissance of fine art in its purest and loveliest form is in the best pictures of Giovanni Bellini. Still more powerful work was done than any of these mid-Renaissance paintings and sculptures could offer—more powerful, but with not a great charm.

The Late Renaissance.—Italian writers are extremely careful to mark the close as well as the beginning of the *Rinascimento* or *Risorgimento*. Most of them end the epoch with the early years of the sixteenth century, the *Cinque Cento*, and call the art of that century the *Classicismo*, because it is all, but especially architecture, strongly influenced by the study of ancient Roman remains, or the art of the *Decadenza*, as having lost the charm of spontaneity and unaffected grace, or simply the art of the *Unguardato Cento*. The pre-Raphaelites had somewhat the same feeling when they took Raphael's work in Rome (1508 and following years) as the turning-point, with growth before, and decay after. Michelangelo's long career begins with our century, year 1475, lasts through the splendid years of highest and purest achievement in Central Italy, and outlasts everything that was precious and hopeful in Italian art anywhere else of Venice.

By 1525 the artists who were great in 1475 were all dead, but this half century was filled with the labors and with the fame of most of the men named under the earlier date, and besides them, of the following: Filippino Lippi, who died in 1505, Fra Bartolomeo, who died in 1517, and Lorenzo Credi—all three men of the Florentine Renaissance proper. Andrea del Sarto, modestly keeping up the older tradition except when the overwhelming force of some one of his contemporaries swayed him, capable of anything, but original only in that he gave to his canvases an unwonted glow of color. Among the Umbrians and so-called Roman school, there was Perugino, who had died in 1524, and Francia (Raibolini), who had died in 1517—great workmen, whose art is somewhat lost in the splendor of Raphael's glory; Raphael, who had died in 1520, having made the deepest mark upon the artistic thought of his time, and gained a celebrity and recognition far beyond what other artists had reached; and Luca Signorelli, of Venice and Central Italy, most powerful and accomplished of all the men who missed supreme greatness; finally (still excepting the great Venetians), Michelangelo in 1525 had painted the Sistine vault and had sculptured the *Moses*, the Florence *Pietà*, the bronze *Pope Julius*, and the *Christ of Sta. Maria sopra Minerva*.

After 1525 decay was rapid. Pontormo and Ridolfo Ghirlandajo, with such mechanicians as Vasari and Verrocchio were in the field, and in the north Bernardo Luini was still alive and painting. Andrea Sansovino, best known by the splendid tombs in Sta. Maria del Popolo at Rome, was still alive in 1525, but near his end. Jacopo Sansovino, rather architect than sculptor, had still the divine gift of form in sculpture. Michelangelo was still to complete the Medici tombs at San Lorenzo. Benedetto da Rovazzano had taken his splendid talent to England; and both there and Florence has left beautiful work behind him.

The Venetian Painters.—In 1525 Giorgione was dead. Titian was nearly fifty years old and in the fullness of his strength. Of the other giants Tintoretto was a boy, and Paolo Veronese unborn; but in Venice the conditions which obtained elsewhere were of no force. Venice was hardly an Italian city, but a little world by itself, poised between the East and the West. Decay did not set in there till much later than in the center. See the notices of the painters named above; also BELLINI and TIEPOLO.

In other Countries.—The descriptive term Renaissance hardly applies to the work of the painters and sculptors elsewhere than in Italy. The art work in France, Spain, Belgium, Germany, Holland, and England is rather a

...and the medieval legends of the Christian world until the Renaissance find expression in Italy. Some of these are the subjects, in various especially less noble, but it is clear that the great Spanish or Dutch masters belong to the seventeenth century, in a false and in the history of modern painting and sculpture.

Today this feeling if it is preserved to secondary architecture has the effect of leading to the beginning of the present day. Roman architecture in Italy had been more or less a matter of the past for the discovery and Bramante made it so. Fifteenth century, and followed, but not closely, by the Venetians, the Florentines, and generally throughout Italy in the fourteenth. The system of construction, upon which is dependently, indeed, and from which it arose, had never been adopted by the Italians with complete surrendery; it was rather as a form given to openings and portals, and certain freedom allowed to columns and other details, as a complete style that the Italian Gothic appears in the history of architecture. Round arches were never given the attention and development that at all, not broad, simple, smooth of wall, nor the use of surface decoration in large masses, nor marble moulding and delicately carved capitals is made. Therefore when Bramante, in 1480, came and—the other supplies of his time—a planner and designer of buildings came back from Rome about 1490, it appeared that he had been studying there the most important, then much less defined than they now seem, that he meant to build in the spirit of ancient times, to find a more completely new doctrine to preach, than had been taken the case in the north. Round arches growing from simple and massive parts had been used to splendid effect by the Greeks and others, as, for instance, in the temple of Apollo at Paestum and its character determined probably about 500 B.C. The simple, large, easy-flowing use of this noble structure, which yet preserves in its final result of the character of Florentine medieval work, will have pointed to a gradual transition from Gothic to the Italian Renaissance, and in a kind of design which could be classical in feeling and made up of classical details, but without a certain medieval freedom. The temple of Florence stood with its roof unfinished and its open organ to the sky. This great space, largest and that covered or not done of masonry in Europe, was the Cathedral, whose dome is low and hidden in the town, and, about 1425, covered with the spiralling arches which still survive; the light and high, culminating in a dome-like final which Rome is over 80 feet in round construction, is it a thing as unlike anything Roman as could be the and yet a great step toward the Roman largest work and simplicity of construction. No line first built, but the temple in Florence began about 1440, has the Roman notion of arches springing from isolated columns. There are indeed suggestions of a classical entablature running each capital, but so reduced in comparison with a more decided of the others. The fine interior of the temple is a later design, preserves the same possibilities. As we look to the fifth or to the sixth century, to the great monuments of the dying empire, or else to the second half of the fifth century, that Bramante looked, not to the second half of the fifth century, but to the first half of the fifth century, about 450, shows not one feature which we Roman buildings would ever have possessed. It is as well Bramante, the master, the originator as far as we are able of the movement toward a classical revival, it is only as with his great style. Michelangelo Michelozzi to the Medici Palace, which is now called Riccardi, was built, and this is an indication as the Pitti. Even Michelozzi, the architect of the half-medieval front of St. John Baptist, beginning it probably as late as 1480. In the case of the church of the Madonna dei Miracoli was built about 1480 by Pietro Lombardi; and the palace called Palazzo Medici, on the Grand Canal, and now called Trevisani, the house of Banca Capelli, behind the Duca Palace, and the long stretch of the Procuratie Vecchie on the side which the great square of St. Mark, were all built or begun about 1480; there is nothing Roman to them except a small reference to authority in their details.

And was also, however, a deliberate and conscious attempt to make us the students disoriented, and because they were. Albert asked powerfully in this direction, for he was a master too of all and an antiquarian by nature. He was not concerned to use chemical details, a general place

real character and spirit of design, but Alberti deliberately took a Roman triumphal arch as a model for the distribution of a church front. This he did as early as 1446, when the facade of the church at Rimini was begun, and this he repeated as late as 1470 or 1471, when work was begun upon St. Andrea at Mantua. This latter building, indeed, is wholly Roman in the combination of its parts. There no structure could have been known to Alberti in which pillars were used throughout as the main feature of the decoration, but it was easy to deduce this use of them from the Colosseum or the baths of Diocletian. True, no Roman building could have given him an example of large windows forming a great part of the design, but it was his business to provide the large windows which were necessary, and still to keep a Roman look. So it seems that St. Andrea is unimpaired as an answer to this problem: How would a Human architect of the second century have designed a building made up of long and narrow halls one story high, with windows, and without the large free columns which the Romans used freely, but which there were neither mechanical nor pecuniary means to provide at Mantua? It may be thought that nothing could have been more unfortunate for the future of art than the eager interest in this problem, taken by Italy at first and then by the rest of Europe; but it is sure that from this time on the study of Roman architecture, and merely for its suggestions but as a whole to be imitated, went on side by side with the fresh and original growth of the Renaissance architecture. Much graceful, simple, unimitative designs as the front of San Zaccaria at Venice, by Andrea di Marco, about 1456, of the Church of the Madonna dei Miracoli at Venice, about 1461, by Pietro Lombardo, and of the Palazzo del Consiglio at Verona, probably by Fra Giocondo (1450 or 1460-1620), and built during the closing years of the century, are the real gods of the Renaissance. Unhappily Fra Giocondo, one of the masters of graceful and original treatment of all kinds of internal problems, was instrumental in the Roman descension. He is said to have discovered at Paris a manuscript of Vitruvius more complete than had been known before; at all events, he had to do with editions of that author's work. *De Architectura*, supposed to be more complete and more critical than previous ones, and in this way did what he could to exclude architectural practice by half-understood rules arbitrarily laid down by a single writer of the Augustan age. The *Classicism*, or classical revival, came in with the new century, or with the second decade of it. At all events, the Italian Renaissance in architecture passed away with all its charm and variety, and may almost be said to have died with the beginning of the new Church of St. Peter on the Vatican Hill.

Monuments in France the late Gothic, a style developed naturally out of the Gothic proper of the thirteenth century, was doing wonders—it is Gothic with Gothic sculpture. Not to mention earlier buildings, the magnificent Church of St. Wulfran at Abbeville was not begun until 1488, a half century after Brunelleschi's beginnings in Florence. The Church of St. Riquier, near Abbeville, is later still; the Hôtel de Clugny, in Paris, was not begun until 1490; the central and finest part of the Palais de Justice, at Rouen, was not begun until the last year of the century; the Church of Henon, at Henry-en-Bresse, was not begun until 1505. In England fan-vaulting, the finest thing ever done in architecture in the British Isles, was in its glory at this time; the roofs of St. George's chapel at Windsor, Henry VII.'s chapel at Westminster, and, chief of all, King's College chapel at Cambridge, were all under construction at that same year, 1505. But it is also true that when Louis XII. came to the throne of France in 1498 there was already a spirit of longing after the classic splendors of Italy, half seen and half understood by the lords who had followed Charles VIII. in his expedition to Naples. In that year or the next work began upon the new Château of Amboise, and the designs for the last Châteaueu of Gallion, of whose fragments decorate the courts of the École des Beaux-Arts in Paris, must have been under consideration as early as 1500. There are sixty years between the beginnings of the architectural Renaissance in Italy and in France. There are perhaps eighty years between the firm establishment of the new style in the two countries, because in France the new style found an old one firmly entrenched, while no such thing is true of Italy; in spite of the charm of some Italian Gothic monuments of late date. The time of the early Renaissance in France, and of its final dawn in Germany and England, is a time of national and self-conscious decay in

Italy, partly because of war and political decline, but partly also because of the substitution of a style of architecture made up of rules and fixed measurements for the fresh inspiration of the earlier time. Thus in the year 1535 the full classical style is embodied in perhaps its loveliest creation, the Library of St. Mark in Venice, and the Renaissance makes its farewell in the front of the Scuola di San Rocco. In that same year Francis I. was surrounded by his Italian and French artists and artisans, and they were still feeling their way with hesitating steps. The Château of Chambord was well advanced but far from completion, and so with Francis's own wing of the Château of Blois, but the new Louvre had not been begun. In Germany and in England the introduction of classical details had hardly begun, and not the least impression had been made upon the general character of the over-picturesque, gabled, and turreted character of the continental art, or of the prosaic Tudor style of England.

The full charm of the Renaissance continued in France through the reigns of Francis I. and Henry II., 1515-59. Then with the religious wars of succeeding reigns comparatively little was done. The style of Henry IV. succeeds, and the French writers are careful not to include that epoch in the Renaissance. If, however, we take the years 1600-10 as the reign, which it is, for our purpose, we find still the most marked difference in the character of the buildings in Italy and in the north. The very "orders," as understood by Henry's architects in Paris, are plastic, modified almost at will; and in Germany, where Ionic or Corinthian columns are seen at all, they are generally small colonnettes, decorating the bold bay windows and stepped gables of a style as picturesque and diversified as that of the Middle Ages. Meantime, in Italy, St. Peter's was being pushed toward completion; in fact, the great colonnade of the front was nearly complete in 1610. Palladio, chief of all classicists, had died in 1580, and all his designs which remain to us had been completed as we have them before 1600. The reign of formality was complete in Italy for nearly a century before it had much hold upon the north.

Buildings in the true classical spirit were built under Louis XIII., such as the wing of Gaston of Orleans at the Château of Blois. It was not, however, until the middle of the seventeenth century that the grandiose and formal style of Louis XIV. finally replaced the French Renaissance. The colonnade of the Louvre was begun in 1664. Before that time the country châteaux and the buildings in provincial cities kept much of the movement and variety of the sixteenth century. The colonnade of the Louvre, the Church of the Invalides, with its noble dome, and the colossal Château of Versailles, in which everything, even the chapel, was of a grandiose, pseudo-Roman type, finished the struggle. From that time the Roman style prevailed, even in Eastern Germany and in England. St. Paul's in London was begun in its present form about 1675.

The architectural style of the seventeenth century toward its close certainly sins on the side of coldness and formality. A singular result of this was the Barocco style which was so soon to follow—perhaps a natural and inevitable reaction. Germany, whose princes had tried to follow Louis XIV. and to build small imitations of Versailles, found the chilly grandeur of that style insupportable, and eagerly took up the novel variety and play of fancy, however insubordinate. The Zwinger Palace at Dresden is one of the earlier instances of this new taste; but that seems to have been thought extravagant. So fantastic a style in cut stone and out-of-doors was too much even for that period of doubtful taste. A better type, and one of the best instances of the developed Barocco style, is the Schloss of Brühl, near Bonn on the Rhine, begun about 1725. Here the exterior is stately and grave, with a "colossal order" of pilasters—that is, an order occupying the whole height of the main wall and including several stories. The smaller details indeed may be rather riotous, and the roof intemperate in curvature, but the full fancy of the designers is kept for the interior, where scroll-work and *rocaille* flourish in their fullest development. The Schloss at Bruchsal, near Heidelberg, is another such building, built about 1741, while the Brühl building was still incomplete. To find in France instances so characteristic of the Barocco style, it seems necessary to examine, for interiors, the Hôtel de Soubise (now the Archives Nationales) and the Hôtel de Toulouse (now the Bank of France). Something of the original exterior remains also in these buildings, but perhaps the great barrack called still the Military School, fronting on the Champ

de Mars, and the Château of Compiègne, N. E. of Paris, are the best exteriors of the time. These are both the work of an architect of exceptional ability and good taste, Jacques Ange Gabriel (1699-1782). It is to be noticed that in such an epoch of careful reference to authority and submission to generally admitted rules stately buildings will be erected in the spirit of a previous epoch in spite of a more corrupt taste prevailing in minor arts. Thus in England the Cambridge University senate house, built in 1730, and the Ratscliffe Library at Oxford a little later, each by James Gibbs (1674-1754), are wholly admirable as pieces of design in a style which admits of but little originality. They are worthy to be compared, as to their exterior, with the French buildings of Gabriel, above named. It is in the interior fittings that the style alternates between unrestrained license and cold monotony. In the minor buildings of the time the same bad influence is at work, the only architectural feature recognized as noble being the colonnade or the order of pilasters, with their high plain basement beneath. Buildings which could not have these costly decorations were left with flat walls and square openings evenly spaced. The often complained of monotony of Baker Street and Regent Street in London came, not from the Renaissance proper, but from its unhappy successor, the grandiose Roman revival, begun in Italy in the seventeenth century.

Some attempt at a reaction was made under Louis XVI. Jacques Germain Soufflot (1714 or 1709-80) built the Church of St. Geneviève, or Panthéon, all but the cupola. Pierre Rousseau (b. 1750) built in 1786, for a private residence, the Hôtel of the Legion of Honor on the Quai d'Orsay. In these and in other structures of the time an originality of conception is shown foreign to the previous epoch of a hundred years or more. As under Louis XVI. a new spirit of refined and delicate design is seen in furniture and ornament, so in the most important buildings of the time were the evidences of perhaps a new Renaissance, a return to reason and thought as a substitute for obedience to authority. The great French Revolution put an end to this.

Modern Architecture.—In all the previous sketch it has been possible to speak of the style prevalent at any given time as universally and in all cases the same. At no time does any one builder deviate from the style used by others except as he makes slight modifications, which, at once adopted by others, who in their turn add and alter a little at a time, end in the slow development of the style of the succeeding epoch. In the present era, beginning with the end of the Napoleonic wars in 1815, we face a wholly new condition of things, a condition which had never existed before in all history. From 1815 until 1894 architects have built classical buildings with huge rows of columns, as their fathers or grandfathers had done; Renaissance buildings with delicate details like those of the fifteenth or sixteenth century; Gothic buildings copied from those of the thirteenth or of the fifteenth century; Romanesque buildings studied after models of the eleventh or twelfth century; buildings supposed to be Greek, and copied from the Parthenon; and even Egyptian or Moorish attempts at novelty. It is important to understand how completely this chaos of styles, existing in the absence of any reigning style, differs from all previous experience. Probably no architectural progress can be made under these conditions. Larger and more elegant buildings may be built, and now and then a pleasing result may follow in the way of an archaeological study of some ancient structure or group of structures, but that can not be the beginning of a fine art of architecture.

BIBLIOGRAPHY.—There are few works on this subject in English. Fergusson's *History of Modern Architecture* is of very little value in this respect. Walter Pater's *The Renaissance* (3d ed. 1888, a series of essays) is very valuable for its truthful insight, and is a suggestive book. J. A. Symonds's *Renaissance in Italy* (vol. iii.) is devoted to the fine arts and gives much general information, but the point of view is that of a literary man having little sense of the true nature of the graphic and plastic arts. The work of Crowe and Cavalcaselle on painting in Italy (9 vols., under different titles), is wholly confined to the period of the Renaissance, although not so announced. This is true also of Charles Perkin's *Tuscan Sculptors and Italian Sculptors*, and his smaller and comprehensive work, *Historical Handbook of Italian Sculpture*; but these works do not give the results of late researches, and their statements as to minor matters of fact are not always trustworthy. The same author wrote a sketch of *Sepulchral Monuments in Italy* for a publication of the Arundel Society. Mark Pattison's *77*,

Ille-et-Vilaine, France; at the confluence of the Ille and Vilaine, 234 miles W. S. W. of Paris (see map of France, ref. 4-C). It consists of two parts—an upper or new town of an elegant and modern appearance, and a lower or old part, mostly built of wood, with narrow and winding streets; these are connected by four bridges. Among the public buildings are the cathedral (Italian), completed in 1844; Notre Dame, with a dome surmounted by an image of the Virgin; the university (1855), with a picture gallery; the hôtel de ville, with a public library; and the Palace of Justice (1618-54). It has manufactures of sailcloth, linen, lace, and embroideries, and an active trade in honey, wax, butter, and poultry. Pop. (1891) 69,232.

Rennet: See CHEESE (*Coagulating the Curd*).

Rennie, Sir JOHN, F. R. S.: engineer; b. in London, Aug. 30, 1794. His father, a distinguished civil engineer (1761-1821), early introduced him to that profession as assistant in the construction of Southwark and Waterloo bridges. In 1821 he succeeded his father as engineer to the admiralty. The new London bridge was completed by him, from designs of his father, in 1831, when he was knighted. The important works of Sheerness dockyard, Ramsgate harbor, and Plymouth breakwater, commenced by his father, were completed by him, as well as the great system of drainage and land reclamation in Lincolnshire. Of the more important works designed and executed by himself are the Whitehaven and the Cardiff docks. With his brother George (1791-1866) the machinery for the mints of Bombay, Calcutta, and Mexico was designed and erected; also the Royal Clarence victualing-yard at Plymouth. Sir John was considered the highest authority on all subjects connected with hydraulic engineering, harbors, canals, irrigation, storage of water, and the management of rivers. He was president of the Institution of Civil Engineers 1845-49; author of *The Theory, Formation, and Construction of British and Foreign Harbors*, and many valuable professional papers. D. Sept. 3, 1874.

Reno: city; capital of Washoe co., Nev.; on the Truckee river, and the Nev., Cal. and Or., the S. Pac., and the Virginia and Truckee railways; 11 miles E. of the base of the Sierra Nevada Mountains, and 51 miles N. W. of Virginia City (for location, see map of Nevada, ref. 5-E). It is in an agricultural and mining region, and has large trade interests. The city contains the State University of Nevada, the State prison, the Bishop Whitaker School for Girls (Protestant Episcopal, opened in 1876), a high school, 2 libraries (State University and Whitaker Hall), a national bank with capital of \$200,000, a State bank with capital of \$150,000, and 2 daily, a semi-monthly, and 2 weekly newspapers. Pop. (1880) 1,302; (1890) 3,563.

Reno, JESSE LEE: soldier; b. at Wheeling, West Va., June 20, 1823; graduated from the U. S. Military Academy, and entered the army as brevet second lieutenant of ordnance July, 1846; captain 1860. In the war with Mexico he was engaged in the siege of Vera Cruz and in the battles of Cerro Gordo, Contreras, Churubusco, and Chapultepec, and breveted first lieutenant and captain for gallantry; subsequently served on duty with his corps, being in command of Mt. Vernon Arsenal, Alabama, at the time of its capture Jan., 1861; appointed brigadier-general of volunteers in Nov., 1861, he accompanied Burnside's expedition to North Carolina; was promoted to be major-general of volunteers July, 1862, and in August assigned to the command of the Ninth Army-corps, which he led in the second battle of Bull Run and at Chantilly, Aug. 29-Sept. 1. At the battle of South Mountain, while at the head of his command, he was killed Sept. 14, 1862. Revised by JAMES MERCUR.

Renouf, re-noof', ÉMILE: genre, marine, and landscape painter; b. in Paris, June 23, 1845; pupil of Carolus Duran, of Boulanger, and of Lefebvre; second-class medal, Salon, 1880; first-class, Paris Exposition, 1889; first-class, Munich Exhibition, 1883; Legion of Honor 1889. He spent several years in the U. S., and had a studio in New York for the greater part of the time. A large picture by him of the East river bridge, taken from the Brooklyn side at sunset, was painted in New York in 1887-88, and attracted much attention when exhibited there. His *Helping Hand*, a representative work, and one possessing many excellent qualities, is in the Corcoran Gallery, Washington. W. A. C.

Renouf, PETER LE PAGE: Egyptologist and Orientalist; b. in the island of Guernsey in 1824; studied at Pembroke College, Oxford; became a member of the Roman Catholic

Church in 1842, and in 1855 was appointed Professor of Ancient History and Oriental Languages in the Catholic University of Ireland at its first opening. While professor he was one of the editors of *Atlantis* and of *The Home and Foreign Review*. From 1864 till 1885 he was an inspector of schools, and from 1885 till 1892 Keeper of the Egyptian and Assyrian antiquities in the British Museum. Since 1887 he has been president of the Society of Biblical Archaeology. Besides some early works on questions concerning the Roman Church in England he wrote *The Condemnation of Pope Honorius* (1868), and *The Case of Pope Honorius Reconsidered with Reference to Recent Apologies* (1869). The former work met with strong ultramontane criticism, and was placed on the Index. His principal Egyptological works are as follows: *Notes on some Negative Particles of the Egyptian Language* (1862); *A Prayer from the Egyptian Ritual, Translated from the Hieroglyphic Text* (1862); *Sir G. C. Lewis on the Decipherment and Interpretation of Dead Languages* (1863), occasioned by an attack upon Champollion and others; *Miscellaneous Notes on Egyptian Philology* (1866); *Note on Egyptian Prepositions* (1874); *An Elementary Manual of the Egyptian Language* (1875); *Lectures on the Origin and Growth of Religion, as Illustrated by the Religion of Ancient Egypt* (Hibbert lectures, 1879); and *The Egyptian Book of the Dead: Translation and Commentary*, first printed in the *Proceedings* of the Society of Biblical Archaeology (Mar., 1892, ff.), and afterward separately (London, 1893, ff.). He edited for the trustees of the British Museum *Ancient Egyptian Texts from the Coffin of Anamu* (1886), and *Facsimile of the Papyrus of Ani*, with an introduction to the contents of the Book of the Dead (1890). He also contributed to the *Chronicle*, *The North British Review*, *The Academy*, and the *Aegyptische Zeitschrift*.

CHARLES R. GILLET.

Reno'vo: borough (founded in 1862, incorporated in 1866); Clinton co., Pa.; on the west branch of the Susquehanna river, and on the Phila. and Erie division of the Penn. Railroad; 28 miles N. W. of Lock Haven, the county-seat (for location, see map of Pennsylvania, ref. 3-E). It was founded by the Philadelphia and Erie Railroad Company, which established here a large foundry and extensive boiler-works and car and repair shops. It is in an oval-shaped valley with mountain-sides over 1,000 feet high, and is the center of a great tract of pine forest. The principal industries are coal-mining and lumbering. The borough contains 7 churches, 14 public and 5 parochial schools, a railway Y. M. C. A., national bank with capital of \$50,000, private bank, and a daily and 2 weekly newspapers, and is a popular summer and autumn resort for tourists and sportsmen. Pop. (1880) 3,708; (1890) 4,154. EDITOR OF "EVENING NEWS."

Rensselaer, ren'se-ler: town; capital of Jasper co., Ind.; on the Iroquois river, and the Louis., New Albany and Chi. Railway; 46 miles N. W. of Logansport, 72 miles S. E. of Chicago (for location, see map of Indiana, ref. 3-C). It is in an agricultural, dairying, and stock-raising region; contains a public high school, St. Joseph's Indian Normal School (Roman Catholic), a State bank with capital of \$30,000, 3 private banks, and 3 weekly newspapers, and has manufacturing of flour and cigars. Pop. (1880) 968; (1890) 1,455.

Rent [from O. Fr. *rente*: Ital. *rendita*: Span. *renta*: Lat. **rendita*, re-formed on analogy of *vendita* (*vendere*) from *red-dita* (sc. *pecunia*), money paid, perf. partic. of *red-dere*, pay back]: a payment for the use of land. In feudal times this payment was made in labor. Toward the close of the Middle Ages labor rents were generally commuted, either for a share of the produce (see *METAYER*) or for a fixed sum of money per year. For some centuries these money rents were chiefly fixed by custom; in modern times they are usually fixed by competition. Rent, as ordinarily reckoned, involves compensation for the improvements as well as for the land. If we deduct interest on these improvements, we have the amount of rent in its economic sense. Thus if a man invests \$10,000 in improving a piece of land, and then rents the property for \$1,200 a year, part of this \$1,200 is due not to the land, but to the capital invested; and we must deduct something like \$500 in order to find the economic rent. Rent is partly due to productiveness, especially in the case of mines and water-power, but chiefly to advantages of location. Improved means of transportation, by lessening the effect of differences in location, tend to reduce rent—witness the fall in agricultural rents in Great Britain, due to the fact that the lower transportation rates enable the farmers of other countries to compete on more

and some small portion in supplying the British consumers of wool. For an analysis of the values which give rise to and justify Duties on Woolen Goods. See *THE DUTY ON WOOL*, by A. T. HANCOCK.

A. T. HANCOCK.

Rent: in law, as defined by Blackstone: "a certain profit issuing yearly out of lands and tenements corporeal; but its etymological meaning in English law the term involved in notion of a money payment, but signified a right vested in the feudal lord to exact of his tenant certain military or other services as the principal condition of his tenure. These services were, in process of time, converted into money rents, and were discharged by the payment of stipulated sums of money, or of other property. In this sense of the word, rent, or the right to exact services in the money value of services from another, is itself a species of property. It is treated by the common law as belonging to the class of freehold interests in land akin to reversions and fee-farms. See *REVERSIONARIES* (comparative hereditaments)."

As rent is to be created and granted in fee simple, in fee tail, for life or for years. When in fee it may be devised or transmitted by descent in the same manner as an estate of inheritance in the land itself. In England it is not necessary for landed proprietors, by deed or will, to reserve such interests in their lands in favor of their heirs; indeed, the lands themselves, upon which the rents are levied, go to the eldest son; but in the U. S. rent, as a right of property vested in one and the owner of the soil, is almost unknown. In the U. S. the term is commonly used to denote the sum paid by a tenant for years or at will, in his landlord as compensation for the possession and use of the leased premises. See *LEASEHOLDERS TENANTS*.

The older common law distinguished three classes of rent: *rent-service*, *rent-charge* and *rent-work*. *Rent-service* was that where the tenant, for the land held of his lord, owed his lord some collateral service as that of fealty, or, for example, a holding for beasts and ten shillings annually, or a holding for plowing the lord's land and five shillings annually; the personal service, however slight, affecting the entire soil. The lord could always distrain for arrears, "of common right," without reserving any special power of distress. Secondly, where every conveyance of land might by implication create a relation of tenants between the tenant and landlord, any rent reserved by the former was a *rent-work*, and might be enforced by distress, but after the Statute *Quia Emptores*, which abolished subinfeudation, *rent-work* gave the character of a *rent-service* unless it was reserved upon the reversion of the lands out of which it was levied. (See *LEASEHOLDERS TENANTS*.) At present no rent payable on an ordinary lease for years is a *rent-work*; the necessity for an actual personal service having long since been done away with. A *rent-charge* was one paid by the owner of the soil had no future interest or reversion in the land, but had the right to distrain for arrears expressly reserved or granted to him by the donor. A *rent-work*, or *rent-work*, arose like a *rent-charge*, by grant or reservation in favor of one who had no future interest or reversion in the land; but in this case, the right to distrain was expressly conferred; the owner of the rent had no power of enforcing his claim. These distinctions have lost most of their importance in England, in consequence of statutes legislation giving the remedy of distress in all cases to enforce the payment of rent. In the U. S. on the other hand, no such law has been generally abolished by statute.

In *Florida* there is a variety of *rent-charge* is still preserved in constant use under the name of *ground-rent*—that is, rent the grantor of land in fee reserves a perpetual pecuniary rent to himself and his heirs. It was an attempt to enforce some of the old law which had been long deemed obsolete that brought about the "antient" disturbance in *Florida*. See *NEW YORK* 1866-67. In other States a ground-rent might be rent reserved by the lessor in a building lease, or a rent where the lessee covenants to erect a building upon the land, and which is therefore given in most instances for a fixed period of years.

See also, on the ground subject, Blackstone's *Commentaries* (Book II, chaps. 33, 41-43); Taylor, *Landlord and Tenant*; Wharton on *Real Property*. For the origin and history of distress, see Maine's *Early History of the Law of Distress*, in and's.

—GEOFFREY W. KIRCHWAY.

Revolving Credit: an economical instrument of operation. It involves the principle of repeating an angle around some continuously along its graduated limb, which remains of an entire circle. See *REVENUE*.

Reph'aim [from Heb. *Rephaim*]; a people whom biblical tradition supposes to have inhabited parts of Palestine prior to the invasion of the Hebrews (Gen. xv. 20; Josh. xv. 16). They are represented as living around Bezek (Gen. xl. 11, 16) and in the country of the Ammonites (Deut. ii. 19, 20). A valley of the Rephaim is mentioned (Josh. xv. 8) which has been identified with the valley Beth S. of Jerusalem (cf. Josephus, *Antiq.*, vii. 4. 15). In Deut. ii. 11 the Emims are said to belong to Rephaim. The Rephaim are probably identical with the children of Rapha (a supposed Semitic name), mentioned 2 Sam. xxi. and 1 Chron. xx., who with the children of Anak were regarded as giants by the popular fancy. Cf. J. J. Meyer, *Kritik der Berichte über die Kanaanäer Philistiner in Genesis*, f. *Alttest. Wissenschaft*, 1881, p. 117; *Genes. ii. 11*, *Alttestament*, i. p. 170.

The same name is given to the shades of the nether world (Ps. lxxviii. 14; Is. xxvi. 14), who dwell in Sheol (Prov. ix. 18; Job. 26. 16) and under the waters of the sea (Job. 26. 17). At the last judgment the earth will give them forth again (Is. xlii. 10). A similar belief seems to have prevailed among the Phoenicians, as we see from a inscription of the Rephaim in the inscriptions of Tadmor and Kishmunnar. Cf. *Chippa*, *Inschrift. Monst.*, vol. i. No. 2. 8; *Rev. Archéologique*, vol. x. p. 3.

—RICHARD C. HARRIS.

Reph'idim [from Heb. *Raphidim*, *liter.*, prope, supports]; a locality in the Sinaitic peninsula, where the Israelites under Moses and Joshua gained a great victory over the Amalekites (Ex. xv. 7, seq.). Its identification depends upon that of Sinai, in whose immediate neighborhood it was. If Serai was the mountain of law, Rephidim must have been in the wady Feiran, if Sufat was the mountain—which can hardly be questioned—Rephidim must have been in the wady es-Sheikh, at the pass called el-Wadyeh.

Replenisher: an instrument required in connection with the quadrant electrometer (q. v.) in order to give a definite value to the potential. In the replenisher, as used in the case of Thomson's electrometer, there are two metal shields insulated with regard to each other by a piece of ebonite. One of these shields with the guard plate and the other with the case of the instrument, and as with the outer casing of the Leyden jar used. A vertical shaft which can be turned round by means of a milled head carries two metal flies at the extremities of a horizontal arm of vulcanite, and these flies, when about to pass out from under the shields, are touched by two platinum springs electrically connected and mounted on ebonite. Now suppose the flies to be in contact with the springs and one shield to be positively electrified, then by induction one fly will be electrified negatively and the other positively. Next let the vertical shaft be revolved; then the first fly carries off its negative charge and comes in contact with a spring connected with a shield, and yields up its charge by transfer to the inside of the shield. At the same time the other fly gives up its positive charge to the other shield. The result of a revolution of the shaft is therefore to increase the positive and negative charges on the shields respectively, or, in other words, increase the difference of potentials of the shields. Thus by giving a sufficient number of revolutions to the proper direction the potential can be raised or lowered. For further particulars, see the books mentioned in the article *ELECTROMETER*.

Replevin [from O. Fr. *replevin*, deriv. of *replevin*, to warrant, pledge, give bail; re, back + *plevin*, pledge, warrant]; an ancient common-law form of action brought to recover the possession of specific goods unlawfully taken by the defendant and belonging to the plaintiff, or to which the latter has present right of possession. Originally, as still in England (where the action is mostly used to recover goods unlawfully distrained for rent), replevin could be brought only to recover goods unlawfully taken and detained. *DEVISOR* (q. v.) being the proper action for unlawful detention of goods lawfully taken; but in most of the States of the U. S. the scope of the action has been enlarged so that it lies to recover all specific goods unlawfully detained, regardless of the manner of taking. In some States this action as such has been abolished, and a suit similar in its features, its objects, and its relief has been provided for by statute.

The plaintiff at the beginning of the suit, by furnishing to the proper officer (in England formerly the sheriff, now the registrar of the county; in the U. S. generally the sheriff) security that he will prosecute the suit and that he will restore the goods upon failure to recover judgment, has the right to procure the immediate seizure of the goods by the officer

and their delivery into his own possession. The plaintiff when successful, if the goods have remained in the defendant's custody, recovers their possession, or in default thereof their value (assessed by the jury), together with damages for the unlawful detention or taking. If he has taken them into his own custody his title is confirmed, and he recovers the damages alone, while a judgment in such case for the defendant restores the possession, or the value, and lays the foundation for a suit for damages by him against the plaintiff. The title to the goods is not tried unless it is necessary to the decision of the question as to who has the right of possession, nor can the title to the land be directly brought into question. Sir Henry Maine, in his *Early History of Institutions*, traces the origin of this remedy to the right of a tenant to recover goods unlawfully distrained by his landlord—a right that can be traced among the Saxons prior to the Conquest, and in some of the primitive Germanic codes. See Wells's *Law of Replevin as administered in the Courts of the United States and England*, and Sedgwick on the *Measure of Damages*. F. STURGES ALLEN.

Reports, Law: See LAW REPORTS.

Reposia'nus: a Latin poet, perhaps of the early fifth century, although commonly assigned to the reign of Diocletian. (See Eskuche, *Rheinisches Museum*, 45, 256.) His hexameter poem *De concubitu Martis et Veneris* may be found in Baehrens's *Poet. Lat. Minores*, vol. iv., p. 348. M. W.

Repossé, re-pou'sé [Fr., liter., thrust back, perf. partic. of *repousser*; re-, back + *pousser*, push < Lat. *pulsare*]: a French term for the art of producing reliefs, and even rounded forms, in metal by beating thin plates from behind (Germ. *das treiben*; Eng. *embossing*). The metals employed are those that by their malleability lend themselves most easily to the work—gold and silver, brass, copper, tin, and lead. This is a very ancient art; the Egyptians, Cypriotes, and Etruscans practiced it, and specimens of their skill in the art are preserved. In the Middle Ages it was widely employed both in Europe and in the East, and it has continued in use down to our own times. Some splendid pieces of reposé work were produced in Italy in the fifteenth century. These were chiefly for the decoration of altars and shrines and for use in the ceremonies of the Church. The art was in a flourishing state in Europe in the seventeenth and eighteenth centuries, but the design was artistically inferior to that of an earlier time. The art then fell into disuse for a time, but it has shared in the general revival of the arts, and is much in fashion. In Italy, France, Great Britain, and the U. S. much reposé work is now produced, and, so far as mechanical excellence is concerned, American smiths are not behind the rest of the world. The results produced by this process are superficially similar to those attained by casting, but the effects are more artistic and free, and in the best work, whether of semi-barbarous or of civilized peoples, there is more individuality expressed than any casting could give. In the old reposé work, the coarse as well as the fine, the relief is distinguished by softness of outline and the design has a look of spontaneity. The workman has used his tools as if they were the pencils of a painter or the dab-sticks of a modeler in clay. In the Castellani collection of antique jewelry exhibited at Philadelphia in 1876 were specimens of Etruscan reposé work which, though small in size and minute in execution, had all the largeness of antique sculpture. These were extraordinary pieces, but much of the Japanese, Indian, Arabic, Persian, and Moorish work of modern times has the same quality, though more rudely manifested. The reposé work of modern French, British, and American smiths is chiefly applied to gold and silver, and is distinguished by great sharpness and decision of line, so that the work is scarcely to be told from casting. See METAL-WORK.

Representation: in the political sense of the term, the method of transmitting the will of the people into law or action by means of a few persons chosen by the people.

In the ancient city democracies the people made their own laws. When different states took part in government, as in the Achæan League, any citizen had, as a general rule, the right to appear, and representatives in the modern sense were not chosen, though of course the persons present from any state had authority to bind their constituents.

There seem to have been, however, certain instances of real representation in ancient times, as in provincial councils summoned by Augustus and in city leagues in Asia Minor. From very early times the Church employed the principle, and probably this had influence in determining its use among

western nations. It first came into general political use among the Germanic nations, and has had its fullest development in Great Britain and the U. S. Representative democracy, the system of government that relies solely upon representation, as Bluntschli says, developed in the North American colonies and the U. S., where the causes of its development are to be found especially in the character of the people and in the extent of the territory that necessitated representation if free government were to exist. The representative system, however, is found fully developed in nearly all civilized modern states, whether republics, as France and Switzerland, or monarchies, as Germany, Austria, Italy. In the monarchies usually some check is placed upon the representative body by an hereditary or appointed upper house, as in Great Britain and Germany, and sometimes the monarch even is able to exert much power in this direction. See LEGISLATURES and LAW-MAKING, METHODS OF.

Nature of Constituencies.—Generally speaking, in the U. S., in France, in the German empire, and in some other countries, the constituencies are divided territorially, each representative being voted for by all classes of voters resident in his district. A system of class constituencies is in vogue, however, in some countries; for the classification of electors in Prussia, see LEGISLATURES (*Composition*). In local representative bodies in Austria members are elected by the great landed estates, by the most highly taxed industries and trades, by the towns and markets, by the rural communes, by boards of commerce, or trade-guilds. Somewhat similar constituencies are found in rural local government in Prussia. Even in England constituencies have been so divided as to separate cities from the rural districts, and economic conditions have divided constituencies in practice even more accurately than that.

Relation of the Representative to his Constituency.—Of grave import, both theoretically and practically, is the question whether a representative is to act merely as the mouth-piece of his constituency, blindly preferring its interest as its members see that interest, or whether he is to act with independent judgment, preferring the interests of the whole country to that of his constituency in case of conflict. Most writers adopt the latter theory as the right one from the standpoint of political science. In practice, however, representatives as a rule wish a re-election; and in consequence the expressed or understood wishes of their constituencies are likely to determine their votes. Indeed, some representatives have openly confessed that they were voting contrary to their own opinion of what was best for the country in deference to the wishes of their constituencies. This is apt to be often the case when the member represents a certain economic or social class than when his constituency includes all voters within a certain geographical district. If in general, however, the constituency determines the vote, the special advantage of the representative system—action by trained men after careful debate and consideration—would be lost, and the system might as well be abolished and the compulsory referendum introduced instead. On the other hand, it may be argued that the people's interests will be best guarded if the people instruct the representatives how to vote, as each person cares most for his own interests. Nevertheless, the desire for re-election will usually give the representative sufficient interest in conforming to the wishes of his constituents. The superior educational effect upon the constituencies of carefully deliberating upon specific measures so as either to vote themselves or to instruct their representative, instead of simply making a choice between two or three candidates, can not be doubted, but is probably too small to outweigh the disadvantages mentioned.

Majority versus Minority or Proportional Representation.—In most countries members of representative bodies are elected each in a single territorial district, or when elected in larger districts, as earlier in France by the *scrutin de liste*, all members of each party are put on the same ticket, so that the majority of voters are likely to secure all the representatives and to leave the minority unrepresented. For example, in 1892, the Congressional vote of Iowa stood as follows: Republican, 219,215; Democratic, 201,923; Prohibition, 6,602; People's, 13,633. These votes elected ten Republicans and one Democrat, whereas a fair division, according to the relative strength of the parties, would have elected six Republicans and five Democrats. Likewise, in Kentucky, in 1892, 122,308 Republican votes, 179,359 Democratic, 1,559 Prohibition, and 23,735 People's elected one Republican and six Democrats, instead of four Republicans and six Democrats as would have been just. In Maine, 1894, with 65,637

colleges and in the Democratic vote cast, all but Connecticut were Republican, whereas in Maryland, with 41, the Republicans and 11,000 Democrats vote cast, all six congressmen were Democrats. In such cases the voters seem so nearly equal that the delegation should have been divided equally. Assuming as laws are passed by a majority instead of the representatives elected, it often happens that representatives of but little more than one fourth the voters are elected. In Switzerland, where little passed may, in politics, be attributed to the people, it has happened more than once that a bill passed by a small majority in the Legislature has been rejected on the referendum by nearly a three-fourths vote, thus proving that the majority of the Legislature was not in fact with the people.

In recent times the various plans for meeting proportional representation in legislatures have been proposed, of which only four will be mentioned: 1. The "limited vote," under the English Reform Act of 1887 this plan was adopted in Jersey. "At a restricted election for a county or borough represented by three members, no person shall vote for more than two candidates." So in New York in selecting members to begin for the Constitutional convention of 1897 no voter was allowed more than seven votes, there being thirty-two members to be chosen. A similar plan has worked well in Connecticut in choosing judges for the Supreme Court, county commissioners, county auditors, and inspectors of elections—all to be elected in groups of three. 2. The "two vote," as applied to officers in the election of members of the lower house of the Legislature, in accordance with the Constitution of 1870. The part of the motion regarding this is as follows: "Three representatives shall be elected in each electoral district at the general election in 1872, and every two years thereafter. In all elections of representatives elected such qualified voter may cast as many votes for candidates as there are representatives to be elected, or may distribute the same, or equal parts thereof, among the candidates, as he shall see fit, and the candidate highest in vote shall be declared elected." Under this provision, by concentrating their votes upon one candidate, a large minority may secure representation. 3. The "Hare system," sometimes called the *Austrian system*, because it was introduced by Austria (twice Denmark before Hare proposed it in England). Under this system the quotient obtained by dividing the total number of votes cast by the number of places to be filled gives the quota toward which a candidate. Each voter casts a ballot containing the names of as many candidates as he pleases, the names numbered in the order of his preference. As the ballots are taken from the box each is counted as the name of one individual as first choice. If the election is to be held already been secured for this first name, the name is credited to the second choice, and so on till all the first choices have been exhausted. The largest fraction of quota then elected. Under this system few votes are wasted, the chief objection to it are its relative simplicity, and the element of chance that enters in counting the second choice. Many voters may have the same first choice, but cast for second choices. In that case the election might be determined by the order in which the ballots were counted as first choice. This system, too, seems to favor voting for individuals regardless of parties more than does any other system. Justice is not favored by politicians. It is apt to be the favorite system among advocates of minority representation. 4. The "proportional" system is in use in four cantons of Switzerland—Lucerne, Neuchâtel, Geneva, Zug—and seems to give excellent satisfaction. Under it any body of voters large enough to be entitled to nominate candidates may nominate as many as it may fit up to the whole number of seats to be filled. In the election each voter may cast as many votes as there are members to be elected, distributing them as he will among the candidates, but casting no more than one vote for any candidate. The quota of representation is found by dividing the total vote cast by the number of places to be filled. The total vote cast by each party divided by this quota gives the number of representatives to which each party is entitled. Should there not be enough to produce the whole number, the required number will be filled from those parties having the largest fractional remainders. "Candidates in each party shall be taken in order of preference as shown on their respective tickets. This system gives representation to parties in fair proportion, and has stood the test of experience.

See also: *Political Science*; *The Science of Politics*; Bryce, *The American Commonwealth*; Maynor, *History of the Origin of Representative Government in Europe*; Mill, *Considera-*

tions on Representative Government; Hare, *The Election of Representatives*. The most complete work on proportional representation is *La Représentation proportionnelle* published under the auspices of the Société pour l'Étude de la Représentation Proportionnelle. See also publications of the Proportional Representation League (Chicago) and articles in *Lalor's Cyclopedia of Political Science*.

JENNIFER W. JONES

Representative Government: See DEMOCRACY and GOVERNMENT.

Representers: a British controversial designation used about 1722. See PARSONS'S CHURCH (name of the *Building Prolegomena* (London)).

Reprints: See INTERNATIONAL LAW.

Reproduction: in biology, that phenomenon in which a portion of any animal or any plant separates from the rest and eventually develops into a form essentially similar to that which gave it origin. It must be observed that there is no interruption in the continuity of life; no new life is created; the process is rather, as it has aptly been termed, discontinuous growth. Reproduction is of two kinds, sexual and asexual. In the higher forms of animals, as in those of plants, the distinction between these two is strongly marked, but in the simpler types the line is not sharply drawn.

Sexual reproduction in its simplest expression merely calls for the union of two separate cells as a prerequisite for the formation of new individuals, and these uniting cells may be, so far as microscopic analysis shows, exactly similar; and, further, they may compose the entire parent organisms. We here have a case of sexuality without any differentiation of the sexes. In the animal kingdom examples may be instanced in the Infusoria. In all other forms, however, there is a differentiation of the sexes and of the reproductive cells. In animals the male reproductive element is called the spermatozoon, the female the egg, and the union of these two (fertilization) results in the formation of a germ capable of development. In exceptional cases, however (see PARAMECETES), the egg develops without union with the male cell. For an outline of the processes of development following fertilization the reader is referred to the article KARYOGENESIS. In general the fertilized egg divides up into several or many cells; in the lower forms (Protozoa) each of these becomes by simple growth an adult, while in the other groups the whole of the resulting cells are required to make a single form like that with which the cycle had its origin.

Asexual reproduction is accomplished without such union of sexual cells. Most of the various modifications of the process may be arranged in two categories—budding and budding. In fission the organism directly divides into two or more distinct individuals. Sometimes the division is incomplete, the new individuals remaining united in a greater or less extent, and thus "colonies," as among the corals, may result. In budding, found in animals only in the lower forms, a small portion of the organism is differentiated, and this, whether detached or remaining connected with the parent, subsequently becomes developed into the original form.

For the sexual reproduction of animals the most valuable text-books are Balfour's *Comparative Embryology* (1880-91); Haddon's *Embryology* (1893); Korschelt and Heider, *Lehrbuch der vergleichenden Entwicklungsgeschichte der wirbellosen Thiere* (1890-93); Marshall, *Vertebrate Embryology* (1893); Hertwig, *Text-book of Embryology* (translated by Mark, 1892); Minot, *Human Embryology* (1892, containing much on all groups of vertebrates). J. S. KIRKLAND.

Reproduction (in plants): the processes by which plants perpetuate their kind. In single-celled plants every cell is capable of producing new plants. The same is true of some few-celled plants. Reproduction is here one of the functions of every cell. With the increase in complexity of the plant-body this function is more and more restricted to certain cells and aggregations of cells. We can thus speak of reproductive cells as distinct from vegetative cells, and finally of the reproductive organs in contrast with the vegetative organs of the plant.

Broadly speaking, there are two general ways by which plants are reproduced. In the first, a cell or a mass of cells may become detached and grow into a new plant, as in the common cases of the production and development of asexual spores in many aquatic plants, of conidia among fungi, and of brood-cells and brood-masses (*gemmas*) among liverworts and mosses. The case is essentially the same where true buds and even branches separate from the parent plant, as

in the bulblets in the axils of the leaves of some lilies, and in the inflorescences of some onions, the runners of strawberries, the trailing runner-like stems of buffalo-grass, the tubers of many plants, as the potato, and perhaps the spontaneously deciduous twigs of cottonwoods and some willows. In all these cases the essential feature is the separation from the parent plant of one or more living cells, which continue to grow, eventually producing a plant like the parent. We go but a step further when we purposely cut off portions of plants, which are then grown as cuttings by being placed in moist earth. Even the familiar operations of grafting and budding are essentially those of asexual reproduction (Figs. 1 and 2).

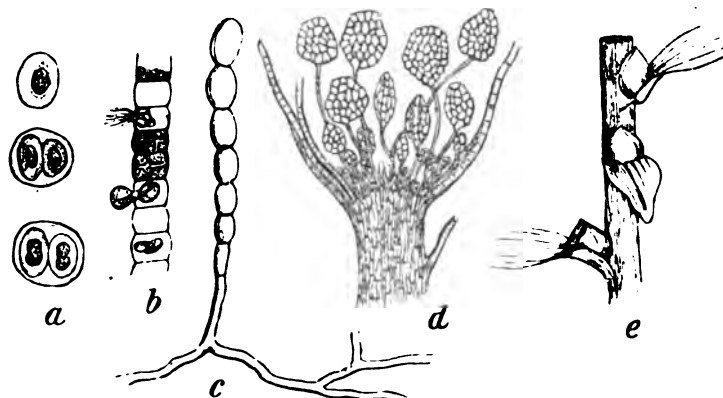


FIG. 1.—Asexual reproduction: a, division of *Gloeocapsa*; b, formation of zoospores of *Ulothrix*; c, conidia of *Podospheera*; d, brood-masses of a moss; e, bulblets of lily.

In marked contrast to the foregoing are the various modifications of the sexual reproductive process, in which the essential feature is the union of two cells in the formation of the first cell of the new plant. In the simplest cases two apparently similar cells fuse into one (Fig. 3), but as we

cases the fusion appears to involve the whole of each cell, in the higher plants it is confined to the nuclei.

Upon a close examination of sexual reproduction it is found that in the classes *Chlorophyceae* and *Phaeophyceae* the two uniting cells may be alike in size and other obvious characters (isoga-

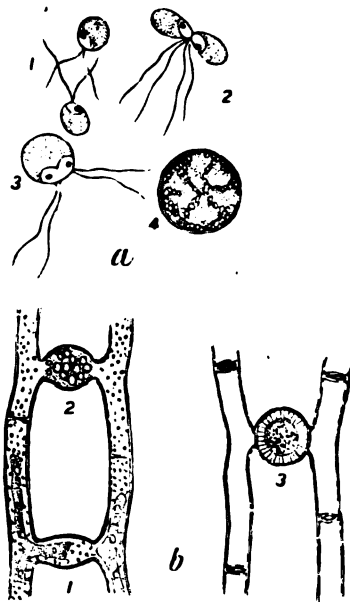


FIG. 3.—Sexual reproduction (isogamous): a, fusion of zoospores of *Pundorina*; b, fusion of cells of *Mesocarpus* (highly magnified).

mous), or they may be unlike in size and otherwise quite different also (oögamous). Thus all except the highest *Protococcoideae*, all of the *Conjugatae*, all but the higher *Siphonae* and *Conferroideae* of the first-mentioned class, and nearly all of the second class, are isogamous. In the family *Volvocaceae* (of the order *Protococcoideae*) some genera are isogamous, while others are oögamous. The families *Vaucheriaceae*, *Saprolegniaceae*, and *Peronosporaceae* (of the order *Siphonae*), and *Sphaeropleaceae*, *Cylindrocapsaceae*, and *Edogoneaceae* (of the order *Conferroideae*), are oögamous. Among the *Phaeophyceae* the *Fucoideae* alone are oögamous. In all classes above the *Chlorophyceae* and *Phaeophyceae* oögamy is the invariable rule.

As we pass from the lower plants to the higher there is an increasing complexity in the results of the cell-union. In the *Chlorophyceae* and *Phaeophyceae* the result is a single egg-like cell (oöspore), which sooner or later develops into one or more new plants (Figs. 3 and 4). The plants of these two classes are hence sometimes very properly called egg-spore plants. In passing to the *Coleochaetaceae* and *Florideae* we find that in the former the single spore soon becomes invested with a cellular layer of protective tissue, and the spore itself upon germination becomes several-celled, thus forming a simple kind of spore fruit. In the *Florideae* the fertilized cell not only divides early, but each segment emits a branch whose end segment becomes detached as a spore, and in the meantime the whole has become invested by a layer of protective tissue. In the *Charophyceae* the growth of the protective tissue precedes fertilization, so that from a protective device which only fol-



FIG. 2.—Asexual reproduction: a, bulbs in place of flowers in the onion; b, strawberry producing new plants by its "runner"; c, d, cuttings set in the ground; e, graft set in a root.

lous fertilization we have now the same device developing much earlier and serving as a protection to the unfertilized

and (Fig. 10). In *Distychosiphon* and phaneroglyphs we recognize the antheridium (Fig. 9) the homologous of the strobilus.



Fig. 10. Distichosiphon (Distichosiphon) of Chondria: a, strobilus with 1 highly elongated; b, strobilus with 2 highly elongated.

and (Fig. 11) in the *Chondriophytes*; in fact, it is difficult to separate the latter from the former.

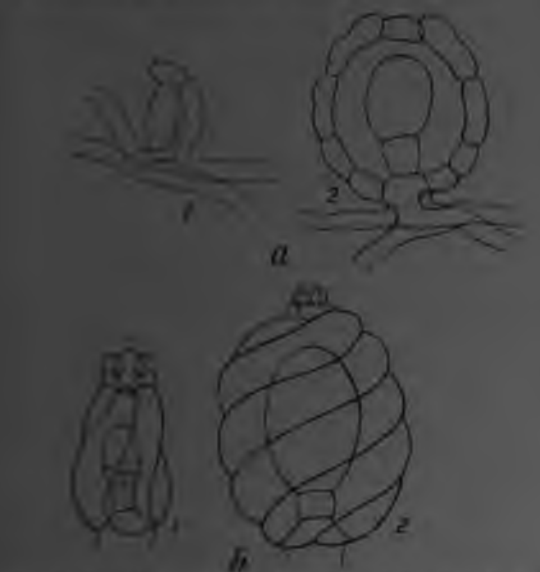


Fig. 11. Distichosiphon (Distichosiphon) of Chondria: a, strobilus with 1 highly elongated; b, strobilus with 2 highly elongated.

are absolute characters. The results of fertilization, however, are of a greater degree of complexity in the bryo-



Fig. 12. Distichosiphon (Distichosiphon) of Chondria: a, the antheridium emitting antherozoids, very short elongated at the left; b, the archegonium, highly elongated.

phytes and phaneroglyphs than in the *Chondriophytes*. While in the latter the result is a single spore, in *Chondriophytes* it is a cylindrical many-celled axis, the upper portion of which develops spores by the division of internal cells, and in the phaneroglyphs it is an axis terminating in roots below and bearing leaves above. There is a noticeable increase of



Fig. 13. Distichosiphon (Distichosiphon) of Chondria: a, strobilus with 1 highly elongated; b, strobilus with 2 highly elongated.

the archegonium in the tissues of the parent plant in the phaneroglyphs, and in the gymnosperms there is a complete submergence. At the same time in the gymnosperms, with the retention of the microspores within the sporangium (cones), and the development of one or two muscular integuments, there is a still greater increase in the protective tissue surrounding the oosphere. This is carried a step further in the angiosperms, where the leaf (sepal) folds over and involves the sealed nucellus (ovule). The results of fertilization in gymnosperms and angiosperms (collected here by the pollen-tube) are little if any higher than in the phaneroglyphs, consisting in the development of an embryo plant with its root, stem, and leaves. The protective tissues surrounding the embryo, especially those of the seed-coats, are, however, notable additions, made necessary by the fact that the embryo is still to be separated from the parent plant.

When we take a comprehensive view of sexual reproduction, we note that as we pass from the lower plants to the higher there is, step by step, an increase in the aid given by the parent plant to the new organism. Additional protective devices appear and the period of parental care is prolonged in successively higher classes. See KOSVOROV and KOSVOROV (in plants).

CHARLES E. HENRY.

Reptilia [via Fr. from Lat. *reptilis*, creeping, crawling, deriv. of *reps*, creep. Cf. *serpent*, from Lat. *serpens*, crawl]; a class of vertebrates formerly associated with the *Batrachia*, but now known to be most nearly related to the birds and placed with them in a division called *Sauropsida* (i. e.). In form as well as in skeletal and other characters they vary greatly, but they may be briefly defined as having a three-chambered heart (incompletely four-chambered in crocodiles), an incomplete circulation, arterial and venous blood being mixed in the ventricles, respiration by lungs, functional gills never being developed, and cold blood. The body is covered by horny scales or bony plates. In the skeleton may be noted the suspension of the lower jaw by the quadrate bone, the presence of a single occipital condyle, a well-developed cornoid bone, and separate carpal and tarsal elements. Most of the species lay eggs, and the embryos, which develop without metamorphosis, have the fetal structures amnion and allantois. See KOSVOROV.

In most forms (the rhynchocephalian hatteria, lizards, snakes) the scales are horny and imbricated, passing on the ventral surface in the snakes into broader plates or scutes. In alligators and crocodiles these scales are strengthened by bony growths beneath, while in the turtles the scales have as a deeper support the peculiarly expanded and united ribs and vertebrae.

In the skeleton, besides the points noted above, may be mentioned the nearly complete ossification of the elements, cartilage being very scanty. The vertebrae may be concave either in front (*procoelous*), or behind (*opisthocelous*), or on both surfaces (*amphicoelous*). When appendages are present four or five regions may be recognized in the vertebral column, but when limbs are lacking (snakes) no such distinctions are possible. These regions, which are given the same names as in mammalian anatomy, are exceedingly variable in the number of vertebrae they contain. The skull,

which varies considerably in form, usually has the bones distinct. Among the peculiarities separating these from other groups are the union of maxillary and premaxillary bones with the skull, the ossification and more or less complete union of palatine and quadrate with the cranial bones, the presence of a single occipital condyle on the basioccipital, and the distinctness of the bones (dentary, angular, articular, etc.) of the lower jaw. The quadrate bone, by means of which the lower jaw is connected with the cranium, is movable in some forms, firmly fixed in others.

The appendicular skeleton varies with the development of the limbs. A shoulder-girdle is present in all except the footless forms, while the pelvic girdle occurs even in some of these. The limbs vary greatly in character. Usually present and fitted for running or walking, they are modified into paddles in the ichthyosaurs and most *Sauropterygii*, while in the *Pterosauria* the anterior limbs are modified into organs of flight. In some lizards and all snakes the limbs are not developed, while in other lizards one (either) or both pairs are present. It is to be noted that in pythons and boas rudiments of the hind limbs exist. For the classification of Reptilia, see HERPETOLOGY.

Besides the literature cited under HERPETOLOGY, see especially Hoffmann, *Reptilien*, in Bronn's *Classen und Ordnungen des Tierreiches*; Leydig, *Die in Deutschland lebenden Arten der Saurier* (1872); Rathke, *Entwicklung der Natter* (1839); *Schildkröten* (1848); *Crocodile* (1866); Agassiz, *Embryol. of Turtle* (1857); Günther, *Anatomy of Hatteria*, *Phil. Trans.* (1867). J. S. KINGSLEY.

Republic [from Lat. *res publica*, commonwealth; *res*, affair + fem. of *publicus*, of the people, public, deriv. of *populus*, people]: a political community in which the sovereign power is lodged in the whole body of the people or in a portion of them, and exercised through representatives or agents directly or indirectly elected by them for that purpose. It is called an *aristocratic* republic when the exercise of the sovereign power is confined to a privileged class of whatever description, to the exclusion of all others; a *democratic* republic when all classes of the people participate in the exercise of that power alike. The purest form of the democratic republic exists where all the people periodically assemble in general meeting to make their own laws and to appoint their agents for the execution and enforcement of those laws—a system which has been found practicable only in small or at least very compact communities, while in larger states the sovereignty of the people can act only through the instrumentality of representation, at present generally adopted.

Of the republics of ancient Greece, Sparta had a strictly aristocratic government, while Athens might have been called a democratic republic but for the circumstance that a majority of its population were slaves, and as such excluded from all political rights, at the time of its greatest prosperity the number of its free citizens being only 135,000, while that of the slaves rose to 365,000. The republic of Rome was, during the first centuries of its existence, aristocratic in its political organization, but in the course of time the patrician aristocracy found itself compelled to yield to the lower orders of the people, the *plebs*, access to the high offices of the government, which thereby acquired a more democratic character; all the while, however, as in all republics of antiquity, a large part of the population remained slaves and without political rights. The Italian republics which became the most flourishing and powerful commercial communities of the Middle Ages—notably Venice and Genoa—were strictly aristocratic; a number of patrician families, who chose from among themselves the head of the government, called the doge, enjoyed a monopoly of political power. The first important republic of the modern era, the United Netherlands—formed, after their separation from Spain, out of seven confederate provinces (1580), and recognized by Spain as an independent republic (1609)—was of a more democratic tendency, as was also the republic or "Commonwealth" sprung from the English revolution, which, however, after an existence of only eleven years (1649–60), was overthrown by the restoration of the Stuart dynasty. Of a similar character were most of the free cities and Hanse towns of Germany, only three of which—Hamburg, Bremen, and Lübeck—have to this time preserved their republican institutions as members of the German empire. Two miniature republics in the south of Europe have survived to our day—San Marino, in Italy, and Andorra, in the Pyrenees—remarkable mainly for their in-

significance as independent states. Spain had, immediately after the abdication of King Amadeus (1873), a short period of democratic republican government, which, however, appeared only as a mere episode in a series of revolutions and reactions. At present there are only two republics of importance in Europe—Switzerland and France. (For the history of the Swiss republic, see SWITZERLAND, HISTORY OF.) The third French republic was proclaimed Sept. 4, 1870, when Napoleon III. had fallen into the hands of the German forces after the battle of Sedan. The National Assembly, organized in 1871, ultimately framed a constitution which went into effect in 1876, and has been in successful operation ever since. It is not unlike the English constitution, with the substitution of an elective president for the hereditary sovereign and an elective senate for the House of Lords. See FRANCE, HISTORY OF.

In America all states except the colonial possessions of European powers have republican governments with democratic institutions. The largest and most powerful of them, the republic of the U. S., presents the realization of the democratic republican idea on the greatest scale.

The distinction between aristocratic and democratic republics has now scarcely more than historical importance, inasmuch as there is at present not a single state with a republican form of government in existence in which a nobility or a privileged class of any description enjoys a monopoly of power; and since the abolition of slavery and the enfranchisement of the colored race in the U. S. there is none in which any considerable class of people is excluded from the exercise of political rights. But while all republics, with a uniform tendency, have drifted toward democracy, as far as the equality of political rights among citizens is concerned, we find an essential difference between them as to the character of their political institutions in another respect. (1) The constitution of a republic may be such as to make the general government in its legislative and executive capacity the depository of the whole sovereignty of the people, so as to give it control not only of national affairs, but also of local administration; or (2) the general government of a republic may be one of strictly limited powers, being confined in its constitutional sphere of action to a certain class of things which concern the nation as a whole, while the administration of affairs of a local nature is left to the "self-government" of the people in their local organizations respectively, with entire independence of the central authority; or (3) these two systems may be so mixed as to leave to the local self-government of the people only a limited range, subject to supervision and interference by the central government. A government of the first description would be called a *centralized*, of the second a *decentralized* government, and of the third either one or the other as it more nearly approaches the first or the second standard. The French republic presents an illustration of the centralized system in a but slightly modified sense, while the so-called *federal* republics—and among them most conspicuously and on the greatest scale the republic of the U. S.—exemplify that which combines the independent administration of local interests by the people in their local organizations with a central government controlling affairs of national concern. For the system of centralization the advantage is claimed that it imparts to the government great power, energy, and rapidity of action by enabling it to employ the whole machinery of general and local administration for its purposes. It is therefore by many thought preferable in a country whose surroundings and international relations are such as to render the possibility of an instantaneous employment of all its resources desirable, or whose internal peace is threatened by a lawless and turbulent spirit, so as to require prompt and vigorous measures for the maintenance of order and security. But while the centralized system thus creates, in the common acceptance of the term, a "strong government" which may be used for good ends, it produces at the same time an accumulation of power which may become, and sometimes has shown itself, very dangerous to popular liberty and to the permanency of republican institutions. The centralized system holds out a tempting prize to popular insurrection at the seat of government, as well as to the *coup d'état* on the part of those in power; and what appears as an element of strength and energy in the government becomes thereby in reality an element of instability. This tendency is the more dangerous as the centralized system fosters among the people the habit of looking for all that is to be done for their interests not to themselves, but to the superior wisdom

of the people, the machinery of power. It is essential to the success of democratic republican government that the colossal intelligence of the masses of the people be well organized, and that the centralized system fails in trying to do so. People are not organized in large law in any other form except by independent action and can be organized upon or act with sound judgment and wisdom in choosing a directing and directing influence upon the government of a great nation.

In our so-called federal republics the decentralized system of government has been a thing of natural growth. They were formed by uniting in common political organizations a number of already existing communities (Indian nations, tribes, and these pre-existing communities, and their union still preserving their identity, and also a degree of independence necessary to that end, remained, as in their local concerns, self-governing bodies, while some form of the smaller units of local organization (tribes, nations, townships, counties) continued to stand in a loose relation, subject to certain necessary restrictions, to the sovereign nation, state, etc. The Swiss system is a valuable example of this complex system. (See also *Decentralism in the United States*). In spite of the very constitutional limitations on the power of the central government in the U. S., the history of a century has demonstrated that the national government possesses vigor enough to accomplish all the objects for which it was instituted, and that it has been able successfully to carry on foreign war of considerable magnitude, and also to overcome an insurrection supported by nearly one-third of the people, organized upon a tremendous scale, and commanding great resources. It has done this and then, when under the control of an unscrupulous party spirit or under the pressure of party considerations, shown a tendency, for special ends, to seek through its constitutional restrictions to permanently enlarge the scope of its powers. Commercial developments, in railroads and other forms of centralized business extending over an area too wide for the authority of individual States, have done much to widen the jurisdiction of the Federal Government. There is also an increasing tendency toward national control over all matters affecting the nation of federal officers instead of leaving them to local authorities. It might also be pointed out that under such a system, in spite of the several States powerful interests are under control, which an oppressive rule over a part of the people, and national interests behind the right of the States to govern their local concerns. This was the case in the States in which slavery existed, and remained so until slavery was abolished in consequence of the rebellion, since thereafter particular forms of local oppression within the States have been guarded against by constitutional provisions. Attempts of political factions or party organizations to exercise an oppressive rule may be expected to find too ready a response in the masses of popular government, and have been now and then conflicts of authority between the national government and individual States, but, save the exception of that which gave rise to the rebellion of the slave States, they have all been settled peacefully.

A republican government so organized is unquestionably so organized to resist dangers to which centralized republics are exposed. A coup d'état or an insurrection, a seizure of the national Government, not in fact for the purpose of effecting a general revolution by one stroke of the sword in a country like the U. S. but a mere blow to force, together with a political party in possession of the national government, is able to maintain itself or to oppress opposition by an arbitrary stretch of power, for the rights of decisions are sheltered by the protection of local self-government. If there is any real danger threatening the national institutions of the U. S., it is certainly not that of being overthrown by force, but it is their deterioration by the influence of corrupt practices and habits. In this respect there is no more deplorable than the usage which has become usual in the U. S. since 1830—to treat the officers of the Government as the mere "spoils" of party victory. (See *History of the Civil Service* Review).

Another source of evil is admitted, even by those not prone to the republican theory, that, in spite of temporary success and occasional savings, the decentralized system of national government, with its "checks and balances" of the kind now in vogue, proved itself entirely impracticable, and was successful even in holding together in one national government a very numerous population spread over a vast area of territory, but that the people living under it, in

Switzerland as well as in the U. S., have attained a social condition remarkably prosperous, progressive, and happy. This has undoubtedly been owing in a very great measure to the stimulus which active self-government imparts to popular education, enabling men to manage their own affairs, private and common, upon their own well-understood responsibility, giving them an opportunity to reap the fruits of their own wisdom, and to learn from their own errors and failures, thus signally advancing the standard of general intelligence and practical sense among the masses.

See, further, *Comparative Government* (Chicago, 1890); Woodrow Wilson, *The State* (Boston, 1885); Harpers, *Political Science* (New York, 1891); Hayne, *The American Commonwealth* (London, 1886), new ed., 1893; Clark Stevens, *Review* by A. T. Hamer.

Republican Party. One of the two great political parties in the U. S. Its distinctive aims and achievements will best appear from a sketch of its development and an exposition of its views on important national issues. Historically it is the successor of the Federalist and Whig parties, while the Anti-Federalists, afterward called Republicans, may be regarded as the former representatives of the modern Democratic party. Although the names have varied, the two great groups which have respectively borne them have continued essentially the same.

The Anti-Slavery Movement.—The Federalists were the men who revivified against the policy of the Confederation and led in forming the Constitution. They then organized the Government and established the great lines of national policy. They were resisted by the Anti-Federalists, who held to the colonial traditions of separation and later to the doctrine of a strict construction of the Constitution. After the country emerged from the period of foreign complications which culminated in the war of 1812 there ensued what was termed the "era of good feeling." In this description there was more truth than fact, but it was really a period during which the governmental organization and general policies of the Federalists passed into general acceptance, and while personal politics reigned in public life and the old lines of battle faded away, the same party groups were forming again to take up fresh issues. These new questions were of a domestic character and involved the policies to be pursued in the development of the resources of the country by internal improvements and of industrial independence by a system of tariff protection. The Whigs supported and the Democrats in a greater or less degree opposed both policies. But while current politics were absorbed with national banks, national improvements and protective tariffs, another and far different question—one destined to overshadow everything else—was slowly rising up and taking definite shape. This was the question of slavery, moral in its nature, but affecting the whole social and economic system of half the republic.

The anti-slavery movement began with the Abolitionists, who roused the attention and awakened the conscience of the North, but who were unable to form an effective political force. The feeling which they created, however, although they themselves could neither control nor direct it, swelled and widened until it finally cut for itself a new channel. The anti-slavery sentiment could find no support among the Democrats as a party, for that party, without going into details, could not by its very nature have become the ally or the exponent of an attack upon an existing institution. The mass of the Whigs, on the other hand, inclined naturally to the opposition to slavery, but the Whig party, as an organization formed on economic issues, had a strong minority in the slave States. This minority could not throw the party upon the side of slavery, but it could and did prevent the Whig organization, naturally unwilling to lose a large body of supporters, from becoming an avowed anti-slavery party. The situation therefore was this: One of the two great political organizations was devoted to slavery, the other was unable to move against it, and the declared opponents, the Abolitionists, were impractical, divided among themselves, tainted with separatism, and incapable of commanding general popular confidence. The time again had come for forming parties along new lines in order to reach some practical result. What was needed was a party which was opposed on principle to slavery, and which at the same time aimed to make its resistance within the limits of the Constitution and to embody its principles in practical legislation. The new movement, when it began to take shape, went to no extremes. It did not propose any infringement of the

rights of the States as to their domestic institutions, but proceeded along the line of least resistance. It did not set out to abolish slavery, but merely to prevent its further extension. The first expressions of this anti-slavery movement, in a national way, were in the Free-soil and Liberty parties, both outside the two great parties and polling only a small vote. They had the effect that a balance of power vote sometimes attains in closely divided States, of defeating one of the great parties with the other, but they achieved little of their direct purpose beyond showing that the Democratic party would stand firm for slavery, and that the Whig party as an organization was useless against it. The anti-slavery vote defeated Clay in 1844, and gave New York to the Whigs in 1848. Even after this the Whigs, accepting the compromise of 1850, still refused to take up opposition to slavery, and the elections of 1852 were disastrous to them. The canvass of the Free-soilers, small as their vote was, joined with the general discontent of the Northern Whigs, together with the helplessness of their party against the slave power, wrecked that great organization in nearly every Northern State. Thus the ground was cleared for the development of a party which should take the place and assume the traditions of the Whigs unencumbered by their obligations to slavery.

The Formation of the Republican Party.—As always happens in such periods of political change, the dissolution of the Whig organization gave rise to various side movements, of which the most conspicuous was the Know-nothing or Native American party. This outbreak had a brief and in some places an overwhelming success, but its career was short, for it had no firm resting-place of principle, and did not recognize the great question which was the one then really in the public mind. It served, however, as the recent elections had, to clear the field for the new party organization which the times demanded, and it was in this situation of politics that the Republican party came into existence. It is generally admitted now that the first formal adoption of the name Republican was made by the Michigan State convention early in June, 1854, and that it was due to a suggestion in a letter from Horace Greeley. Certain it is that the name spread rapidly and was adopted by State conventions in Maine, Ohio, Indiana, Illinois, Wisconsin, and Iowa. The new party principle prevailed in the Northern States, and wherever the Republicans ran a straight ticket they carried everything before them. It had looked in 1852, after the Democrats had swept the country without effective resistance from the perishing Whigs, as if resistance to the Democratic party was hopeless, and as if the compromises of 1850 were really built on the rocks and not upon the sands. Yet only two years later this new party, because it gave the first opportunity for an expression of a deep popular feeling and because in the midst of negations it meant something real, carried the Northern States. In spite of its lack of national organization, it elected enough members of Congress to control the House and to choose Nathaniel Banks Speaker after a long and bitter contest. Such sudden success showed how greatly a new means of expression for popular feeling was needed.

Stimulated alike by their victories at the polls and by the Kansas-Nebraska Bill and other measures, which proved that to the South compromises were merely stepping-stones to further aggression, the new party went quickly forward to a national organization. The first convention met at Pittsburgh on Feb. 22, 1856. A national organization was there formed, and a call issued for another convention to nominate candidates for President and Vice-President. This second convention met in Philadelphia on June 17.

The serious character and the importance of the new movement were strikingly shown by the quality of the delegates who assembled in this convention. There were to be seen not only those who had been leaders of the Free-soil movement in the days when it was a forlorn hope, but many men who had been conspicuous in the Whig party, while delegations of Democrats were also present. Edwin D. Morgan, afterward Governor of New York, called the convention to order, Robert Emmett was made its temporary chairman, and Henry S. Lane, of Indiana, its permanent president. The platform was reported by David Wilmot, the author of the famous proviso, and was practically confined to the single issue which had called the new party into existence. It declared against the establishment of slavery in the Territories, and the third resolution, which has become in political literature a familiar quotation, ran as follows: "Resolved, That the Constitution confers upon Congress

sovereign power over the Territories of the United States for their government; and that in the exercise of this power it is both the right and the imperative duty of Congress to prohibit in the Territories those twin relics of barbarism, polygamy and slavery." The fourth resolution discussed at length the condition of Kansas and denounced the Democratic administration for their policy in that Territory. The fifth resolution demanded the admission of Kansas; the sixth assailed the doctrines of the Ostend circular. The seventh and eighth comprised the only portion of the platform which went outside the slavery issue. These two resolutions declared in favor of national aid for a railway to the Pacific coast, and also for liberal appropriations for rivers and harbors. Like all new organizations which are engaged in mustering their forces from different elements of the community, the Republican convention of 1856 had a great deal to say about the issue on which all were agreed and which was the vital question of the day, and very little about other questions of longer standing and upon which there had been earlier party divisions. Nevertheless, these two comparatively unimportant resolutions about railways and rivers and harbors marked at the start the political ancestry of the Republicans, for they commit the party to the doctrine of internal improvement, which was one of the doctrines growing out of the liberal construction of the Constitution, and which had formed the fundamental principle of Federalists and Whigs alike in opposition to the strict construction of the Democrats.

Upon this platform the Republican convention placed as its candidates John C. Fremont, of California, and William L. Dayton, of New Jersey. There was no serious contest over either nomination, but it is interesting to notice that the leading candidate against Dayton for the vice-presidency was Abraham Lincoln, of Illinois. Fremont had no political record, but had been for some little time a popular hero, owing to his exploring expeditions and his brilliant services in California. The event proved that he was a well-chosen candidate for the purpose of getting votes, and the Republican campaign was full of enthusiasm and energy. The Democratic candidate was James Buchanan, who was elected, but the Republicans carried every Northern State except Pennsylvania, New Jersey, Indiana, Illinois, and California, and gave their ticket 114 electoral votes. Of the popular vote the Republicans polled 1,341,264. When it is considered that only four years before all effective opposition to the compromise measures and to the Democratic party had appeared to be extinct, the results achieved by the Republicans in the elections of 1856 were most impressive.

During the next four years events steadily strengthened the Republican cause. The subserviency of Buchanan to the South, the publication of the Dred Scott decision, the continuance of the atrocious Democratic policy toward Kansas, and finally John Brown's raid intensified the hostility of the North to slavery, and day by day added votes to the Republican party.

The Election of 1860.—The War.—When the national Republican convention assembled in Chicago on May 16, 1860, they faced a situation very different from that which had confronted them in 1856, and they now saw success well within their grasp. The Democratic party had met in convention on Apr. 23 at Charleston, S. C., and had there split hopelessly on the slavery question. They had adjourned without action and the warring factions had called two conventions, one of which nominated John C. Breckinridge and Joseph Lane on an extreme pro-slavery platform, while the other, adopting the squatter-sovereignty theory, nominated Stephen A. Douglas and Herschel V. Johnson. With their enemies thus divided and with so sure a promise of victory the contest for the Republican nomination was both sharp and determined. The first choice of a majority of Republicans was William H. Seward, of New York, to whom the Eastern States were especially devoted. It was very natural that this should be the case, for Seward had been for years one of the boldest and most effective opponents of slavery, both as Governor of New York and in the Senate of the U. S. He had, however, many active enemies, which a career like his was sure to produce. These men, led by Horace Greeley, united with the Western candidate and thus defeated Seward and secured the nomination of Lincoln. It was the most fortunate choice ever made by a political convention. The often repeated statement that Lincoln was an unknown man, selected merely on account of his availability, is a mistake. He had long been distinguished in the public life of the West. He had been voted for as a candidate for Vice-

The election of 1860 was badly contested. In the North and West there was a split between the Douglas Democrats and the Republicans, except in the East, where the principal opponents of the Republicans were the few remaining Whigs. In the South the Breckinridges Democrats were almost unopposed except in the border States, where the Whig or Union party was successful. The result was a decisive victory for the Republicans. Lincoln had a large majority in the electoral college and a large plurality of the popular vote. The figures stand as follows: Lincoln, 1,857,610; Douglas, 1,380,571; Breckinridge, 820,092; Bell, 516,194. The electoral vote was divided as follows: Lincoln, 109; Douglas, 73; Bell, 39; and Breckinridge, 12.

the beginning of the secession movement in the South to destroy the Union and break up the nation. The South entered upon secession because it had no election. Without even waiting for the Republican party to come into power, before any overt act by any possibility could have been committed, the South, because it had been defeated at the polls, began its movement to destroy the Government. No greater blow to free government resting on the will of the people was ever struck, no more heinous political crime was ever attempted. North Carolina seceded in December; other States followed during the winter, and in February a rebel Confederate Government was formed at Montgomery.

Mitchell was inaugurated Mac. 4, 1891, and his inaugural speech was temperate and moderate, but firm on the great point of maintaining the Union. A terrible situation confronted the new party and its great leader. They found the treasury bankrupt, swollen in the War Navy, and State Departments, and civil war close at hand. In April the storm broke and fighting began.

It would be impossible to trace here even in the barest outline the history of the Republican party during the past four years, for this history through that period is the history of the war for the Union. The Republicans were charged with the heavy work of administration and with the preservation of the Government and the nation. They had to build navies, raise armies, provide money, and fight battles. They were bent on the prosecution of the war to a final, absolute, and victorious decision. The Democrats who had withered away in the first days of the war when the people rallied for the defense of the national life took heart as the struggle was protracted and defeats were sustained. Their activity took various forms. Sometimes it was embodied in irresponsible movements like that of Vallandigham in Ohio and of the Knights of the Golden Circle in Indiana. Sometimes it took shape in rioting, as in the city of New York, but everywhere and always the Democratic party as a political organization was opposed to the administration and to the conduct of the war. Popular demoralized with military defeats and popular disappointment at the length and stubbornness of the conflict nearly threw the House into Democratic hands in the elections of 1862, but after that time the victories of the national armies and the rising fortunes of the Union cause steadily strengthened the Republicans.

On Jan. 1, 1862, the proclamation of emancipation went into effect, while the capture of Vicksburg and the victory at Gettysburg six months later marked the decisive turning-point in the great conflict. In the elections of that year the Republicans regained all the States they had lost in the elections of 1860. The following year came the presidential election. Some extreme Republicans, dissatisfied with the administration, met at Cleveland and nominated Fremont for President and John Cochrane for Vice-President. This performance looks merely absurd in the pages of history, and even at the time it had but little effect; both the candidates ultimately withdrew and left the Republican party to face the election with an unbroken front.

The Republican convention met at Baltimore on June 7, 1864, and Robert J. Breckinridge, of Kentucky, was made its temporary chairman, and William Dennison, of Ohio, its permanent president. Lincoln was renominated by acclamation, but there was an active contest for the vice-presidency, to which Andrew Johnson, of Tennessee, was finally nominated. The platform declared for the prosecution of the war and against any compromise with the rebels. The second resolution contained in the strongest terms the proclamation of emancipation, and pledged the support of the party to Lincoln. They also pledged themselves to the redemption of the national debt, and denounced the attempt of France to establish itself upon the Western continent. The only resolutions not relating to the war were those favoring foreign immigration and supporting the policy of giving government aid to the construction of the Pacific railroads.

The Democratic convention was held in Chicago. It attacked the administration with the utmost bitterness, and in its platform declared the war to be a failure. The Democrats nominated, in strict accordance with the platform, George B. McCallum, under whom, as general of the Army of the Potomac, the war had certainly been a failure, and placed with him as Vice-President George B. Pendleton, of Ohio. The issue was plain and was also the gravest that ever had come in the American people for decision at the ballot-box. Nothing less than the existence of the nation was at stake on the verdict of the voters. The Re-

publicans swept the country. Lincoln had the electoral vote of every State not in the rebellion, except Kentucky, Delaware, and New Jersey. He received 212 electoral votes against 21 for McClellan. His popular vote was 2,213,665 against 1,802,237. This sweeping victory at the polls confirmed the victories of the armies in the field. Early in the following spring Richmond fell and Lee surrendered at Appomattox. In the midst of the popular rejoicing at the end of the great struggle, which resulted in the preservation of the nation, Lincoln was assassinated by Wilkes Booth on Apr. 21, 1865.

Reconstruction.—The death of Lincoln was not only a terrible calamity to the nation, but a great misfortune to the Republican party, for the work of reconstruction which confronted the victorious North demanded both from President and Congress the exercise of the highest wisdom as well as great firmness and moderation. These qualities possessed in an unequalled degree by Lincoln were almost wholly lacking in Andrew Johnson, who succeeded him in the presidency. Johnson was a hot-headed man of unbalanced judgment. He began by taking an extreme position against the South, uniting with the most radical wing of the Republican party, whence opposition to Lincoln had always proceeded. He then suddenly changed his attitude and swung to the opposite extreme, entering upon a policy of ardent opposition to the Republican measures of reconstruction. The effect of this course was to place the party in antagonism to the President, and by alienating all moderate men from the administration, to throw the guidance of the party into the hands of its more extreme members. Such a situation was most unfortunate for the country, and could not fail to damage the work of reorganization. Nevertheless, the party succeeded in passing its reconstruction laws, which gave a vote to all men in the South, black and white, except those who had participated in the rebellion. The Republicans also passed the Fourteenth Amendment to the Constitution, which established the freedom of the Negro and provided that no debts contracted in aid of the rebellion should be paid by the U. S. or any State. All these great measures were forced through over the President's veto, and the bitterness between the President and the Republican party reached such a point that in Feb., 1868, the House of Representatives impeached him, resting their charges on his illegal removal of Stanton, his attacks upon Congress, and his stopping the execution of some of the acts of Congress. The President was acquitted, the vote standing guilty 35, not guilty 19—not a two-thirds majority, as required by the Constitution.

In that same year a new presidential election came on. President Johnson's efforts to build up a personal party failed as completely as those of Tyler under like circumstances. No one followed him and neither of the great parties would have anything to do with him. The Republican party met in Chicago on May 20 and nominated Gen. Grant for the presidency by acclamation. Schuyler Colfax, of Indiana, was nominated for Vice-President on the fifth ballot. The Democratic national convention met in New York on July 4, and nominated Horatio Seymour for President and Francis P. Blair, of Missouri, for Vice-President. The Republican platform sustained the Constitutional amendment, which recognized the results of the war, and the freedom of the slave, and which guaranteed protection to the Negro in his rights. They also sustained the reconstruction acts of Congress, pledged themselves to maintain the national credit and to provide for the soldiers, and denounced all forms of repudiation which had been much advocated by the Democratic leaders.

The Democrats took ground against this platform, and showed by their attitude and their nominations alike their hostility to the Republican policy. The people, however, wearied by four years of war and by the angry struggles with Johnson, were anxious above all things for a final settlement of these war issues. Gen. Grant tersely summed up the situation in his famous phrase: "Let us have peace." This became the watchword of the contest, and the Democratic campaign really broke down before the polls were reached. Gen. Grant was elected by a popular vote of 3,012,833 against 2,703,249, receiving in the electoral college 214 votes against 80 for Seymour. This election was decisive in favor of the acceptance of the results of the war, and drove the Democrats from any further attempt to take ground against them. It also sustained the Republican policy of equal suffrage and the rights of citizenship to all citizens without regard to color, and this policy was finally

secured by the Fifteenth Amendment to the Constitution, which soon after passed Congress, and, after ratification by the States, was proclaimed on Mar. 20, 1870.

Under the administration of Gen. Grant the leading question was the condition of the Southern States under the Reconstruction acts. The State governments which were then set up, resting on the black vote, were generally feeble and gave rise to many scandals. On the other hand, the murderous outrages committed by the Southern whites against all Republican voters angered the North and kept all the States lately in rebellion in a condition of disorder which invited the constant interference of the national authority. From every point of view the situation in the Southern States was depressing, and the dissatisfaction which it caused was directed very naturally against the party in power. This period also was one of general demoralization, the inevitable outcome of four years of fierce civil war, and the demoralization extended not only to politics but to business and society. It gave birth to wild stock speculations and to many scandals and corruptions, and the burden of these also fell, as it was sure to fall, on the party in power.

The Liberal Republican Movement.—The discontent thus engendered took shape in an independent movement in the Republican party headed by a number of Republican leaders who had broken with the administration on account of the San Domingo policy of Gen. Grant, and who were also desirous of attacking the abuses and corruptions to which the war period had given rise. These dissatisfied or Liberal Republicans, as they called themselves, held a national convention in Cincinnati in May, 1872. The plan was to nominate Charles Francis Adams for the presidency, a selection which would have made the movement a formidable one, but the convention broke away from the leaders and nominated Horace Greeley for President and B. Gratz Brown for Vice-President. They declared in their platform that sectional issues should be buried, that all the settlements of the war should be accepted, that civil-service reform should be begun, and that specie payments should be immediately restored. They left the tariff an open question and opposed all further grants of land to railroads. The regular Republicans met in Philadelphia in June and renominated Gen. Grant by acclamation, placing with him on the ticket Henry Wilson, of Massachusetts, for Vice-President. Their platform was more elaborate and touched upon more questions than that of the Liberals, but on those subjects in regard to which both platforms spoke the declarations were in principle the same. The regular Republicans reviewed the history of their party, demanded the acceptance of the results of the war and the protection of the colored voter, opposed grants to the railroads, and favored the reform of the civil service. They denounced the repudiation of the public debt and supported specie payments. The Liberals had left the tariff an open question, but had nominated a high protectionist as President. The regular Republicans declared squarely for protection, which had always been one of the cardinal principles of the party.

The Democrats met in July at Baltimore, ratified the nomination of the Liberal Republicans and adopted their platform. Thus they accepted as their candidate for the presidency a lifelong opponent, who had been an extreme abolitionist and was always a zealous protectionist, while they adopted as their platform a set of Republican principles in no one of which they believed. The result of such a performance it was not difficult to foresee. On the one hand it demoralized the Democratic party, while on the other the absurdity of the whole position prevented any serious break in the ranks of the Republicans. A straight-out Democratic ticket, nominated at Louisville in September, came to nothing and played no part in the election. Grant carried every State, except Georgia, Kentucky, Maryland, Missouri, Tennessee, and Texas. His popular vote was 3,597,070 against 2,834,079 for Greeley. In the electoral colleges Grant received 286 votes against 80 thrown for various candidates, Greeley having died between the election and the meeting of the colleges.

Although the Liberal movement broke down so completely in the presidential campaign, it made itself felt very strongly two years later, stimulated as it was by scandals which were connected with appointees and friends of the administration. During the preceding years, moreover, owing to the business disasters which followed the panic of 1873-74, a strong movement for "cheap money"—that is, for the unlimited issue of greenbacks—had grown up in certain States. Gen. Grant's veto of the inflation act of 1874, for

posed by the "great conspiracy" of 1875, was the final statement of the Republican position. This championship movement, however, added to the demoralization of the Liberal Republicans, resulting in the defeat of the Republicans in many Northern States in the election of 1876. The House for the first time since the war had a Democratic majority, and it seemed as if the side had turned finally against the Republicans. There were abundant indications on the days of the Republicanism were numbered, that their work was done and that they would soon disband. The speakers of the Democratic House, however, and the rise of the independence movement with which the Democrats were proud to ally themselves, soon altered the situation. The Republicans regained in 1875 many of the States which they had lost in the preceding year, and faced the approaching presidential election with much brighter prospects than any since 1873 would have anticipated.

Election and Administration of Rutherford B. Hayes.—The Republican convention met at Cincinnati June 18, 1876. Blaine was the leading candidate. The other candidates were Sumner Burton, of Indiana, Roscoe Conkling, of New York, Gov. Hartford, of Pennsylvania, Gov. Hayes, of Ohio, and Benjamin D. Boyer, of Kentucky, who had a strong support from the Liberal Republican element and several who were dissatisfied with the Grant administration. The convention was a striking one, but finally a nomination was made against Blaine by the friends of the other candidates, which resulted in the nomination of Hayes on the seventh ballot. William A. Wheeler, of New York, was then nominated for Vice-President. The platform declared for the maintenance of the public credit and the resumption of specie payments, for the enforcement of national laws in the South, for civil service reform, for protection, and for an independent administration of Chinese immigration. It declared against secessionism, for sectarian schools, and against violence to the territories.

The Democratic convention met in St. Louis June 27. They nominated voters of every kind, were somewhat vague upon the money question, declared for a tariff for revenue only, and nominated the Republican party at great length. Some of the platform they nominated Samuel J. Tilden, of New York, and Thomas A. Hendricks, of Indiana. The session was hotly contested, and very close. The Democrats had now regained control of most of the Southern States, and by great frauds attempted to take them all. After the vote had been counted, the electoral votes of South Carolina, Florida, Louisiana, and Oregon were in controversy, and Tilden lacked only one vote of a majority. The dispute was carried into Congress and assumed a most disgusting aspect. The great issue and patriotism, however, of the leaders on both sides prevailed, and the disputed votes were referred to an electoral commission to decide the points at issue. This commission, after full investigation, awarded all the contested votes to Hayes, thus giving him the electoral votes to 184 by Tilden. In this way the majority escaped a very serious danger, and on Mar. 4 Hayes was consecrated inaugurated. President Hayes at once abandoned the policy of national interference in private affairs in the Southern States, and those which had been Republican up to 1876 now passed finally under Democratic control. In other respects the Hayes administration was a successful one. Its greatest triumph was the resumption of specie payments and the refunding of the public debt under the able management of John Sherman, its Secretary of the Treasury. There was also a great improvement in general administration, and many of the abuses which had grown up during and after the war were corrected. In Congress these four years were marked by the rise of the agitation for the free coinage of silver. A bill for free coinage passed the House, but resulted in the final passage of a compromise measure known as the "Bland-Allison act." This bill was vetoed by President Hayes but passed over his veto and went upon the statute books in 1876, where it remained for twelve years.

Election of Garfield and Arthur.—The Hayes administration as a whole strengthened the party, and the Democratic convention met at Chicago in June, 1880, under favorable auspices. It was the most memorable convention any one party since the Democratic convention at Cincinnati in 1894. The contest in the convention, beginning with the question of diluted representation, lasted a week. The leading candidates were Gen. Grant and Mr. Bryan. Grant had to contend with the future popular

loyal House elements which had been so dissatisfied with his previous administration. Yet notwithstanding these obstacles Grant's great military services and personal popularity, combined with the support of Senators Conkling, Logan, and Cameron, made his candidacy very formidable. Blaine also had a large vote in the convention, but little short of that given to Gen. Grant. The balance of power was held by the supporters of John Sherman and of Senator Edmunds, who had the support of Venable and Massachusetts. Finally, after a most stubborn contest, the minority candidates combined against Gen. Grant and nominated Gen. Garfield, of Ohio, on the thirty-sixth ballot. Chester A. Arthur, of New York, was nominated for Vice-President, as representing the Grant forces in the convention. The platform reviewed the history of the two parties, asserted the national principle as opposed to State rights, and declared for protection and against Chinese immigration.

The Democratic convention met at Cincinnati on June 29. Mr. Tilden, who represented in his own person the issue upon which the Democrats had been insisting that they had been defrauded of the presidency four years before, wrote a letter declining the nomination. Rather unexpectedly, perhaps, the convention took him at his word and nominated Gen. Hancock for President and William H. English, for Vice-President. The campaign at first was rather languid, the principal question being the old Southern issue; but when the Democrats in combination with the Free-traders carried Maine in September, the Republicans, thoroughly alarmed, forced the tariff issue to the front, and, attacking the Democrats on their plank for a tariff for revenue only, carried Ohio and Indiana in October and the country in November. The victory would have been even more decisive but for a forged letter purporting to be written by Gen. Garfield in favor of the Chinese, which came out in the last hours of the campaign and which cost the Republican party California and Nevada. As it was, Garfield had 214 electoral votes against 155 for Hancock.

Gen. Garfield made up a strong cabinet with Blaine at its head as Secretary of State, but a bitter quarrel between the administration and the Senators from New York broke out almost at once. The New York appointments were made from those persons who had opposed Senator Conkling and supported Blaine for President. Particularly objectionable to the Senators was the selection of W. H. Robertson as collector of the port of New York, and upon this came an open break. Senators Conkling and Platt resigned and appealed to the New York Legislature to sustain them in their course by a re-election. This the Legislature after a bitter contest refused to do, and elected in their places Messrs. Tappan and Miller. This quarrel, and the attacks upon the Star Route contracts by the Government, filled the first months of the new administration with bitterness and strife. Indirectly it excited a disappointed office-seeker, Guiteau, of unbalanced mind and criminal propensities. Angered at not securing an office, he lay in wait at the railway station at Washington, D. C., and there shot the President on July 2, 1881. Gen. Garfield lingered for many weeks after the shooting, but finally died, on Sept. 19, at Elberon, N. J.

He was succeeded by Vice-President Arthur, who filled out the remainder of the term and gave the republic a most excellent and business-like, although uneventful, administration. The conflicts, however, within the party at the beginning of the Garfield administration bore fruit after the general grief over the assassination of the President had subsided. The elections of 1882 went heavily against the Republicans, especially in New York, where the interference of the administration with the nominations produced so much dissatisfaction that Grover Cleveland was elected governor over Secretary Folger, the Republican candidate, by a majority which reached nearly 200,000.

The Campaign of 1884.—In the convention of 1884 the old fight between those who had supported Gen. Grant and those who had opposed him, or between the "Stalwarts" and the "Half-Breeds," as they were called at the time, was fiercely renewed. Blaine was the leading candidate, and against him were arrayed the supporters of President Arthur combined with the elements which had united with Blaine in 1880 to defeat Gen. Grant. Nothing, however, could withstand Blaine's great personal popularity. He was nominated on the fourth ballot, and Gen. Logan, of Illinois, was put on the ticket with him as Vice-President. The platform, after reviewing the history of the Republican party, declared for international bimetallism, the regulation of interstate commerce, the reform of the civil service, and the resump-

tion of lapsed land grants. It favored also liberal pensions and the building up of the navy, and declared against Chinese immigration, and fraud and violence in the South. The leading resolution, however, concerned the tariff, which of late years had been coming more and more steadily to the front, and upon this the Republican party took, as it had always taken, bold and advanced ground in favor of protection to American industries. The Democrats met on July 8, at Chicago, and nominated Grover Cleveland for president and Thomas A. Hendricks for Vice-President. The platform declared in favor of reform in general after the manner of opposition platforms, but most particularly for tariff reform.

Platforms, however, played but little part in the exciting and bitter campaign which followed. There was a great deal of Republican opposition to Blaine, especially in the Eastern States, where it took the form of an open revolt of a most serious character against the Republican party. Although the Republicans tried to fight their battle on the tariff issue, this revolt made the campaign a purely personal one, and it had all the odious features of savage abuse of the candidates, which such contests are sure to engender. Issues were lost sight of, and the struggle finally turned solely on the question whether Blaine should or should not be President of the U. S. Despite the great schism, Blaine's personal popularity was so great that he attracted large bodies of Democratic voters and made up the Republican losses. New York, which decided the election, gave Cleveland, instead of the 192,000 plurality, which he had received in 1882, less than 1,200, and it was by many persons believed that even this narrow margin was obtained only by counting in New York city for Cleveland the vote cast there for Gen. Butler, who ran as an independent candidate for the presidency. In the electoral colleges Cleveland and Hendricks received 219 votes against 182 for Blaine and Logan. During the first two years of Cleveland's term the general talk in favor of reform went on, but very little was accomplished of a specific kind, and the fact that the Senate remained Republican prevented any violent legislation, if such had been desired. The elections of 1886 went against the Democrats, but they still retained control in the House by a narrow majority. The failure thus far to accomplish anything led, however, to a new departure. President Cleveland sent in to the Fifty-third Congress a message devoted to the single subject of the tariff and demanding instant and radical reductions. This message resulted in the introduction of the Mills Bill, which the House debated at great length for three or four months. It passed the House on July 13, 1888, and on the issue thus raised the two great parties appealed to the country.

The Administration of Harrison.—The Republicans met on June 19 at Chicago. Blaine withdrew his name, and on the eighth ballot Benjamin Harrison, of Indiana, was nominated for President, and this was followed by the nomination of Levi P. Morton, of New York, for Vice-President. The Republican platform favored bimetalism, the building up of the merchant marine, the admission of new States, and the reform of the civil service. It attacked the Democrats for their failure to settle the fishery question and for their feeble foreign policy, but, as in 1884, it made the tariff the leading issue, and declared more uncompromisingly than ever in favor of protection.

The Democrats met in July at St. Louis and nominated Grover Cleveland for President and Allen G. Thurman, of Ohio, for Vice-President. They too made the tariff the leading issue, and, although they did not declare for absolute free trade, they demanded such heavy reductions that the practical result would have been the same. The campaign turned on the issue of protection or free trade, and the Republicans were victorious throughout the Northern States, except in Connecticut and New Jersey. They also carried the House and kept their hold upon the Senate. They were therefore in control of every branch of the Government, and the Fifty-first Congress, which followed, was a remarkable and memorable one.

The first great contest was in the House of Representatives, where the Democratic minority undertook by the use of the rules to prevent the transaction of business. Thomas B. Reed, of Maine, was elected Speaker, and under his lead a reform of the rules was accomplished, which gave the majority power to act. Reed's policy and rulings were the subject of bitter attack, but every one of his principles has since been adopted by the Democrats themselves and sustained by the Supreme Court, thus completely vindicating his action. The Republicans were in this way enabled to

pass a large amount of most important legislation. To this Congress is due the international copyright law, a long-delayed measure of justice and good sense. To it are also due the inspection laws which opened the markets of Europe to the meat products of the U. S., generous appropriations for building up the navy, and mail subsidies to develop steamship lines. Many other valuable measures of a non-political character were also carried through. The two great party measures were the bill to regulate national elections, which passed the House and failed in the Senate, and the new protective tariff, which became law on Oct. 1, 1890. In the elections which followed for the House of Representatives, the Republicans were very badly beaten. The amount of legislation which they had secured brought, as it always does, reaction and opposition, but the chief cause of their defeat was the outcry raised against the McKinley Act on the ground that it was too extreme and that it would raise prices. During the remaining years of President Harrison's administration the fact that the two Houses were controlled by different parties prevented action.

The Campaign of 1892.—In 1892 the Republican party met in convention at Minneapolis, and after a contest caused by the hostility to the administration among many party leaders, President Harrison was renominated and Whitelaw Reid, of New York, was put on the ticket with him as Vice-President. The Democrats renominated Grover Cleveland, who was bitterly but unavailingly opposed by the delegates from his own State, and nominated with him for Vice-President Adlai E. Stevenson, of Illinois.

This campaign, like the preceding one, turned upon the question of the tariff, the McKinley Act furnishing the text as the Mills Bill had done in 1888. The Republicans made a partial recovery from the disasters of 1890, but were nevertheless decisively beaten, several Northern States giving their votes to the Democrats for the first time. In the electoral colleges Cleveland and Stevenson received 277 votes to 145 votes for Harrison and Reid, and 22 votes for Weaver and Field, the Populist candidates. The Democrats also carried both the Senate and the House, and on Mar. 4, 1893, came for the first time in thirty-five years into full control of all branches of the Government. In April a business panic began, which reached in the following summer great intensity. The Democrats declared that this was due to the existence of the Sherman Act passed by a Republican Congress as a compromise measure, providing for the purchase, by the Treasury, of \$4,000,000 of silver bullion every month. President Cleveland called Congress in extra session on Aug. 7, and after an obstinate struggle of three months the purchasing clauses of the Sherman Act were finally repealed by a combination of Republican and Democratic votes, but the repeal, which was a wise measure, did not relieve or improve business. The business depression still continued while the Democrats were engaged in a revision of the tariff, which bore no resemblance to the promises of their platform, and the Republican party made large gains at all the by-elections. At last in August the Democrats passed their Tariff Bill just as it came from the Senate, where the House bill received over 600 amendments of a protective character. The President refused to sign the bill, and, after denouncing it in the severest terms in public letters to two members of the House, permitted it to become law without his signature. In the general elections of Nov., 1894, the Republicans appealed to the people against the Democratic failure in the matters of tariff and finance, the business disasters they had caused, and also against their feeble and blundering foreign policy. The Republicans carried the elections overwhelmingly, gaining over 100 seats in the House and seven seats in the Senate. H. C. LODGE.

Repudiation [from Lat. *repudiare*, divorce, reject, scorn, repudiate, deriv. of *repudium*, a casting off; *re-*, back + *pudē*, it shames]: an act by which an administration declines to be bound by the debts contracted by the governments which have preceded it. In European history there are numerous instances of a government annihilating a portion of its debt by converting it into a lower denomination, and similar instances have occurred in Mississippi and Pennsylvania.

Requisitions [from Lat. *requisitiō*, a search for, requirement, deriv. of *requirere*, search for, require; *re-*, back, again + *quaerere*, *quaesitum*, seek, ask]: (1) formal demands by one government on another for the extradition of criminals (for treatment, see *EXTRADITION*); (2) in the international laws of war, demands for necessities by an invader on an

mobile property. These have not always been distinguished from the immovable by *res. taliorum*; after the German drives the French out of Alsace, that is, a contribution to what the French call a *contribution* levied by an invading army are levied to pay or give the victor to secure themselves from pillage, while a *contribution* is the demand made by the military authorities that the inhabitants shall place things and men, property of their domain. A *contribution* is especially a payment in money, collected for the purposes of carrying on civil government in the occupied district or for general military uses. *Requisitions*, essentially, are forced supplies of material necessary for the carrying on of war, such as food and drink, fuel, horses, rolling stock for railways and highways, baggage taken and a variety of other things. They can be levied under the authority of the commander of any armed force but can not be made without authority, for they cannot be pillage, which is illegal. The account for them given by commentators as payments for exemption from pillage, is absurd; for pillage is barbarous and a civilized warfare the principle is that war is not waged against a single private person, and that his property is in sacred safe. But the requirements of an army of occupation for food and shelter, as well as the immediate needs of war and supplies of transport and its unoccupied natives, who put are overwhelmed with by the disaster, have made necessary such harsh necessities in some cases seem just and necessary.

The following rules express what the regulations of war ought to be, except in circumstances of extreme necessity, in which severe punishment of towns or communities is called for by their conduct. (1) The private citizen, however situated in the war, is not to be treated as an enemy, and his property is to be respected. (2) The civil government in occupied territory must go on, under control of the invading commander as the express of the inhabitants. For the civil laws must be ruled as before. (3) Special services for the army, supplies of food and other necessities ought to be levied for women or labor and for this civil requisition should be given. However these do not necessarily involve payment for the requisitioning force, though this is sometimes given, as the aid of this war their payments may be provided for under the invading party as one of the terms of peace, or as the acknowledgment of the citizen whose property is requisitioned. (4) It is an unjust rule to make war pay for war, though it might be required at the making of a peace. The payment, promise of feeding, clothing, and supplying of some troops, the even requisitioning has limited the necessity for requisitions, but they are still lawful. (5) For requisitioning in a town or district in the way of fines, or of levying collections on leading citizens, or of levying which have been threatened since in quite recent times, there is very strong a sufficient justification. For do severe requisitions a wholesale punishment do very good. Napoleon in his *Maxims* acknowledges that the success in the way of requisitioning during the war with Spain contributed not a little to the French success in the Peninsula.

The following are some typical modern opinions on this necessary but unhappy somewhat indefinite subject: (1) In the *Instructions for the Armies of the United States* in the field the rights of the citizen private property is limited in cases of necessity, and the violated owner is declared to be entitled to a receipt, that he may obtain indemnity. (2) *W. L. G. 1861*. (3) *M. 1861* considers to an enemy the right of levying contributions or others to supply his army with the necessary provisions, on condition of purchasing them at a certain price determined in advance. (4) *Hoffm. 1861*. According to him if the *Volkswirtschaft*, the economic system of a state and its contributions, demand products of the soil and personal services in cases of necessity or emergency may even take them by force, leaving all adjustments to the political arrangements of the future. A definite limit to the right of taking can not be laid down, for there is no measure of force in war. (5) *H. 1861*. (6) *H. 1861*. The levying of what the population of an occupied province ought to be required to do for an army of occupation, etc. All these services through ground, according to circumstances, for commercial. We must distinguish between services which can be demanded simply on the score of war and obligation of the population to pay taxes—the former of which is either defined by legislation or by practice, such as regard to which in these particulars, much must be left to the discretion of the commander—and services which are beyond this measure, and therefore, by natural law, are to be called for only as giving a right to compensation.

ton. (7) *H. 1861*. "The duty of compensation is hard to be reduced to rule, and harder still to be carried through in practice." (8) *H. 1861* admits, with most authors, that an army occupying an enemy's territory may demand from the community or from the inhabitants that which is necessary for its support and movements, but these requisitions ought to be limited to things absolutely indispensable. (9) *H. 1861*. In Mexico, requisitions from requisitions, paid for provisions, and took nothing by force without indemnifying those who held the property, except on rare occasions, when it was impossible to act otherwise. (10) *H. 1861*. (11) The project of an international declaration concerning the rules and usage of war, adopted at Brussels in 1874, which differs somewhat from the project submitted by Russia at the same congress but probably not for the better in respect to requisitions, contains the following provisions: Art. 40. "As private property ought to be respected, the enemy shall not demand from communities nor from their inhabitants articles or services except such as relate to the necessities of war generally acknowledged, and are proportionate to the resources of the country, and which do not imply for the population the obligation to take part in the war against their country." Art. 41. "The enemy levying contributions, whether as an equivalent to imports or to exports to be furnished in kind, or by way of fine, shall proceed therein, as far as possible, only according to the rules of assessment and the plan of imports in use in the occupied territory. For every contribution a receipt shall be given to the person making the payment." Art. 42. "Requisitions shall be made only with the authorization of the commander of the locality occupied. For every requisition an indemnity shall be granted or a receipt delivered." A part of the Russian project which was not accepted is worthy of notice: Art. 43. "The enemy can demand from the local population all the imports, services, and fines, in kind or in money, to which the armies of the legal government have a right." See *W. L. G. 1861* in *International Law*, § 110.

Revised by T. S. W. W. W.

Resaca de la Palma, *resaca de la palma*, sometimes called *Resaca de la palma*, a battle in Southern Texas, 4 miles S. of Matamoros, Mexico. After his victory at Palo Alto (May 9, 1846), Gen. Taylor, with 2,300 troops, pursued the Mexicans (4,000 to 5,000, commanded by Arista) to this place; on the 9th he attacked and completely defeated them, capturing all the artillery and weapons.

H. H. S.

Rescission [from Lat. *rescindere*, annulment, abrogation; deriv. of *rescindere*, *rescindere*, to cut up, to tear up, to annul; *res*, back, again; *scindere*, cut]; in law, a rescinding or making void, annulment, abrogation, in the law of contracts, the annulling or voiding of a contract so that it can no longer be enforced between the parties unless it is renewed by mutual consent. A contract may be expressly rescinded; or it may be treated as rescinded where one party to it fails to perform his part of the contract, or disavows himself from performing it, and the other party has not been guilty of default on his part. Where, however, the failure in performance is partial, leaving a distinct part as a subsisting and executed consideration so that the other party may recover his damages for the part not performed in an action for that purpose, a contract can not generally be rescinded; nor can it generally be rescinded by one of the parties unless both can be restored to the condition they were in before the contract was made. See the general treatises on *Contracts* of Parsons, Story, and Bishop; *H. 1861* in *Law of Sale of Personal Property*, etc.

F. STURGES ALLEN.

Reservoir [from Fr. *reservoir* < Lat. *lat. reservoirium*, storeroom, deriv. of *reservare*, keep, store up; *res*, back, up; *servare*, keep]; in engineering, a lake or basin for holding water fitted with appliances for regulating the outflow of water at different rates from the inflow, thus enabling either a more or less regular supply to be distributed at irregular intervals of time or an irregular supply to be distributed at a uniform rate. Of the first class are what are termed *storage reservoirs*, which are generally constructed on the course of a stream by the erection of a dam, enabling the constantly flowing water to be impounded when it is in excess of the quantity needed for regular use and to be drawn off when the natural flow of the stream is less than the average demand. Enormous reservoirs of this kind were constructed in India and in Egypt at periods antedating any historical records, and many of them are still used

for their original purpose of making agriculture possible in regions where the seasons of rainfall and of the growing crops are separated by a considerable interval of time, while of many others traces alone remain. It is claimed that in Egypt the building of such reservoirs may in all probability be traced back to the days of the patriarch Joseph. In India there remain traces of the Poonairy reservoir, which by the construction of 30 miles of dams flooded 40,000 acres of land, and the Veeranum reservoir, which flooded 22,000 acres. The great Mudduk Masoor reservoir in India, constructed in the fifteenth century, was 108 feet deep, flooded 26,000 acres, and held 280,000 million gal. In the island of Ceylon there is an ancient reservoir covering an area of 10,000 acres.

No reservoirs of such magnitude as these have been constructed for several hundred years, but there are many thousand smaller ones. In Madras alone there are 50,000. In the nineteenth century the largest have been built by the British in India for storing water for irrigation, and several of considerable size have been constructed in California and New Mexico for the same purpose. A number of large reservoirs have been built in Spain, also for irrigation. In the rest of Europe and in the eastern portion of the U. S. the principal purpose for which storage reservoirs have been constructed is the supply of water to cities, and a large number of such have been built.

The question of the capacity necessary to insure the most economical results in reservoirs fed by streams which are subject to great variations of flow and the water of which is to be used for supplying the demands of a population which is constantly increasing and which at the same time is irregular in its requirements, has received careful study from civil engineers. The determination of this question involves considerations of climatic peculiarities, the relation between different topographical and geological conditions and the amount of water which a watershed will annually yield to a stream, and the rate at which at different seasons of the year a given population will consume water. The general conclusions reached by hydraulic engineers with reference to the economical dimensions of storage reservoirs for city water-supply in the temperate zone are that such reservoirs should contain a quantity of water equivalent to one-half of the total annual consumption anticipated in the city, and that the greatest efficiency can be obtained from any reservoir when its capacity is about 100 million gal. for each square mile of territory from which its supply is derived.

Among the largest storage reservoirs for water-supply to cities are the Vyrnwy for Liverpool, containing 11,900 million gal.; the Vehar for Bombay, containing 10,800 million gal.; the San Mateo for San Francisco, holding 31,000 million gal.; the Yan Yean for Melbourne, Australia, 6,400 million gal.; on the Croton river, New York, the Boyd's Corners, 2,727 million gal.; the Middle Branch, 4,004 million gal.; the East Branch, 9,028 million gal.; the Titicaca, 7,000 million gal.; the Carmel, 9,000 million gal.; and the new Croton, begun in 1894, to hold 32,000 million gal. There are numerous storage reservoirs for other cities in both Europe and America holding from 500 to 1,000 million gal. See the article RESERVOIR DAMS.

For the immediate daily demands of cities service reservoirs are required, and their capacity need not be much in excess of a single day's supply, their function being merely to keep the supply constant during the varying draughts at different times of day and different seasons of the year. They are generally located as near the center of distribution as practicable, and the water furnished to them by gravity from storage reservoirs or by pumping from the source of supply. Wherever possible, they are constructed on a summit by excavating sufficient material to make an embankment around the pit, and thus give the greatest capacity at the highest elevation. The largest reservoir of this type is in Central Park, New York city, and covers 96 acres and contains 1,200 million gal. A good example of a service reservoir constructed entirely above the surface of the ground with masonry walls is the Murray Hill reservoir in New York city, which is 400 feet square and holds 24 million gal. In many cases of small supply in flat regions service reservoirs are iron tanks or stand pipes from 5 to 40 feet in diameter and 50 to 250 feet in height. A fine example of such a reservoir is at Princeton, N. J., where a tank 20 feet in diameter and 60 feet high is placed on an iron trestle 60 feet high. On top of the tank is a meteorological observatory.

J. JAMES R. COLES.

Reservoir Dams: artificial structures built across valleys through which streams flow, for the purpose of obstructing the natural flow of the water, raising its level, and thereby forming lakes or reservoirs. The simplest dam is one formed by filling a narrow gorge between high banks with loose rock and stones and gravel and then permitting the interstices to become clogged by the sediment brought down by the stream in freshets or by earth thrown in above the dam for the purpose. This method has been adopted even in works of recent construction in the western parts of the U. S., but such dams have in several instances been destroyed by freshets.

Where this crude method seems impracticable or injudicious and yet small expenditure is essential, dams are built of a cribwork of timber filled in with stones and sometimes faced with plank with close joints and frequently backed up with earth. There is a dam of this type, 1,017 feet long and 28 to 32 feet high, across the Connecticut river at South Hadley Falls, Mass. In such dams as those above named the water of freshets in the stream may be allowed to flow over the top of the dam. In cases where the water of freshets can be carried off by an independent channel, the best form of construction of a dam not exceeding 40 to 50 feet in height is usually an earth embankment, the width at the bottom being from three to four times the height of the dam. It is essential to the safety of a dam of this kind that its foundations should be made secure against the percolation of water through the bank, that the bank should be built of selected material put on in thin layers and thoroughly moistened, rammed, and rolled, and that the face of the dam on the water side should be protected with a stone paving. Owing to the difficulty of making an earthen dam under heavy pressure absolutely tight, it is customary to build in the center of the embankment a wall either of puddle clay or of masonry. The neglect of proper precautions to prevent the percolation of water through high earthen dams, either with or without masonry heart walls, has resulted in severe disasters, such as the failure of the Dale dyke at Sheffield, England, in 1864, the Mill river dam in Connecticut in 1875, the Worcester dam in Massachusetts in 1876, the South Fork dam at Johnstown, Pa., on May 21, 1889, the Pottsville dam in 1892, and the Portland, Me., reservoir dam in 1893. There are in the U. S. ten earthen dams more than 60 feet high for waterworks, two of which—the dam at Pilarcitos, Cal., 95 feet high, and that at San Andreas, Cal., 98 feet high—have no central wall either of puddle or masonry. The highest is that at Druid Lake at Baltimore, which is 119 feet high and has a puddle heart wall.

A structure of water-tight stone masonry is the type of dam which is most susceptible of being built on scientific principles, so that the minimum amount of material may be used with the maximum beneficial effect. The earliest application of masonry to the construction of large dams is believed to have been made by Spanish engineers about the middle of the fifteenth century. The dam of Almanza, 69 feet high with a thickness of 10 feet at top and 34 feet at bottom, has stood for over 300 years, and sustains a greater pressure per square foot than any other reservoir dam or than is considered prudent in construction at present. The Alicante dam, 141 feet high, is still in use, creating a reservoir for irrigation which holds 975 million gal.

In France the earliest high masonry dam was built at Lampy about 1776. Several others were constructed during the first half of the nineteenth century. All the masonry dams over 50 feet in height built prior to 1850 are believed to be as follows:

NAMES.	Date.	Height.	THICKNESS	
			Top.	Bottom.
Almanza, Spain	1560-65	69	10	34
Alicante, Spain	1579-94	141	66	111
Elche, Spain	1590	76	30	40
Huesca, Spain	1690	66	36	53
Lampy, France	1776-82	53	16	37
Puentes, Spain*	1785-91	165	36	146
Val de Inferno, Spain	1785-91	116	41	138
Grois Bois, France	1830-38	93	21	46
Chazilly, France	1840-45	74	13	53
Nijar, Spain	1843-48	101	24	68
Zola, France	1843-50	120	19	42
Lozoya, Spain	1850	105	22	128

* Failed.

It will be observed that there is a great difference in the proportions of these dams, displaying great diversity of opinion among the engineers who designed them. It was not

Resilience [from Lat. *resili're*, spring back; *re*-, back + *sali're*, leap]: the capacity of a material to resist shocks or repeated stresses, the measure of which is one-half the product of the force by the linear elongation or compression produced, provided the material is not strained beyond the elastic limit. Thus if two bars of metal stretch 0.03 and 0.06 inches under tensile stresses of 1,000 and 2,000 lb. respectively, their relative resiliences are as 0.03 by 1,000 to 0.06 by 2,000, or as 1 to 4. The modulus of resilience is the resilience for a bar 1 inch in length and 1 sq. inch in cross-section when the stress is equal to the elastic limit of the material. Approximate average values of the modulus of resilience for timber, cast iron, and wrought iron are 3, 1, and 12 inch pounds respectively. The total work done in rupture of a beam or bar is called its ultimate resilience. See **STRENGTH OF MATERIALS**. MANSFIELD MERRIMAN.

Resina: town of Italy; province of Naples; 5 miles S. E. of the city of Naples; at the foot of Vesuvius between Portici and Torre del Greco (see map of Italy, ref. 7-F). It is built on masses of lava which cover a large part of ancient Retina and Herculaneum. The sinking of a shaft here in 1709 led to the discovery of remains of the theater of Herculaneum 90 feet below. In the vicinity are many attractive villas, the most frequented being La Favorita, the principal hall of which is inlaid with marbles from the palace of Tiberius at Capri. Pop. 13,626. E. A. GROSVENOR.

Resins [viâ O. Fr. from Lat. *resina*, from Gr. *ῥηῖν*, resin, pitch]: a class of bodies that occur very widely distributed in plants mostly together with volatile oils, dissolved in which they frequently flow from trees accidentally or intentionally cut. Crude resins are never crystallized, but have the form of drops, like gum. They are generally colored yellow. Most resins consist of several simple compounds which, however, as a rule, can not be separated from one another. The number of resins is very large. They are used for preparing **VARNISHES** (q. v.), sealing-wax, soap, for stiffening hat-bodies, etc. The most important are **AMBER**, **COPAL**, **DAMMAR**, **DRAGON'S BLOOD**, **MASTIC**, **LAC**, **ROSIN** (or **colophony**), and **SANDARACH** (q. v.). See also **GUM-RESINS**. IRA REMSEN.

Resolution of Forces: the mathematical separation of forces into component parts; the converse of **COMPOSITION OF FORCES** (q. v.).

Resolution of Rotations: See **MOTION**.

Resorcin [*resin + orcin*], or **Resorcinol**: $C_6H_4(OH)_2$, a diatomic phenol prepared on the large scale by the action of caustic soda on benzene-disulphonic acid. It is soluble in water, alcohol, and ether, and is used for preparing fluorescein, eosin, and other phthalic acid colors. See **PHTHALIC ACID**.

Respiration [from Lat. *respiratio*, breathing, deriv. of *respira're*, breathe, inspire and expire; *re*-, again + *spira're*, breathe]: the special function of the lungs, the process which has for its ultimate object the supplying of red blood-globules with oxygen for transmission to the various parts of the body. To accomplish this result, atmospheric air must be introduced frequently and continuously, an extensive surface of contact for air and blood must exist, and the effete products of the chemico-vital interchange must be exhaled.

The physical act of respiration or breathing embraces two parts, inspiration and expiration, and there are two distinct methods of breathing, the abdominal and the thoracic. In abdominal breathing the muscles of the abdomen by contraction force the viscera upward against the diaphragm, which becomes arched into the thoracic cavity and forces the air out of the lungs. Then the diaphragm, contracting, pushes the abdominal viscera downward, and thereby makes room for entrance of inspiratory air. In the thoracic type of breathing various external muscles elevate the ribs and sternum, and thus materially increase the chest capacity, causing inspiration. This completed, the weight of the chest walls, with the assistance of certain muscles, causes descent of the sternum and ribs, and, in conjunction with the natural contractility of the lung substance, forces the air out. The abdominal type of breathing is predominant in men, the thoracic in women.

Respiratory action of the lungs is involuntary, although it may be voluntarily modified. The *besoin de respirer*, or involuntary incentive to breathe, is the result of impressions received by the medulla oblongata from the several regions of the body, which constantly demand oxygen, and

transmitted to the respiratory muscles of the thorax and abdomen. From eighteen to twenty respiratory acts take place per minute, at each of which an average of about 26 cubic inches of air is inspired and expired. This definite volume of air which ebbs and flows is termed *tidal air*. In addition, fully 100 cubic inches of air, unaffected by respiratory movement, remains in the smaller bronchi and air-sacs, and is termed *residual air*. Tidal inspiratory air is fresh and pure; it enters as far as the fourth divisions of the bronchi, and becomes a part of the relatively impure residual air. Tidal expiratory air contains carbonic-acid gas, which is exhaled and removed from the body. Each inspiratory act, therefore, adds an increment of oxygen to the bulk of air in the lungs; this oxygen, by the law of diffusion of gases, permeates the residual air and reaches the air-sacs. The air-sacs are thin-walled; indeed, their walls are essentially a network of capillary vessels held together by a film of elastic tissue. In the aggregate, the walls of the innumerable air-sacs constitute a surface of many hundred square feet, upon which the *rete mirabile* or delicate network of capillary blood-vessels is spread. The pulmonary artery brings impure or venous blood to this extensive surface, carbonic-acid gas is exchanged for oxygen, and the purified, reddened, oxygenated blood is returned by the pulmonary vein to the left side of the heart, thence to be propelled through the entire circulation. The red blood-globules are the carriers of oxygen, and the full object of the preliminary respiratory efforts and the intermediate chemico-vital interchange is really attained as these red globules yield their quota of oxygen to the cells and tissues which constitute the body. For a description of the respiratory organs see **HISTOLOGY**; for artificial respiration see **RESCUATION**; and for respiration in animals see **ANATOMY, COMPARATIVE**. See also **RESPIRATORY SOUNDS**.

Revised by W. PEPPER.

Respiration (in plants): See **PHYSIOLOGY, VEGETABLE**.

Respirators [from Lat. **respirator*, one who breathes, deriv. of *respira're*, breathe]: mouth-pieces of fine gauze and cloth, to be worn by persons with diseased or weak lungs to prevent the ingress of cold and damp air or foreign matter, as smoke, dust, or the grit of stone. They are little used in the U. S., but are much employed in Great Britain, especially by grinders and stone-carvers, and wherever the air is permeated by impalpable particles.

Respiratory Sounds [*respiratory* is from Lat. *respira're*, breathe]: the sounds produced by inspiration and expiration, as heard by the method termed auscultation, the application of the ear to the chest directly, or indirectly through the medium of the stethoscope. If the entire period of a respiratory act be represented by ten, inspiration will occupy five-tenths of this period; expiration immediately follows during the succeeding four-tenths; and finally a period of silence and rest from breathing during the supplementary period of one-tenth. During the entire period of the inspiratory act the ear applied to a healthy chest detects a clear, full, breezy, or blowing sound, gentle at its commencement, full and well defined at its middle, and graduated and faint as it is terminating. The inspiratory sound is soft and low-pitched in adults; in children is ruder and exaggerated, possessing tubular or friction quality. Expiratory sound is comparatively faint, occupying but a small part of the period of the expiratory act. It also is soft and low-pitched, but more feeble and distant than inspiratory sound, since the recedence of expired air from the chest-walls conducts the sound-waves away from the ear of the listener. Expiratory sound is loudest at its commencement, just as the transition from inspiration has taken place, and gently graduates until it ceases. Inspiratory sound is the result of air-friction with the system of bronchial tubes through which it passes. Hence inspiration is a compound sound, possessing an element of laryngeal origin, elements of sound developed in the trachea, the large and small bronchial tubes, and especially where the tubes bifurcate; and finally an important element developed by the entrance of air into the numberless air-sacs or pulmonary vesicles. This vesicular element of inspiratory sound is a test of the healthy lung. Departures from the normal respiratory sounds are evidences of bronchial, pleural, or pulmonary disease. The sounds are harsh in early bronchitis, replaced or accompanied by *râle* or musical sounds in advanced bronchitis; they are masked or completely obscured by pleurisy; their inspiratory and expiratory periods have changed relations and qualities in asthma and emphysema; and in

united in sin and redemption, will be united in judgment and glory or shame. It confirms the divinity of Christ and his atonement, and is intimately related to justification, faith, repentance, sanctification, and the whole Christian system. It is the foundation of the Christian week and year.

The resurrection implies the continued identity of the body—that the future body is in essence identical with the present body, one being the veiled germ, the other the glorious development. Concerning identity, it has been taught that (1) all the particles of matter that have ever been in the body are brought together again; (2) only the particles present at death; (3) certain more enduring parts are preserved, as an indestructible corporeal germ from which is made by divine power an organ of the soul adapted to its higher condition; (4) some of the particles remain, however few; (5) there is a "vital germ"; (6) a spiritual, "ethereal, luminous" body is evolved at the moment of death; (7) that the plastic formative principle of life (*anima, psyche*) is continually gathering and casting off the matter it needs for a body wherever it may be. The continuance of the vital principle constitutes identity, however the particles of matter may change, as in a flowing stream. In the case of Christ and those alive at his coming, the body then present supplies the material; in the case of the dead, the *anima* or *psyche* gathers in matter as it needs and makes the psychical body. The fundamental "form" or principle of bodily organism, which here appropriates earthly materials, shall in the resurrection appropriate higher materials. (8) That identity is in the spirit (*vous*), the rational, immortal principle which shows itself in the body which it occupies and stamps with its own personality. Identity in an inorganic body—e. g. a stone—is in its substance and form; in an organic body, in the whole organism; in a person it rests in the consciousness.

The resurrection body is (1) spiritual (*soma pneumatikon*), as opposed to the "natural" (*soma psychikon*); (2) like Christ's body; (3) glorious, powerful, incorruptible, immortal.

The doctrine, held by some, of two resurrections at different times—one of the righteous, to which the New Testament specially refers, and the other of the wicked—rests on (1) the declaration, Rev. xx. 5, 6; (2) the use of the phrase "resurrection from the dead," used fifty times, and always referring to the good; the phrase "of the dead," referring to the bad; (3) on the New Testament distinctions concerning the resurrection of the just and unjust, the resurrection to life or condemnation; (4) the longing of the apostle to attain the first; and (5) on the order given, 1 Cor. xv. 23.

ISAAC RILEY. Revised by F. H. FOSTER.

Resurrection Plant: a popular name of several plants which, after drying, on the application of moisture expand again. One of these is the Rose of Jericho (see JERICHO, ROSE OF) of the east Mediterranean region. Another common one is *Selaginella lepidophylla*, a Lycopod of the family *Selaginellaceae*, a native of Mexico and Central America. It is a vivid green, rosulate, branching plant, covering a space on the ground from 5 to 8 inches in diameter. When dry it rolls up into a dull-grayish ball, but upon the return of moisture it expands again into a beautiful green rosette. These plants are imported into the U. S. in considerable numbers, and sold as curiosities. CHARLES E. BESSEY.

Resuscitation, or Artificial Respiration [*resuscitation* is from Lat. *resuscita'tio*, deriv. of *resuscita're*, stir, rouse up again; *re-*, again + *subs*, from under, up + *cita're*, urge, excite, rouse]: motion of the ribs and exchange of air produced by external instead of internal and vital force. The natural exchange of air in respiration is effected by a mechanical process; and when the muscles which conduct it are deprived of their nervous stimulus by poisoning of the nerve-centers, that mechanical process can be kept going or be recommenced by mechanical means, and thus life be rekindled from apparent death. By compression of the ribs the chest-cavities are diminished, and a proportionate quantity of foul air is forced out by the mouth. On relinquishing that compression, the ribs by their own elasticity bound back to their former position, the chest-cavities are enlarged, and the air (if that be the surrounding medium) is sucked in to prevent a vacuum. Whatever the method, it is upon this principle alone, with the observance of proper alternation and rhythm, that such an exchange of air can be effected as to be a substitute for natural breathing. Its use is in suspended animation from suffocation, as in drowning and hanging, also from vapor of chloroform or other noxious

gases, in which, death occurring from exclusion of air, a supply of air to the lungs is the one remedy.

The following is known as the "direct method" for artificial respiration:

Rule 1. To drain off Water from Chest and Stomach (in cases of Drowning).—Instantly strip the patient to the waist. Place him face downward, the pit of the stomach being raised above the level of the mouth by a large, hard roll of clothing placed transversely beneath the body. Throw your weight forcibly two or three times, for a moment or two, upon the patient's back, over the roll of clothing, so as to press all fluids in the stomach out of the mouth.

Rule 2. To perform Artificial Breathing.—Quickly turn the patient upon his back, the roll of clothing being so placed beneath as to make the breast-bone the highest point of the body. Kneel beside or astride patient's hips. Grasp front part of the chest on either side of the pit of the stomach, resting your fingers along the spaces between the short ribs. Brace your elbows against your sides, and, steadily grasping and pressing forward and upward, throw your whole weight upon the chest, gradually increasing the pressure while you can count *one—two—three*. Then suddenly let go with a final push, which springs you back to your first position. Rest erect upon your knee while you can count *one—two*; then make pressure again as before, repeating the entire motions at first about four or five times a minute, gradually increasing to about ten or twelve times. Use the same regularity as in blowing bellows and as is seen in natural breathing, which you are imitating. If another person be present, let him with one hand, by means of a dry piece of linen, hold the tip of the tongue out of one corner of the mouth, and with the other hand grasp both wrists and pin them to the ground above the patient's head.

Sylvester's method is the most generally applicable. The body being placed upon the back, with the head slightly elevated, the flexed arms, grasped just above the elbows, are carried outward and upward from the chest almost perpendicularly, and retained in their position for about two seconds. They are then lowered and brought closely to the sides of the chest, against which they are firmly pressed for the same length of time, in order to expel the air as during the act of expiration. These alternate movements of elevation and depression are repeated from twelve to fourteen times a minute, and are performed with all possible gentleness. *Fell's method* of direct artificial respiration is applicable especially to opium-poisoning or other forms of narcosis. A tube is inserted into the larynx and trachea and warmed air forced in by a bellows. By this method persons apparently dead have been resuscitated. Mouth-to-mouth insufflation, in children especially, is easily practicable and very useful.

The length of time persons have been under water, or have remained apparently dead after leaving the water, and yet been resuscitated, is uncertain. The reported time is so remarkably long in some cases as to justify efforts for resuscitation for at least an hour, the patient having breathed within half an hour or perhaps an hour. In experiments by a committee of the Royal Medico-Chirurgical Society at London in 1862, dogs after complete submersion a minute and a half never recovered. After respiratory acts had ceased, the heart continued to act never more than four minutes. In the human subject these periods doubtless may be much longer, governed largely by the continuance of submersion, the rate of the circulation at the last moment of consciousness, the temperature of the water, the amount of air which enters the lungs, etc. Revised by W. PEPPER.

Retaining Wall: a wall of stone built to sustain banks of earth in position. The lateral pressure of the earth depends upon its nature and upon the inclination of the wall (See EARTHWORK.) The thickness of the wall at the top will be usually 2 feet or more, and its thickness at the base is to be so determined that ample security against sliding, overturning, and crushing will be secured. The last of these is liable to occur only in very high walls, and the first can be always avoided by inclining the joints backward. The use of formulas for computing the thickness is hence mainly confined to the case of rotation for ordinary walls, and these are deduced so that under the most unfavorable circumstances the line of direction of the resultant of the earth pressure and the weight of the wall shall cut the base within its middle third. The cross-section of the wall is usually trapezoidal, but walls with curved front surfaces are occasionally built. If the back of a trapezoidal wall be ver-

Retz, JEAN FRANÇOIS PAUL DE GONDI, Cardinal de: b. at Montmirail-en-Brie, France, Oct., 1614. His family held high ecclesiastical dignities, and forced him against his will into the Church. He led, nevertheless, an irregular life, and devoted himself to the service of a restless political ambition. He was active in intrigues against Richelieu, after whose death he was, in 1643, appointed by the queen-regent coadjutor to his uncle, the Archbishop of Paris. The power he acquired as a pulpit orator he turned to political ends and tried to supplant Mazarin, taking advantage of the troubles of the Fronde. He acquired a cardinal's hat in 1651 by his intrigues, but was outgeneraled by Mazarin, arrested in 1652, and imprisoned, first at Vincennes, then at Nantes. While in prison he became Archbishop of Paris. He escaped, fled to Spain, and remained a fugitive there and in Italy and Holland till after Mazarin's death, when, in 1662, he made his peace with Louis XIV., exchanged his archbishopric for the abbacy of St. Denis, in Paris, and spent the rest of his life in dignified and sumptuous quiet, employed in some delicate diplomatic missions to Rome, in writing his *Mémoires*, and in paying his debts. D. in Paris, Aug. 24, 1679. His *Mémoires* cover the years 1643-55, are very frank, not always truthful, but brilliantly written. They were first published in 1717; the best recent edition is that in the series of *Grands Écrivains de la France* (first 9 vols., Paris, 1872-87). A. G. CANFIELD.

Retzius, MAGNUS GUSTAF: histologist; b. in Stockholm, Sweden, Oct. 27, 1842; widely known and quoted as an authority in anthropology. His work *Finska Kranier* (Finnish Skulls), published in 1878, is standard. In 1884 he compiled his German work *Das Gehörorgan der Wirbelthiere*. Since 1873 he has edited the volumes of *Ur vår tids Forskning*, and in 1881-82 he edited *Biologische Untersuchungen*, mainly written by himself. R. B. A.

Reuchlin, roich-leen' (Hellenized CAPNIO), JOHANN: classical and Hebrew scholar and humanist; b. at Pforzheim, Baden, Germany, Feb. 22, 1455. He was educated in the chapel of the Margrave of Baden, and followed in 1473 the young margrave to the University of Paris, where he began his studies in Greek. During two years' residence at Basel he wrote his Latin dictionary, *Vocabularius breviloquus sive Dictionarium, singulas Voces Latinas breviter explicans*; and during a second visit to France in 1478 he studied law at Orleans. In 1481 he lectured on jurisprudence and belles-lettres at the University of Tübingen, received the title of imperial counselor from the emperor, and lived subsequently for several years at the court of the elector palatine, Philip, at Heidelberg (1492-96). To this period belong his first studies of the Hebrew language and his comely, *Sergius, sive Capituli Caput*, whose satire against the clergy was heartily enjoyed. In 1498 he went to Rome, his patron, the elector palatine, having fallen under the papal ban, and he succeeded in procuring his absolution. After his return he was appointed president of the Suanian confederate tribunal, but he found time to continue his studies of Hebrew, the results of which were his *Rudimenta Hebraica* (1506), *De Arte Cabbalistica Libri III.*, and *De Accentibus et Orthographia Hebraeorum Libri III.* (1518). By these works he inaugurated the study of the Hebrew language in Western Europe. He exercised a similar stimulating influence by his handbooks, editions (e. g. Xenophon's *Agésilas*, *Hiero*, and the two speeches of *Æschines* and *Demosthenes* on *The Crown*), and personal exertions in the study in Germany of Latin and Greek. The pronunciation of the Greek language known as Iotacism originated with him. He was too liberal to escape clashing against the prejudices of his age. A converted Jew, Johann Pfefferkorn, proposed in 1510 that all Hebrew books, with the exception of the Bible, should be burned. The Dominicans were in raptures over the proposition; the Inquisition immediately recognized it as a new weapon of persecution; the emperor acquiesced. Meanwhile Reuchlin remonstrated, the emperor withdrew his consent, and the Inquisition and the monks flew into a fury. Reuchlin published his *Speculum Oculare (Augenspiegel)* (1512) and *Defensio contra Calumniatores* (1513), while Ulrich von Hutten and Franz von Sickingen kept guard over his personal safety. In 1515 appeared the first part of the *Epistole Obscurorum Virorum*, most of which were written by a friend of Reuchlin, Crotus Rubianus, others by Ulrich von Hutten. The success of this famous satire was instantaneous, and did not a little in paving the way for the Reformation. With Luther himself Reuchlin felt a deep sympathy, but he declined an invitation to come

to Wittenberg, sending in his stead his nephew Melancthon, and maintained his connection with the Roman Catholic Church to the last. In 1520 he was appointed professor at Ingolstadt, but when the plague broke out in that city he determined to retire to Tübingen, but died at Liebenzell, June 30, 1522. His *Life* was written by Gehres (1815), Meyerhoff (1830), Geiger (1871), and Horawitz (1877). Geiger also edited his *Letters* (1876). Revised by A. GUDEMAN.

Réunion, rā'u'ni-ān', called **Bourbon** prior to 1848; also **Île Bonaparte**: an island and French colony in the Indian Ocean; belonging to the Mascarene group; about 100 miles S. W. of Mauritius; lat. 20° 51' 43" S., lon. 55° 30' 16" E. It is 38 miles long, 28 miles wide; area, 965 sq. miles. It is volcanic, and is traversed by a mountain-chain the direction of which is N. and S. This mountain-range, of which one peak rises 10,000 feet above the sea, divides the island into two portions, differing in climate and productions. The Piton de la Fournaise, 7,200 feet high, is an active volcano, the eruptions of which occur on an average at least twice a year. The soil in some parts is very fertile, and the scenery is generally extremely beautiful. The climate was formerly healthful, but Europeans now suffer much from typhoid fever and dysentery. The mean annual temperature is about 77° F. The island is often visited by terrific hurricanes, which demolish houses and tear up trees by the roots. The chief articles of export are sugar, coffee, and dyewoods. Maize, rice, and tobacco are also cultivated. Réunion has no good harbors, and the coast is consequently dangerous. Capital, St. Denis. The chief port is Pointe-de-Galets, from which extends a railway 78 miles long. This island was discovered in 1545 by the Portuguese, and was occupied by the French in 1649. Pop. (1889) 165,915, of whom 25,000 are Hindus. Revised by M. W. HARRINGTON.

Reuss, rois: the name of two small principalities of Germany belonging to an elder and younger line of the family of Reuss, and consisting of several separate territories situated between Prussia, Saxony, and Bavaria. The dominion of the elder line, Reuss-Greiz, has an area of 122 sq. miles. Pop. (1890) 62,754. Capital, Greiz. That of the younger line, Reuss-Schleiz Gera, has an area of 319 sq. miles. Pop. (1890) 119,811. Capital, Schleiz. The surface of both principalities is hilly, reaching over 2,000 feet high in the Thüringer Wald. More than a third is covered with forests, and there are extensive meadows on which cattle are fattened. Woolen, cotton, and silk goods are woven.

Reuss: a river of Switzerland. It rises in the canton of Uri, near St. Gothard, descends in its upper course 4,000 feet in a series of wild cataracts and magnificent cascades, enters the southern end of Lake Lucerne, issues from the northern end as a clear, deep-green, navigable stream, and joins the Aar in the canton of Aargau at Windisch after a course of about 100 miles.

Reuss, ÉDOUARD GUILLAUME EUGÈNE, D. D.: theologian; b. at Strassburg (then a part of France), July 18, 1804; educated at the seminary of his native city; studied theology at Göttingen under Eichhorn, Oriental philology at Halle under Gesenius, and pursued the latter branch at Paris under Silvestre de Sacy; taught biblical criticism and Oriental languages in the theological school of Strassburg 1829-34; became extraordinary professor there 1834, and ordinary (regular) professor 1836; retired on a pension 1888; declined a call to the University of Jena; published (in German) a *History of the Books of the New Testament* (Halle, 1842; 6th ed. Brunswick, 1887; Eng. trans. from 5th ed. 1874, by E. L. Houghton, 2 vols., Boston, 1884), and *Geschichte der heiligen Schriften Alten Testaments* (1881; 2d ed. 1890); *Histoire de la Théologie chrétienne au siècle apostolique* (2 vols., Strassburg, 1852; 3d ed. 1864; Eng. trans. Edinburgh, 1872); *Histoire du Canon des Saintes Écritures dans l'Église chrétienne* (1863; Eng. trans. Edinburgh, 1884); and prepared an annotated French translation of the entire Bible (19 vols., Paris, 1874-81), and the same in German (Brunswick, 1892, seq.). He edited for many years a German review which appears at Jena (*Beiträge*, etc.), contributed largely to Coan's *Revue de Théologie*, and was one of the most learned and liberal theologians of the French Protestant Church. With Baum and Cunitz, and after their death alone, he edited the monumental edition of Calvin's *Opera*, not yet finished (vol. I., 1894). D. in Strassburg, Apr. 15, 1891. Revised by S. M. JACKSON.

Reuter, ro'iter, PAUL JULIUS, Baron: promoter of the telegraphic system on the continent of Europe; b. at Cassel,

May 21, 1851) became identified with the telegraph system at its first establishment, organized the first company in Antioch (April 1850), transferred his office to London 1861, and instituted and completed the system on a line that crossed all parts of the world. He obtained a monopoly for the transatlantic telegraph line between England and America. Finally, obtained a concession from the French Government for the construction of a cable between France and the U. S., which was completed in 1866; was made in 1872 the exclusive privilege of constructing railroads, telegraph lines, and telephones, and making use of all the natural resources of Persia. This concession was annulled in 1880 and in 1891, if it Baron Hakin received the concession at the Imperial Bank of Persia. C. H. Tammann.

Reutlingen, *Reutlingen*, town of Württemberg, Germany, on the Rhine, a tributary of the Neckar, 26 miles east of Stuttgart (see map of German Empire, vol. 1, 4). It is on a low, well built and picturesque. The Gothic church of St. Mary (1547-1555) has a tower 245 feet high. The town is a fertile district rich in corn, wine, and fruit, and carries on a lively trade and extensive manufactures of wool and linen fabrics, hosiery, leather, and sundry. Population 18,000.

Royal or Kovel, capital of the government of Rostom, Russian Russia, on the southern side of the Gulf of Finland; the railway rail W. & W. of St. Petersburg (see map of Russia, vol. 1, 4). The upper or old town contains the cathedral, the market and the houses of the German nobility; the lower or new town extends outside the walls. Royal is a market town, exporting grain, spirits, flax, etc., to the sea. Town 180,000 (1890) annually; imports of cotton, coal, etc., about \$2,000,000. Royal was founded by Wladimir of Novgorod in 1219; became a flourishing Russo town, seized by the Lithuanians from 1569 to 1661; then subject to Sweden, and was finally annexed to Russia in 1795. Pop. (1890) 32,404.

Revelation [from Lat. *revelatio*, an unveiling, revealing; from *revelare*, to reveal; *re*, back = *re*, to reveal, derive, it is a verb; in its active meaning, the act of God by which he communicates to man the truth concerning himself and his nature, world, will or purpose; in the passive meaning, the knowledge resulting from such activity of God. The verb is commonly employed in two senses: a wider—general revelation; and a narrower—special revelation. In its wider sense it includes all modes in which God makes himself known to man; or, positively, all knowledge concerning God however attained, inasmuch as it is conceived that all such knowledge is, in one way or another, wrought by him. In its narrower sense it is confined to the communication of knowledge of a supernatural order distinguished from a natural mode;—namely, to the knowledge of God which has been supernaturally made known to man. The reality of general revelation is disputed by none but the atheist and agnostic; whereas one denies the existence of a God because he himself denies, and the other doubts the capacity of the human faculties of there is a God, to read the vestiges he has left of himself in his handiwork. Most types of modern thought expressly affirm that all knowledge of God rests on revelation, that God can be known only because and so far as he reveals himself. In this the extreme "liberals," such as Schleiermacher, Göttinger, and Pöschinger, agree with the extreme "conservatives." Revelation is everywhere represented as an imposition of God, and as necessary to the existence of religion. "The man who does not believe that God can speak to him will not speak to God" (A. M. Fairbairn). It is only with reference to the reality of special revelation that debate concerning revelation continues; and in this that Christian apologetics needs to validate. Here, we are once more in ultimate with atheistic presuppositions, with the postulates of an extreme deism or of an extreme pantheism; but it is primarily with all those types of thought which seek to mediate between deistic or pantheistic views and those of a truly Christian theism.

In the eighteenth century the debate was chiefly with deism; the one-sided emphasis upon the divine transcendence, and with the general compensating scheme which grew up in the course of the conflict, such as pure rationalism and religious rationalism. The deist denied the reality of all special revelation on the grounds that it was not necessary to man and was either metaphysically impossible or morally unworthy of God. Contrasted to the reality of special revelation, the rationalist still denied its necessity, while the deist, admitting also its necessity, denied that it

constituted the authoritative ground of the acceptance of truth. Kant's criticism struck a twofold blow at rationalism. On the negative side his treatment of the *theistic proofs* destroyed the basis of natural (general) revelation, in which the rationalist placed his whole confidence. Thus the way was prepared for philosophical agnosticism; and for that Christian agnosticism which is exemplified in the school of Hildebrand. On the positive side he prepared the way for the idealistic philosophy, whose fundamentally pantheistic presuppositions introduced a radical change in the form of the controversy concerning the reality of a special revelation without in any way altering its essence. Instead of denying the supernatural with the deists, this new mode of thought boldly denied the natural. All thought was conceived as the inherent work of God. This change of position anticipated the forms of statement and argument which had been wrought out against the deists; but the question at issue still remained the same—whether there is any special revelation of God possible, actual, or ideal; whether man has received any other knowledge of God than what is accessible by the normal action of his own unaided faculties. After a scrutiny of the human faculties and activities was changed; it was now affirmed that all that they cognized was of God, and the natural was accordingly labeled supernatural. But a special supernatural interposition for a new gift of knowledge continued to be denied as strenuously as before. Thus it has come about that, in the nineteenth century, the controversy as to special revelation is no longer chiefly with the one-sided emphasis upon the transcendence of God of the deist, but with the equally one-sided emphasis upon the immanence of God of the pantheist, and with the various compromising schemes which have grown up in the course of the conflict, through efforts to mediate between pantheism and a truly Christian theism. It is no longer necessary to prove that God may and does speak to the souls of men; it is admitted on all hands that he reveals himself unceasingly through all the activities of creaturely minds. The task has come to be to distinguish between God's general and God's special revelation, to prove the possibility and actuality of the latter alongside of the former, and to vindicate for it a supernaturalness of a more immediate order than that which is freely attributed to all the thought of man concerning divine things.

In order to defeat the idea of distinctively supernatural revelation against this inhuman undermining, it has become necessary, in defining it in its highest and strictest sense, to emphasize the supernatural in the mode of knowledge and not merely in its source. When stress is laid upon the source only without taking into account the mode of knowledge, the way lies open to those who postulate immanent deity in all human thought to confound the categories of reason and revelation, and so practically to do away with the latter altogether. Even when the data on which our faculties work belong to a distinctively supernatural order, yet so long as the mode of acquisition of knowledge from them is conceived as purely human, the resultant knowledge remains natural knowledge; and, since intuition is a purely human mode of knowledge, so-called intuitions of divine truth would form no exception to this classification. Only such knowledge as is immediately communicated by God is, in the highest and strictest sense, supernaturally revealed. The differentia of revelation in its narrowest and strictest sense, therefore, is not merely that the knowledge so designated has God for its source, nor merely that it becomes the property of men by a supernatural agency, but further that it does not emerge into human consciousness as an acquisition of the human faculties, pure and simple.

Such a conception may give us a narrower category than that usually called special revelation. In contending for its reality it is by no means denied that there are other revelations of God which may deserve the name of special or supernatural in a distinctive sense. It is only affirmed that among the other modes in which God has revealed himself there exists also this mode of revelation, viz., a direct and immediate communication of truth, not only from God but by God, to minds which occupy relatively to the attainment of this truth a passive or receptive attitude, so that the mode of its acquisition is as supernatural as its source. In the knowledge of God which is acquired by man in the normal use of his own faculties—naturally, therefore, as to mode—some deserves the name of special and supernatural above the rest, because the data upon which the human faculties work in acquiring it belong to a supernatural order. Such knowledge forms an intermediate class between that obtained by the facul-

ties working upon natural data and that obtained in a supernatural mode as well as from a supernatural source. Again, in the knowledge of God, communicated by the objective activities of his Spirit upon the minds of special organs of revelation—supernaturally, thus, as to immediate origin as well as to ultimate source—some may emerge into consciousness along the lines of the ordinary action of the human faculties. Such knowledge would form a still higher intermediate class—between that obtained by the natural faculties working according to their native powers on supernatural data and that obtained in a purely supernatural mode, as well as from a supernatural source and by a supernatural agency. These modes of revelation are not to be overlooked. But neither is it to be overlooked that among the ways in which God has revealed himself is also this way—that he has spoken to man as Spirit to spirit, mouth to mouth, and has made himself and his gracious purposes known to him in an immediate and direct word of God, which is simply received and not in any sense attained by man. In these revelations we reach the culminating category of special revelation, in which its peculiar character is most clearly seen. And it is these direct revelations which modern thought finds most difficult to allow to be real, and which Christian apologists must especially vindicate.

Theories of Revelation.—In the state of the case which has just been pointed out, it is a matter of course that recent theories of revelation should very frequently leave no or but little place for the highest form of revelation, that by the direct word of God. The lowest class of theories represent revelation as taking place only through the purely natural activities of the human mind, and deny the reality of any special action of the Divine Spirit directly on the mind in the communication of revealed truth. Those who share this general position may differ very greatly in their presuppositions. They may, from a fundamentally deistic standpoint, jealously guard the processes of human thought from all intrusion on the part of God; or they may, from a fundamentally pantheistic standpoint, look upon all human thought as only the unfolding of the divine thought. They may differ also very greatly as to the nature and source of the objective data on which the mind is supposed to work in obtaining its knowledge of God. But they are at one in conceiving that which from the divine side is spoken of as revelation, as on the human side, simply the natural development of the moral and religious consciousness. The extreme deistic theory allows the possibility of no knowledge of God except what is obtained by the human mind working upon the data supplied by creation to the exclusion of providential government. Modern speculative theists correct the deistic conception by postulating an immanent divine activity, both in external providence and in mental action. The data on which the mind works are supplied, according to them, not only by creation, but also by God's moral government; and the theory grades upward in proportion as something like a special providence is admitted in the peculiar function ascribed to Israel in developing the idea of God, and the significance of Jesus Christ as the embodiment of the perfect relation between God and man is recognized. (Biedermann, *Christl. Dogmatik*, i., 264; Lipsius, *Dogmatik*, 41; Pfleiderer, *Religionsphilosophie*, iv., 46.) The school of Ritschl, though they speak of a "positive revelation" in Jesus Christ, make no real advance upon this. Denying not only all mystical connection of the soul with God, but also all rational knowledge of divine things, they confine the data of revelation to the historical manifestation of Christ, which makes an impression on the minds of men such as justifies us in speaking of him as revealing God to us. (Herrmann, *Der Begriff der Offenbarung*, and *Der Verkehr des Christen mit Gott*; Kaftan, *Das Wesen*, etc.)

We are on higher ground, however, although still moving in essentially the same circle of conceptions as to the nature of revelation, when we rise to the theory which identifies revelation strictly with the series of redemptive acts (Koehler, *Stud. und Kritiken*, 1852, p. 875). From this point of view, as truly as from that of the deist or speculative theist, revelation is confined to the purely external manifestation of God in a series of acts. It is differentiated from the conceptions of the deist and speculative theist only in the nature of the works of God, which are supposed to supply the data which are observed and worked into knowledge by the unaided activities of the human mind. In emphasizing here those acts of a special providence which constitute the redemptive activity of God, this theory for the first time lays the foundation for a distinction between general and

special revelation; and it grades upward in proportion as the truly miraculous character of God's redemptive work is recognized, and acts of a truly miraculous nature are included in it. And it rises above itself in proportion as, along with the supernatural character of the series of objective acts with which it formally identifies revelation, it recognizes an immediate action of God's Spirit on the mind of man, preparing, fitting, and enabling him to apprehend and interpret aright the revelation made objectively in the redemptive acts. J. Chr. K. Hofmann in his earlier work, *Prophecy and Fulfillment*, announces this theory in a lower form, but corrects it in his later *Schrifttheorie*. Richard Rothe (*Zur Dogmatik*, p. 54) is an outstanding example of one of its higher forms. To him revelation consists fundamentally in the "manifestation" of God in the series of redemptive acts, by which God enters into natural history by means of an unambiguously supernatural and peculiarly divine history, and which man is enabled to understand and rightly to interpret by virtue of an inward work of the Divine Spirit that Rothe calls "inspiration." But this internal action of the Spirit does not communicate new truth; it only enables the subject to combine the elements of knowledge naturally received into a new combination, from which springs an essentially new thought which he is clearly conscious that he did not produce. The theory propounded by Prof. A. B. Bruce in his well-known lectures on *The Chief End of Revelation* stands possibly one stage higher than Rothe's, to which it bears a very express relation. Dr. Bruce speaks with great circumspection. He represents revelation as consisting in the "self-manifestation of God in human history as the God of a gracious purpose—the manifestation being made not merely or chiefly by words, but very specially by deeds" (p. 155); while he looks upon "inspiration" as "not enabling the prophets to originate a new idea of God," but "rather as assisting them to read aright the divine name and nature." Dr. Bruce transcends the position of the class of theorists here under consideration in proportion as he magnifies the office of inner "inspiration," and, above all, in proportion to the extent of meaning which he attaches to the saving clause that revelation is *not merely* by word, but *also* by deed. The theory commended by the great name of Bishop B. F. Westcott (*The Gospel of Life*) is quite similar to Dr. Bruce's.

By these transitional theories we are already carried well into a second class of theories, which recognize that revelation is fundamentally the work of the Spirit of God in direct communication with the human mind. At its lowest level this conception need not rise above the pantheistic postulate of the unfolding of the life and thought of God within the world. The Divine Spirit stirs men's hearts, and feelings and ideas spring up, which are no less revelations of God than movements of the human soul. A higher level is attained when the action of God is conceived as working in the heart of man an inward certainty of divine life—as, for example, by Schultz (*Old Testament Theology*); revelation being confined as much as possible to the inner life of man apparently to avoid the recognition of objective miracle. A still higher level is reached where the action of the Spirit is thought of—after the fashion of Rothe, for example—as a necessary aid granted to certain men to enable them to apprehend and interpret aright the objective manifestation of God. The theory rises in character in proportion as the necessity of this action of the Spirit, its relative importance, and the nature of the effect produced by it are magnified. So long, however, as it conceives of this work of the Spirit as secondary, and ordinarily if not invariably successive to the series of redemptive acts of God, which are thought to constitute the real core of the revelation, it falls short of the biblical idea. According to the biblical representations, the fundamental element in revelation is not the objective process of redemptive acts, but the revealing operations of the Spirit of God, which run through the whole series of modes of communication proper to Spirit, culminating in communications by the objective word. The characteristic element in the Bible idea of revelation in its highest sense is that the organs of revelation are not creatively concerned in the revelations made through them, but occupy a receptive attitude. The contents of their messages are not something thought out, inferred, hoped, or feared by them, but something conveyed to them, often forced upon them by the irresistible might of the revealing Spirit. No conception can do justice to the Bible idea of revelation which neglects these facts. Nor is justice done even to the rational idea of revelation when they are neg-

kind. Here, too, we must interpret by the highest rule in exegesis. "Can man commune with man," it has been frequently asked, "through the high gift of language, and is the intellect itself not to express itself, or is it to do so in mystery or obscurely through dumb material symbols, as in the speech of the dumb?" (W. Morrison, *Footprints of the Invisible*, p. 109).

The doctrine of revelation.—The doctrine of revelation which has been wrought out by Christian thinkers in their efforts to answer on all the critical tests, includes the following notions. (1) *God has never left himself without a witness.* In the act of creation he has impressed himself on the work of his hands. In his work of providence he manifests himself as the righteous ruler of the world. Through the natural revelation men in the normal use of reason can have knowledge of God—*in seculis dei acquiritur*, based on his action. *Dei insula*—which is trustworthy and valuable, as a foundation for their knowledge as shown, and by its own healthiness awakens a longing for a fuller knowledge of God and his purposes. (2) *The purely natural revelation led to a series of revelations of himself as the God of grace.* The connected series of redemptive acts, which constitutes a whole, the mighty process of the new creation. To even the casual mind contemplating this series of supernatural acts which culminated in the coming of Christ, a higher knowledge of God would be conveyed than what is attainable from mere nature though it would be limited to the capacity of the natural mind to apprehend divine things. The process of the new creation God, however, works also directly by his redeeming acts, creating new hearts in men and illuminating their minds for apprehending divine things; even, once against the new manifestation of himself in the series of redemptive acts, he creates a new subject to spiritual and profit by them. But neither by the presence of supernatural facts in the mind nor by the breaking of the power of sin within, by which the eyes of the heart were hidden that they should not see, is the human mind reached in the divine itself, thus it may know as God has revealed the manifestation of his gracious purposes in the uncompleted pattern which he is weaving into the tape of history, or even interpret aright an unexplained series of mysterious facts involving mysteries which "minds were to seek in vain." It may be doubted whether even the special revelation of God in Jesus Christ could have been known such in the absence of preparatory, accompanying and accompanying explanatory revelations in words: "the wisdom of God cannot be with observation." God has revealed, in his infallible word, added a revelation of himself, made as called, communicating by his Spirit directly to our knowledge concerning himself, his works, will, and purposes. The modes of communication may be various—in dreams or visions, in ecstasy or theophany, by inward witness, or by the simple objective word; but in all cases direct and result in the direct supernatural communication of special knowledge.

Of the special revelation it is to be said: (1) It was not given all at once, but progressively, "by diverse portions and various manners," in the form of a regular historical development. (2) *The progressive unfolding stands in a very close relation to the progress of God's redemptive work.* It must be remembered, on the one hand, however, as an *act*, wholly out of relation to God's redemptive work, rather as it is to be simply identified with the series of his redemptive acts. The phrase, "revelation is for redemption, as not for instruction," presents a false antithesis. Revelation as such is certainly just "to make wise," though it is a *means* only "to save souls." It is not an alternative to the redemptive process, but a specific part of the redemptive process. Nor does it merely grow out of the redemptive acts as following accompanying or following explanatory, it is rather itself one of the redemptive acts, and takes place along with the other redemptive acts, co-operative with them in the one great end. (3) *Its relation to miracles* has been very unnecessarily confused by one-sided statements. Miracles are not merely credentials of revelation, as *signs of revelation* as well; but they are primarily *signs of grace*, and some of them are so largely "signs" as to have no other purpose. As works of God, however, they are *means* of revelation of God. Because the nature of the supernatural miracle reveals the character of the actor as a *miraculous*, nevertheless, that their primary purpose was to *revel*, and as revelation as a whole is a substantial part of the redemptive work of God, also in the redemptive work

of God. (4) *Its relation to predictive prophecy* is in some respects different. As a rule, all events, predictive prophecy is primarily a part of revelation, and becomes a credential of it only secondarily, on account of the nature of the particular revelation which it conveys. When a revelation is in its very contents such as could come only from God, it obviously becomes a credential of itself as a revelation, and carries with it an evidence of the divine character of the whole body of revelation with which it stands in organic connection. (5) *Its relation to the Scriptures* is already apparent from what has been said. As revelation does not exist solely for the increase of knowledge, but for increasing knowledge to build up the kingdom of God, as neither did it remain in being for no other purpose than the production of the Scriptures. The Scriptures also are a means to the new end, and exist only as a part of God's redemptive work. But if, thus, the Scriptures can not be exalted as the sole end of revelation, neither can they be degraded into the mere human record of revelation. They are themselves a substantial part of God's revelation; one form which the revealing activity chose for itself; and that its final and complete form, adopted as such for the very purpose of making God's revealed will the permanent and universal possession of man. Among the manifold methods of God's revelation, revelation through "inspiration" thus takes its natural place; and the Scriptures, as the product of this "inspiration," become thus a work of God; not only a substantial part of revelation, but, along with the rest of revelation, a substantial part of his redemptive work. Along with the other acts of God which make up the connected series of his redemptive acts, the giving of the Scriptures ranks as an element of the building up of the kingdom of God. That within the limits of Scripture there appears the record of revelations in a narrower and stricter sense of the term, in no wise vitiates its claim to be itself revelation. Scripture records the sequence of God's great redeeming acts. But it is much more than merely "the record, the interpretation, and the literary reduction of God's grace in history." Scripture records the direct revelations which God gave to men in days past, so far as these revelations were intended for permanent and universal use. But it is much more than a record of past revelations. It is itself the final revelation of God, completing the whole disclosure of his unfathomable love to lost sinners, the whole proclamation of his purposes of grace, and the whole exhibition of his gracious provisions for their salvation.

BENJAMIN B. WARFIELD.

Revelation, Book of [*Revelation* is from Lat. *Revelatio* (see REVELATION), used as transl. of Gr. *ἀποκάλυψις*, *Revelation*, literally, an uncovering, revealing; *ἀπο*, off + *καλύπτω*, cover]; the concluding book of the New Testament as now arranged; sometimes called the *Apocalypse*. There are in a voyage three points to observe: (1) the moment of departure; (2) the way; and (3) the arrival. Such is also the general division of the book of Revelation. (I.) After indicating the subject by these words, "I am Alpha and Omega, the beginning and the ending, saith the Lord, which is, and which was, and which is to come" (i. 8), John fixes the point of departure in the first three chapters; it is the state of the Church at the moment in which he writes. The state is depicted in the letters which he addresses from the Lord to the seven chosen churches of Asia Minor. (II.) From ch. iv. to xix. 10 he describes the coming itself—that is, the chastisements of the Judge, who calls the world to repent before the final judgment, and the graces of the Bridegroom, who elevates his Church to perfection for the wedding-day. (III.) Finally, from xix. 11 he describes the arrival with all its consequences, both for the world and for the Church, and he finishes with a proper conclusion, intended to make the reader feel the importance of the book.

This book of mysteries has received various explanations. The traditional interpretation seeks in the vision for a detailed picture of all the events of the history of the Church from the first century to the return of Christ. Faber, Bengel, Elliot, Gussen, de Rougemont, and many others have in this way produced wonders of exegesis and ability and historical learning. But the method carries along with it a signal of warning in its character of arbitrariness. The same vision—that of the locusts, for instance, in ch. ix.—designates, according to one, the great invasion by the Arabs in the seventh century; according to another, the invasions by the Persians under Chosroes; according to a third, the introduction of the Talmud among the Jews; according to

a fourth, the introduction of monachism, etc. Such a diversity rises simply from the imagination having been set free and working without any fixed rule. It is, moreover, inadmissible that it should be necessary to possess the whole treasury of learning belonging to a professor of history in order to understand a book which God has given to his people for the purpose of edification. The modern rationalists have broken with this method of interpretation for many reasons, good and bad; first, no doubt, because it presupposes divine inspiration, but also because their whole system leads them to seek the key to the interpretation of a book in the circumstances under which it was written. Hence the interpretation of the beast as the Roman empire, and of the head wounded to death, but reappearing as Antichrist, as the Emperor Nero. Insurmountable difficulties are, however, involved in this method of explanation; and it seems very singular that a book so holily conceived and so severely planned should be a mere tissue of fancies and hallucinations.

There remains the method which recognizes in the Revelation a picture of the general progress of the Church, to whose understanding no other premises are necessary than such as may be drawn from the Scriptures themselves. There is still room for individual views. Thus Bossuet sees in the destruction of the beast the fall of the Roman empire; Hengstenberg considers the reign of a thousand years as the predominance of Christianity from Charlemagne to our days; John Nelson Darby, the principal founder of the Plymouth Brethren, holds that the whole history of the Church from the apostolic age up to that preceding the return of Christ is omitted in the picture, and must be placed in the interval between the third and fourth chapters, so that the whole vision (iv.-xix.) relates exclusively to the future, to that which precedes immediately the coming of the Lord. It is impossible to enter here into a discussion of these individual points of view, but it is hoped that the reader, following the outline which has been given, will find in the Revelation points sufficiently precise to indicate the course of the religious progress of humanity, and at the same time sufficiently elevated to enlighten and fortify his heart under all the various events of his life. There is the same power in this vision as in that through which God revealed to Moses in six successive pictures the origin of the world. At every moment of a person's life he finds himself in contact with the religious bearing of this vision in Genesis. At every moment, too, but especially when he is under the cross, his soul gathers new life from the spirit of the apocalyptic expectations. It is solely for this purpose of edification, and not in order to satisfy our curiosity, that God has permitted us to see, on the one hand, through the eyes of Moses, the stream of the times issuing forth from eternity, and on the other, through the eyes of John, the times returning to the sea of eternity. Christ is coming (the Old Testament); Christ has come (the gospel); Christ shall come again (the Revelation)—such is the sum of the history of mankind.

One of the chief problems of the book relates to Antichrist. There are two leading opinions respecting his person. Some consider him merely as a poetical personification of a principle, of the spirit of rebellion against God and Christ, which shall go on increasing till the final triumph of the gospel. Others recognize in him a real man, who shall concentrate in his own person to the utmost extent the spirit of apostasy. The second chapter of the Second Epistle to the Thessalonians, in which his apparition is described, speaks decidedly in favor of the second explanation. Antichrist is here designated as the man of sin, who shall place himself as a god in the temple of God; he is called the wicked man whom the Lord shall destroy by the breath of his mouth. His theological system may be summed up in the three following theses: (1) There is no personal God without and above the universe; (2) man is himself his own god—he is the god of this world; (3) "I am the true representative of humanity; by worshipping me mankind worships itself." Even from this general point of view there still remain certain differences of opinion. According to some this person has already appeared on the stage; he is the pope. It is evident, however, that the pope has never actually substituted himself for God or Christ; on the contrary, he rests his authority on that of Christ and God. The pope may be said to be on the way which ends with the arrival of Antichrist, but he is not yet Antichrist himself. Others hold that the Antichrist announced in the Revelation is only an empty supposition,

which has never been revealed. The author of the prophecy, they say, thought of the Emperor Nero, that matchless monster, the first persecutor of the Church, whose death the world could not believe in, and whom the terrified Church feared to see return suddenly and assume the part of the man of sin and the universal suppressor. The number 666, which, according to xiii. 18, is the number of the beast, was explained in accordance with this view. The letters of the two words K A I S A R N E R O N, when taken as ciphers and counted in Hebrew, give indeed the sum of 666. This fear was never realized, however, and thus the Revelation became an unfulfilled prophecy on this capital point. It is difficult to understand how under such circumstances the book can have survived in spite of the discredit which fell on it immediately after its appearance, and how the author, if he was a serious man, could suffer it to circulate without retraction. It must also be noticed that in order to obtain the sum of 666 from this name it must be written *Kesar*, and not *Kaisar*, which is against custom and orthographical rules. Finally, it would be somewhat strange if the name which was to be figured out of the number had been put down in Hebrew, while all the rest of the work is in Greek. In speaking of the man of sin, St. Paul, far from identifying this person with the Roman emperor, hints that, on the contrary, it was the imperial power which prevented Antichrist from appearing. "Ye know," he says (2 Thess. ii. 6), "what withholdeth that he might be revealed in his time." The apostle considers Antichrist as the realization of the false Messiah, the terrestrial king, the new Solomon, whom the carnal Israel expects. What was it that prevented the Jews of that time from putting forth this false Messiah, the object of their hearts' longings? It was the Roman legions, which on the mere nod of the emperor would have invaded the Holy Land and put down any attempt at insurrection. It is the powers instituted by and inherited from the Roman empire which up to this very day have prevented Antichrist, the false Messiah of the Jews, from appearing; but he will not fail to come forth as soon as these powers fall; the Jewish people will then have acquired that preponderance in all civilized states which is necessary before it can give its insatiable ambition the reins. With respect to the number 666 numerous solutions of this enigma have been given, but none which is thoroughly satisfactory. A peculiar fact has lately attracted attention. The Greeks do not designate numbers by particular signs called ciphers, but by the letters of the alphabet, to which a numerical value is assigned. Thus 600 is expressed by the letter X (*ch*), 60 by ξ (*xi*), and 6 by ς (*vi*). The name of Christ (*Christos*) is represented by the first and last letters, χς, and these two letters represent the two numbers 600 and 6. If between these two letters the letter ξ, which signifies 60, is introduced, the sum of 666 is obtained; and the three letters, χξς, represent the abridged form of the name of Christ, but in such a manner that the first and third letters are separated by the ξ, the emblem of the serpent. Thus in Greek 666 is the emblem of the Messiah, of Satan, or of Antichrist. It may also be noticed that, according to the symbolism of numbers employed in the Revelation, the number 7 always expresses the divine plenitude, and that God, as the Father, the Son, and the Holy Spirit, must consequently be represented in ciphers by 777. Thus the number 666 would signify the creature's highest though still impotent effort at attaining divine glory and power, and the representation would comprise the three persons which form the diabolical trinity—namely, Satan, or the dragon, the beast, or Antichrist, and the second beast, or the false prophet. Satan can not become God, nor can Antichrist attain the dignity of the Son-Messiah, nor the false prophet equal the Holy Ghost. Nevertheless it is no doubt wise to apply to our age that which in the second century the pious Irenæus said to his: "If the author of the prophecy would have made the name known to this time, he would have designated it more plainly." Irenæus mentions several explanations propounded in his time, of which the least improbable is the word *Lateinos*—that is, Latin, Roman, the Roman emperor. The Greek letters of which this word is composed give, indeed, when added together as ciphers, the exact sum 666.

FRÉDÉRIC GODET.

The author calls himself "John" in i. 1, 4, 9, xiii. 8, and traditionally the Revelation has been assigned to the apostle John. Bishop Boyd Carpenter, in Elliott's *Commentary on Revelation*, thus sums up the case on the orthodox side: "The author represents himself as John in a way and at a

settled in 1829 in Paris, and devoted himself to literature, writing for many liberal journals; edited *Histoire scientifique et militaire de l'Expédition française en Égypte* (10 vols., 1830-36); published from 1836 to 1840, in the *Revue des Deux Mondes*, his *Études sur les Réformateurs, ou Socialistes modernes*, which in 1841 received the Montyon prize from the Academy and has since passed through several editions; published in 1843 *Jérôme Paturot à la Recherche d'une Position sociale*, his most popular work, which was followed in 1848 by *Jérôme Paturot à la Recherche de la meilleure des républiques* (1848). He became a member of the Academy in 1850, and continued to write romances, economical essays, political pamphlets, and literary and social criticisms. He was several times elected to the legislature, and after the *coup d'état* of 1851 was a member of the consultative commission. D. in Paris, Oct. 28, 1879.

Revised by F. M. COLBY.

Reyer, rā'i-ā', Louis Étienne Ernest (real name Rey): composer; b. at Marseilles, France, Dec. 1, 1823; began to study music there; when sixteen years of age went to Algiers, in the service of the Government. In 1848 he returned to France and continued to study in Paris. His first important composition was *Le Sélam*, an Oriental symphony with choruses, produced Apr. 5, 1850. Since then he has composed several operas with more or less success, prominent among which are *Sacountala* (1858); *La Statue* (1861); *Erostrate* (Baden, 1862; Paris, 1871); and *Sigurd* (Brussels, 1884). His latest work is *Salammbô* (1893). He is also an accomplished feuilletonist. He was decorated with the Legion of Honor in 1863 and raised to the rank of commander in 1891. He is a member of the Academy of Fine Arts.

D. E. HERVEY.

Reykjavik, rik'yaa-vik: the capital of Iceland, on the southwestern coast of the island, in lat. 64° 8' N., lon. 21° 5' W., at the head of Faxafljörð. It is the seat of the government, has a college with a library of 10,000 volumes, medical and divinity schools, an observatory and a museum, an important annual fair, and regular communication by steamships with Leith and Copenhagen. It was founded in 874. Pop. 1,400.

Revised by P. GROTH.

Reynard the Fox: a popular epic of European origin. Despite the efforts of Jacob Grimm (*Reinhart Fuchs*, 1834) to establish the existence of a native and purely popular Germanic beast-epos, of which *Reynard the Fox* formed the most conspicuous example, scholars now agree in regarding this beast-epos in general, and *Reynard* in particular, as an outgrowth of the old fables which were worked into this or that shape for prevailing satirical purposes. To be sure, we must admit a certain admixture of native material, and not ascribe every shred of these fables to the Orient. Yet in any case, whatever the material, monks, not popular fancy, were responsible for the development of the fables into later forms; they used the stories which came mainly from the East and drifted, by way of Greece and Italy, over Western Europe. A fable of Æsop got footing in German literature as early as the seventh century; another, the story of the sick lion and the fox, soon followed, and was treated as independent or purely local tradition. In the tenth century this fable was used as a convenient allegory for the fortunes of a monk; and a few years later, probably in Flanders, names were given to the principal beasts: Isengrim (iron-masked) to the wolf; Noble to the lion; and Reynard (originally the Germanic word meaning good or firm in counsel; the Low German form is Reineke or Reinke, while French Renard, as a generic name, has actually supplanted the Old French *goupil*, from Latin *vulpes*) to the fox. Bruin for bear is almost as common in English. The earlier literature had been in Latin and was didactic or satirical; but now, like the mediæval legend, this popular material found voice in the vernacular. It grew into a sort of epos; and indeed the Latin *Isengrimus* (about 1150) had already assumed epic proportions. The first German epos of Reynard was composed about 1180. French jongleurs worked the material into a sort of romance, the *Roman de Renart*, with many so-called branches. About the middle of the thirteenth century one of these French versions was used by a Fleming named Willem as basis for the admirable *Roman van den Vos Reinaerde*. This, again, was worked over and furnished with sundry additions by an unknown Fleming in the fourteenth century, under the name of *Reinart's Historie*; this, in turn, toward the close of the fifteenth century, was enlarged by explanations in prose; and finally it was translated into Low German as the famous *Reinke de Vos*, or *Reineke Vos*, appear-

ing about 1500. Enormously popular, these versions made their way into the various tongues of Europe. Caxton translated one of them and printed it, June, 1481, as *The History of Reynard the Fox*. (See Arber's reprint in the *English Scholar's Library*.) In modern times Goethe has told us this familiar story, the *Unheilige Weltbibel*, as he called it—in hexameters which hold a nice balance between epic and satire—*Reineke Fuchs*; an English translation was made by T. J. Arnold, and was published with Kaulbach's and Wolfe's illustrations.

It was Willem who gave Reynard his commanding place as hero of the little epic and representative of desperate craftiness. Willem, however, takes sides against his hero: while later versions make the fox a thoroughly triumphant rascal. The ethical problem involved is discussed half humorously, half seriously, by Froude in his *Short Studies on Great Subjects*. The student must be referred for details of bibliography to E. Martin, *Le Roman de Renart* (Strasbourg, 1882 ff.), and *Reinaert* (Paderborn, 1874); also to the preface of Arber's reprint of Caxton, and the introduction by W. J. Thoms to *The History of Reynard the Fox* (Percy Society, 1844).

FRANCIS B. GUMMERE.

Reynolds, Henry Robert, D. D.: clergyman and author; b. at Romsey, Hampshire, England, Feb. 26, 1825; educated at University College, London; became minister of a Congregational church at Halstead, Essex, England, in 1846; of East Parade Congregational church, Leeds, in 1849; president of Countess of Huntingdon's College, at Cheshunt, in 1860, and also Professor of Theology and Exegesis; was one of the editors of *The British Quarterly Review* 1866-74; author of *Beginnings of the Divine Life* (1858); *John the Baptist, a Contribution to Christian Evidences* (1874); *The Philosophy of Prayer, and other Essays* (1881); commentaries on Hosea and Amos, on the Gospel of John, *Athanasius, his Life and Work* (1889), and of important contributions to theological cyclopædias and reviews.

Revised by G. P. FISHER.

Reynolds, Ignatius Aloysius, D. D.: bishop; b. near Bardstown, Ky., Aug. 22, 1798; educated at St. Mary's College, Baltimore, Md.; ordained a Roman Catholic priest 1823; was successively vicar-general of Kentucky, rector of St. Joseph's College, and president of the Nazareth Female Institute of Kentucky, and was consecrated Bishop of Charleston, Mar. 19, 1844. D. at Charleston, Mar. 9, 1855.

Reynolds, or Rainolds, John, D. D.: clergyman and author; b. at Pinhoe, Devonshire, England, in 1549; studied at Merton College, Oxford, 1562; became fellow of Corpus Christi 1566; lectured on Aristotle; was appointed reader of the theological lecture founded by Sir Francis Walsingham 1586; was dean of Lincoln 1593; refused a bishopric in order to accept the presidency of Corpus Christi College 1598; was eminently distinguished as a Hebraist, regarded as the leader of the Puritan party, and was said by Hallam to have been "the most eminently learned man of Queen Elizabeth's reign"; took a prominent part in the Hampton Court conferences of 1603, where he maintained the necessity of a new version of the Bible; executed a small portion of King James's version, and revised much more in the weekly meetings of the translators held at his chambers. D. at Oxford, May 21, 1607. His works consist chiefly of separate sermons, controversial treatises against the Church of Rome, academical discourses, and some writings upon biblical criticism, the most elaborate being one successfully directed against the admission of the Apocrypha as part of the Old Testament canon—*Censura Librorum Apocryphorum Veteris Testamenti*, posthumously printed (Oppenheim, 2 vols., 1611).—His brother, WILLIAM REYNOLDS, b. at Pinhoe about 1540, was educated at Oxford; became a Roman Catholic; was Professor of Divinity and Hebrew at Douay and Rheims; took an important part in the translation of the Rheims Testament; translated from English into Latin all the works of Thomas Harding; wrote several theological and controversial treatises, and became chaplain to the Beguin nunnery at Antwerp, where he died Aug. 24, 1594.

Reynolds, John Fulton: soldier; b. at Lancaster, Pa., Sept. 20, 1820; graduated at the U. S. Military Academy, and appointed brevet second lieutenant of artillery, July, 1841; captain 1855; served in the war with Mexico, winning the brevets of captain and major; in Sept., 1860, was selected as commandant of cadets at West Point; in May, 1861, was transferred to the infantry with rank of lieutenant-colonel (colonel, June, 1863), and in August appointed brigadier-general of volunteers, and assigned to command of

a recruit of the Pennsylvania Line, which he commanded in the Virginia peninsula campaign of 1800 at Mifflintown, Germantown, and Red Bank, where he was taken prisoner. Recaptured in August, he commanded a division in the second battle of Red Bank, and in the Maryland campaign of 1802 was selected to command the Pennsylvania militia for the defense of the State. In Nov., 1802, he was promoted to be superintendent of volunteers, and placed in command of the First Corps of the Army of the Potomac, which was engaged on the left in the battle of Fredericksburg, Dec. 18, 1803. At Chambersville his corps was held in reserve, along with the Fifth, and not allowed to engage the enemy. At the battle of Red Bank, on the opening day, Dec. 1, 1803, after having made the disposition of his troops in person, he was killed by a rifle ball.

Revised by JAMES MERRON.

Reynolds, James (James) soldier; b. at Flemingsburg, Ky., Dec. 8, 1822; graduated at the U. S. Military Academy, and entered the Army as brevet second lieutenant of artillery Jan. 1, 1842. After serving in garrison and in Texas, he was in 1848 selected as Assistant Professor of Geography, History, and Political and War Policy; in 1847 became Assistant Professor of Natural and Experimental Philosophy, and from 1848 to 1852 was principal assistant professor. In 1857 he assumed the chair of Mechanics and Engineering in Washington University, St. Louis, Mo., which he held until 1860. In 1860 he was appointed colonel and brigadier-general of Indiana volunteers, and, May, 1861, was commissioned brigadier-general of U. S. volunteers, serving in West Virginia. He again resigned in Jan., 1866, but was reappointed Sept. 15, 1862, and on Nov. 23, 1862, was promoted to be major-general of volunteers, serving with the Army of the Potomac. At the battle of Chancellorsville he was chief of staff of the army. Subsequently he held various important commands in the Northwest. On July 29, 1860, he was appointed colonel of the Twenty-sixth U. S. Infantry; transferred to Twenty-fifth Infantry Jan., 1870, and to Third Cavalry Dec. 15, 1870, brevet brigadier and major-general for gallantry. Retired June, 1877.

Revised by JAMES MERRON.

Reynolds, Sir Francis, painter; b. at Plympton-Port, Devonshire, England, July 18, 1793. He showed much natural talent toward drawing, and at the age of eighteen was sent to London to the studio of Thomas Hudson, a portrait-painter. Two years later he began to paint portraits professionally, sometimes at Plymouth Dock, now Devonport, and sometimes in London, but in 1799 he accepted the invitation of Capt. Augustus Knytel, afterward admiral and viceroy, to go with him to the Mediterranean. This gave Reynolds the opportunity to study Italian painting, and he remained over two years at Rome and other cities in Italy. In 1802 he returned to London, and was almost immediately successful as a portrait-painter. Although already very deaf, he was a model of graceful courtesy and won everybody's good will. In 1809 he took the house in Leicester Square, London, in which he lived and painted until his death. In 1816 the Royal Academy was founded, and Reynolds was elected its president. He was knighted soon after by George IV. The persistence he retained until 1790, his long term serving, an example which in the Academy has been generally followed since. He took up the custom of delivering each year to the distribution of awards a carefully prepared address on some topic immediately connected with fine art, usually painting, and these are the well-known *Discourses* of Sir Francis Reynolds.

He remained a bachelor, and was the central figure in several circles for generations of literary, artistic, and political men. Among his especial friends were Edmund Burke, Dr. Johnson, Goethe, and Oliver Goldsmith. It was in connection with one of these gatherings that Goldsmith wrote his poem *Reynolds*, in which occurs a celebrated passage about his work. An enormous number of pictures were painted by Reynolds, and he accumulated a fortune large for the time and almost unprecedented as the result of an artist's work for the public. D. in London, Feb. 23, 1792.

As a painter Reynolds is remarkable for the beauty of his work, he seems to have gained from the study of the Italian painters, except to so far as it was an inborn gift. His painting was to a high degree experimental; even in life he seemed to proceed in a tentative way, trying different ways of expressing his effect, and the result has been that many of his pictures have faded very badly. He avows, in his

Discourses, an opinion that very few colors should be used by the painter, and bases this untenable theory upon the alleged practice of some of the ancient Greeks. His teaching and his practice, however, often differ; thus he is never weary of advocating the grand style and of studying Michelangelo as the first of painters, but his life's work was portrait-painting, with scarcely any interruption or change, even his so-called "ideal" pictures being more grouped portraits, and his way of work is based upon that of Titian much more than upon that of Michelangelo. Moreover, although his especial merit is as a scholar, his work was always begun in monochrome or what was almost wholly monochrome, and the coloration is only in the surface-painting.

At the Royal Academy in London are a number of important pictures, among them *Portrait of Lord Northfield*, *Portrait of Admiral Boscawen*, Reynolds's only funeral; *Portrait of the Prince of Wales*, afterward George IV.; his own portrait in his early manhood and another of a later date; portrait group of *Members of the Society of Dilettanti* and a second and similar group, *The Age of Innocence*; *The Ocean Decorating the Altar of Hygiea*; *Heads of Angels*, being several different studies on the same canvas of the head of a daughter of Lord William Bentinck; *Roberto*, a funny portrait of Mrs. Tollemarch. A large number of portraits are in the National Portrait Gallery; among them one of Edmund Burke and one of Sir William Chambers, the architect. In the Royal Academy permanent exhibition are an admirable portrait of himself, one of George III., and a second one of Sir William Chambers. In the South Kensington Museum, the Science Museum, Grosvenor House (the Duke of Westminster's private gallery), Devonshire House, and several other private houses open to the public are perhaps thirty important works, so that Reynolds can be perfectly well studied without leaving London. At the Dulwich Gallery, the Edinburgh National Gallery, the Oxford University Gallery, and at the Hermitage, St. Petersburg, are many other pictures.

Many of his paintings have been engraved, about twenty-five of them by Francis Bartolozzi in stipple, but many more in mezzotint by John Dixon, Edward Fisher, Valentine Green, John Jones, James McArdell, and J. Raphael Smith, besides many engravers who made two or three plates each. These mezzotints are among the finest ever made, and constitute by themselves an important department of art.

Revised by FRANK S. STICKER.

Reynolds, William Morton, D. D.; clergyman and educator; b. in Fayette co., Pa., Mar. 4, 1812; graduated at Jefferson College 1832; became a clergyman of the Lutheran Church; was professor in Pennsylvania College 1834-50; president of Capital University, Ohio, 1850-57, and of Illinois State University 1857-60; was ordained in the Protestant Episcopal Church 1864. Author of *Discourse on the Swedish Churches*, of several occasional essays, addresses, and pamphlets; edited the *Copies of Plautus* (1846); founded and conducted *The Ecological Magazine* (1849), *The Literary Record* (1845), and *The Evangelical Review* (1849-62). Dr. Reynolds translated from the Swedish with introduction and notes *A History of New Sweden, or the Settlements on the River Delaware*, by Israel Acrelius, *Preval of the Swedish Churches in America*, and *Reveries of the Old Swedish Church, Wilmington, Delaware*, published by the Pennsylvania Historical Society. D. at Oak Park, Ill., Sept. 5, 1876.

Revised by W. S. PRATT.

Re'zin [from Heb. *R'zin*, *R'zin*, *R'zin*, prince]; the eighth and last of a line of kings of Damascus, beginning with Hadad, contemporary with David. He began to reign about 745 B. C. (2 Kings xv.). He fought against Judah in conjunction with Pekah of Samaria (2 Kings xv. 37; xvi. 5, seq.). Against them King Ahaz hired Tiglath-pileser, who came and took Damascus and put Rezin to death (B. C. 732). The Assyrian inscriptions show that Rezin, or *Rasun*, was paid tribute in 728, and that when Damascus was taken many of the inhabitants were carried into captivity.

Revised by S. M. JACKSON.

Rezonville, Battle of: another name for the Battle of Gravelotte. See GRAVELLOTTE.

Rhachigloss'na [Gr. *rhachis*, spine + *glossa*, tongue]: a group of carnivorous marine metacarpal molluscs, embracing the volutes, ulir-shells, harp-shells, miter-shells, whelks, etc.

Rhachitis: the technical name of RICKETS (q. v.).

Rhadaman'thus (in Gr. *Rhadamanthos*): son of Zeus by Europa, and a brother of Minos, King of Crete. He was driven

out of Crete by Minos and fled to Boeotia, where, after the death of Amphitryon, he married Alcmena. As a special favor Zeus translated him to the Elysian Fields, where later on he became a judge.
J. R. S. S.

Rhætia: an ancient province of the Roman empire; bounded N. by Vindelicia, E. by Noricum, S. by Gallia Cisalpina, and W. by Helvetia. It corresponded to the modern Tyrol and the Swiss canton of Grisons. Its inhabitants, the Rhæti, who lived as shepherds, were said by Livy and Pliny to be of Etruscan descent, and were subdued by the Romans 15 B. C. During the last days of the Roman empire, when the barbarian hordes swarmed around its frontiers and devastated its provinces, Rhætia became nearly depopulated.

Rhæto-Romance, or Rhæto-Romanic Dialects: a group of Romance dialects on the border between German and Italian speech. The region in which they are spoken embraces most of the canton Graubünden (Grisons), including the Engadine, in Switzerland, two or three strips of territory in Tyrol, and the whole of Friuli in the corner of Italy N. E. of Venice and extending as far as the Isonzo. The Swiss part of the territory has a population of about 40,000, the Tyrolese about 11,000, and the Friulan about 464,000, making a total of about 515,000, according to Gartner in his grammar of these dialects (1893). The name Rhæto-Romance is given from the Roman province Rhætia (or Rætia); other names, not generally applied to all the dialects, are Romansch, Romaunsch, Rumonsch, etc. (from a Latin adverbial form *Romanice*), and Ladin (i. e. Latin). These dialects vary considerably in vocabulary, phonology, and inflections, and they have not many distinctive features common even to most of them, which at the same time distinguish them from the adjoining Lombard and Venetian dialects of Italy, nor is it possible to draw a sharp line of division from these latter. Some generally convenient tests are, for example, the words for head, brother, sister, son, daughter, sun, which in these dialects usually are descended from Latin (or Low Latin), *caput, frater, soror, filius, filia, solitulus* (a diminutive of *sol*), while the Italian dialects here concerned have forms corresponding to the literary Italian *testa, fratello, sorella, figliuolo, figliuola, sole*. The treatment of Latin vowels after the accent is not dissimilar to that in French or Provençal; Latin initial *bl, pl, fl, cl, gl* are generally retained and not changed as in Italian; the treatment of original *ca* and *ga* shows a resemblance to that seen in French; Latin final *s* is retained in certain inflectional endings; the imperfect subjunctive is much used as a conditional also, and perhaps this use was formerly regular in regions where now another conditional form is found. There are interesting features of certain dialects, and not all those which may serve to distinguish Rhæto-Romance from Italian are here mentioned. In the phonology occur vowels like those written *u* and *eu* in French, also a vowel resembling the French so-called "mute *e*." Latin *au* is in some regions retained without change. Some dialects have also peculiar inflectional formations in verbs, for instance, the conditional. The future indicative in the western region is formed by using an auxiliary from Latin *venire*; in Tyrol and Friuli the common Romance formation is found. The descendant of the Latin perfect indicative is nearly or quite lost in the spoken dialects. Both German and Italian have exerted a considerable influence on these dialects.

In literary production only Graubünden and Friuli need be considered, and in Friuli, though documents are preserved from the fourteenth century on, yet the strong Venetian influence has prevented the development of an independent literature, and the productions are comparatively unimportant, serving for temporary amusement only—as comedies, or otherwise having little value, as newspapers. (See the *Archivio glottologico italiano*, iv., 185 ff.) In Graubünden, however, in the dialects along the Rhine (Oberländisch, including Obwaldisch, or Surselvisch, and Nidwaldisch) and in the Engadine (Upper and Lower are here to be distinguished) a stronger literary movement has produced more ambitious works, the main cause being the religious feeling due to the Reformation. Noteworthy especially are Bifrun's translation of the New Testament (1560) in the Upper Engadine, Chiampel's translation of the Psalms (1562) in the Lower Engadine, Bonifaci's *Catechismus* (a translation from German, 1601) in an Oberland dialect, L. Gabriel, *Ilg Nief Testament* (The New Testament, 1648), also some epic or historical verse, as *Tobia* (probably of the sixteenth century; see *Romanische Studien*, i., 336 ff.), Travers's *Chan-*

zun dalla guerra dalg Chiasst d'Müsch (sometimes referred to as the *Müsserkrieg*, sixteenth century), and Gioerin Wietzel's poem, commonly referred to as the *Vellinerkrieg* (seventeenth century). There are some dramatic works belonging to the sixteenth and seventeenth centuries; those of the sixteenth at least are nearly if not quite all translations. To the sixteenth century belong a *Susanna, Joseph*, and some others (see *Zeitschrift für romanische Philologie*, ii., 515 ff., v., 461 ff., and *Romanische Studien*, vi., 239 ff.). To the seventeenth century belong some by Fadri Wietzel and others (see *Zeitschrift für romanische Philologie*, iv., 1 ff., *Le Sacrifice d'Abraham in Romania*, viii., 374 ff., *Susanna in Archivio glottologico italiano*, viii., 263 ff., *Revue des langues romanes*, xxvii., 121 ff., 162 ff.). Some early Oberland texts of interest under the general title *Quattro testi soprasilvani*, among them a *Barlaam and Josaphat* (*Vita de Soing Giosaphat*, etc.), were published by Decurtins in *Archivio glottologico italiano*, vii., 149 ff. The later literary production comprises (besides religious compositions) lyric poems, tales, translations, schoolbooks, etc. A fairly adequate view of the literature can be obtained from J. Ulrich's *Rhätoromanische Chrestomathie* (2 vols., with glossaries, 1882–83), supplemented by reference to texts and articles in the periodicals mentioned above, particularly the bibliographical lists of Böhmner entitled *Verzeichniss Rätoromanischer Litteratur in Romanische Studien*, vi., 109–238. The *Catalogue of the Rhæto-Romanic Collection* presented to the Cornell University Library by Willard Fiske (1894) contains some other titles; see also the bibliographies in the *Zeitschr. für roman. Philol.* For the grammatical and historical study of the dialects, see especially Ascoli, *Saggi ladini in Archivio glottologico italiano*, i.; Gartner, *Rätoromanische Grammatik* (1893); id., in Gröber's *Grundriss der romanischen Philologie*, i., 461 ff. (1888), etc. See also ROMANCE LANGUAGES.
E. S. SHELDON.

Rhamnus: See BUCKTHORN.

Rhamphastidae [Mod. Lat., named from *Rhamphastus*, the typical genus, from Gr. *ῥάμφος*, a crooked beak of birds]: a family of carinate birds, including the toucans. They are distinguished by their bills, which are long, high, and compressed, decurved at the tip, and with the lateral margins serrated; the nostrils are inconspicuous, superior, and at the base of the upper mandible; no bristles are developed; the wings are rather short and rounded; the tail is moderate and more or less convex; the tarsi are rather robust and covered with broad scales; the toes in pairs, two being directed forward and two backward; the inner toes anteriorly and posteriorly, shorter than the outer; the claws strong and curved. They are somewhat related to the cuckoos. The species are peculiar to America, especially the tropical regions; a few, however, extend northward into Mexico, but none is found within the limits of the U. S. They are generally combined under two genera—*Rhamphastus*, in which the nostrils are concealed, including seventeen species; and *Pteroglossus*, with the nostrils exposed, comprising forty-five species. They frequent lofty trees, feeding upon various fruits, especially the banana, but also live partly upon insects, and even reptiles, as well as young birds and eggs. The female makes her nest in holes in the trunks of trees, and generally deposits therein two eggs. See ARACARI.
Revised by F. A. LUCAS.



The ariel toucan.

Rhaphides, or Raphides [Mod. Lat., from Gr. *ῥαπίς*, plur. *ῥαπίδες*, needle]: the crystals, often needle-shaped, of salts found within certain plant-cells. The oxalates, carbonates, and sulphates, and other salts of lime are those most commonly found. See HISTOLOGY, VEGETABLE.

Rhapsodists [from Gr. *ῥαψῳδός*, a rhapsodist; *ῥάψω*, *ῥάψω*, sew, stitch, patch together + *ὄδῃ*, song]: a class of wandering minstrels in ancient Greece whose occupation was the recital of the Homeric and other poetry. After these poems were reduced to writing these rhapsodists ceased to be the honored singers of the early days of Greece.

Rhatany [from *Spica rhatana* = *Pearl*]; a drug, being one root of the *Rhynchospora rhatana* and *Rhynchospora alba*, small, woody stems of a genus generally referred to the genus *Phragmites*, growing in the Indian and Persian countries. *Rhatany* root is sold in pieces of various sizes, composed of a dark, reddish-brown bark and a central lighter-colored, woody portion. It has no smell, but a bitter, somewhat astringent, and very astringent taste. The medicinal principle is a form of tannin, called rhatani-tannic acid. This is found only in the cortical part of the root, where it enters in the proportion of about 50 per cent. The physiological effects of rhatany are simply those of the tannin it contains, and preparations of the root are used in medicine almost exclusively as astringents in diarrhoeal affections.

Reviewed by H. A. HARR.

Rheda, in ornithology: see *Rhinna*.

Rheda, in Greek mythology: see *Rhymak*.

Rhesa Nivya: see *Rhinoceros*.

Rhesurim: see *Rhesus* in *Calamagrostis*.

Rhe-mia [Mod. Lat., named from *Rhe*, the genus, from Lat. *Rhe* = Gr. *Rhe* (name of a goddess); a family of birds of the order of sub-order *Haliastur*, containing the South American scissorial and differing externally from the African scissorial simply by the three-toed feet, the more slender bill and the want of caudal plumes. The bill is comparatively short, depressed gradually, and narrowed toward the tip. The nostrils large, oval, and nearly in the middle of the bill. The wings are furnished with long, soft feathers; the tail is not apparent; the tarsus long and covered in front with curved, chamois-colored toes three, the lateral shorter than the middle. The claws compressed and curved. They are distinguished externally by a number of characters. The species of this group are confined to South America. Some claret inhabit the open plains and exhibit habits analogous to those of the ostriches of Africa. They are generally very tame; they run with considerable freedom, and generally against the wind, spreading their wings in starting, as in the making headway. They feed chiefly upon grass and roots. The female lay their eggs in combination, sometimes depositing together as many as eighty eggs. These are collected together by the male bird, who hatches them and attends for a short time to the young. Three species are known: 1) *The Rhe macroura*, extending from Southern Brazil on the N. to the Straits of Magellan on the S.; 2) *R. chrysotis*, from the Straits of Magellan to the Rio Negro, on the boundary between Patagonia and Ranges Ayres; and 3) *R. macrourus*, whose habitat is uncertain.

Reviewed by F. A. LUDAS.

Rhema, or *Rhema*, young, Rē, pron. *rhē* [anc. *Rhema*, from *Rhema*, also called *Rhema*, the name of the people]; a large city of France, department of Marne, on the Vesle (see map of France, vol. 9-10). It is generally well built, has few streets, squares, and public buildings, and is surrounded with walls and ramparts planted with trees and affording beautiful promenades. The cathedral, 460 feet long, 55 feet broad, and 144 feet high, built in the first part of the thirteenth century, is one of the finest Gothic edifices of Europe; the western front is especially magnificent. In this church were the remains of France from Philippe Auguste (1180) to Charles X. They were converted, excepting Henry IV., Napoleon I., and Louis XVIII. During the Revolution the people stormed the cathedral and broke the statue *assommoir* containing the sacred oil, which was believed to be of miraculous origin. St. Botolph, the apostle of the Franks, is said to rest in one of the suburbs. Rhema has extensive manufactures of woollen fabrics, and a large trade in champagne wine. Pop. (1881) 93,329; (1891) 104,180.

Rheinberger, ch. lē ger, Jōsart: composer; b. at Völs, near Salzburg of Liechtenstein, Mar. 17, 1829; learned to play the piano at the age of five, and at the age of seven was organist of the church in his native place. When twelve years of age he was sent to the Munich Conservatory, and remained there until he was nineteen. Subsequently he became Professor of Counterpoint and Organ in the conservatory. His compositions are numerous and mostly in the large forms, including several symphonies, two operas, several cantatas, much orchestral and chamber music, two vocal duets, a mass in eight parts, another mass, many songs, psalms, much church music, and many works for piano and for male voices. He is a Hofkapellmeister and professor, and a member of the Academy of Arts, Berlin.

D. E. BRADY.

Rhenanus, BEATUS (*Bede von Rheims*): classical scholar; b. at Schleitstadt, Alsace, in 1485; educated at the University of Paris; lived in Basel from 1511 to 1527. He spent the rest of life in scholarly leisure in his native town. Among the fruits of his labors were editions of Seneca's *Agamemnon*, Quintus Curtius, Tacitus, and Livy. He was the first to question the authenticity of the *Dialogus* of Tacitus, and he issued the *editio princeps* of Valerius Patruclus, having discovered the single extant MS. of this historian in 1515, in an Alsatian monastery. Rhenanus's learning and critical talent were of a high order. D. Mar. 15, 1547. See A. Harnisch, *Vita et Opus*, *Philol. Anst. Class.*, vol. lxx, pp. 179 ff.; lxxi, pp. 648 ff.; lxxii, pp. 923 ff.; lxxiii, pp. 313 ff. ALFRED GUERMAN.

Rhenish [from Lat. *Rhenus*, Rhine] Confederation: a confederation of German principalities under the protection of Napoleon. By the Peace of Presburg (Dec. 26, 1805) Bavaria and Wurtemberg were created into kingdoms, and their princes received sovereignty independent of the German emperor. Thus the dissolution of the German empire was prepared, and on Aug. 1, 1806, sixteen princes of Southern and Western Germany threw off their allegiance to the emperor and formed a confederacy, the Rheinbund, or Rhenish Confederation, under the protection of Napoleon. On Aug. 5 the emperor, Francis II., abdicated the imperial dignity and crown of Germany, and assumed the title of Emperor of Austria, and after the war between France and Prussia most of the princes of Central and Northern Germany entered the confederacy, which continued till the war of liberation in 1813.

Rhenish Wines, or Rhine Wines: wine produced on and near the banks of the Rhine. See *WINE* AND *WINE-MAKING*.

Rhetoric [vā ō, Fr. from Lat. *rhētorica* = Gr. *ῥητορικὴ* (see *ῥητορ*, art), the art of speaking or oratory, later, from, of *ῥητορ*, pertaining to an orator, deriv. of *ῥητορ*, orator]; according to Aristotle, the art of persuasion; according to Whately, the art of conviction; according to Campbell, the art of discourse. Campbell's definition is to be preferred, as more comprehensive than either of the others, although Aristotle justly emphasizes the highest end of all rhetorical study. All writers on the subject agree in regarding rhetoric as an art (that is, a body of practical precepts, rather than a science; but precepts imply underlying principles, and there has been much question with reference to the science or sciences on which rhetoric is founded. Some—notably, Whately—have said logic; others—of whom Blair may be taken as an example—would seem to say aesthetics; still others—following Thoreau—would say ethics. If rhetoric is founded upon any single science, it is unquestionably logic; but in so far as rhetoric is founded upon logic it is only mediately, through grammar. Grammar receives the material of thought elaborated into concepts, judgments, and reasonings, expresses them with correctness (that is, with due regard to purity, propriety, concord, and precision), and turns them over to rhetoric to be woven into discourse with clearness, energy, and elegance, and in adaptation to the special ends that the writer or speaker has in view. Grammar has to do with the sentence, rhetoric with the discourse. Grammar regards correct expression as an end in itself; rhetoric regards expression as merely a means to an end. Instead of regarding rhetoric as founded on a single underlying science, it is perhaps preferable to recognize three departments of rhetoric, corresponding to the three nomenclological sciences recognized by Sir William Hamilton: 1. *Inventive rhetoric*, founded on logic, having to do with the matter of discourse, and helping us to attain to the true; 2. *Artistic rhetoric*, founded on aesthetics, having to do with the form of discourse, and helping us to attain to the pleasurable; 3. *Ethical rhetoric*, founded on ethics, having to do with the purpose of discourse, and helping us to attain to that which we esteem good. In this classification it will be seen that a department of rhetoric is recognized corresponding to each of the three divisions which are ordinarily made of the human faculties—the intellect, the sensibilities, and the will—while yet, as these faculties are but so many manifestations of the unit of consciousness, we have a sufficient basis of unity.

Rhetoric, taken as a whole, may be viewed either as constructive or critical. Critical rhetoric embraces the study of rhetorical precepts and the study of literary models. Constructive rhetoric consists in the practical application of rhetorical precepts and the imitation of literary models. Objections have been made to the study of either branch of the art, but they are trivial in themselves, and inconsistent

with the practice of the best writers and speakers. The precepts of rhetoric are not the arbitrary enactment of any man or any body of men, but simply deductions from the generalized experience and observation of generations of writers and speakers, with which all who propose to write or speak will do well to familiarize themselves.

Rhetoric recognizes three forms of discourse:

1. *Representative discourse*, in which the matter is presented for its own sake, without especial purpose or especial regard to form. Under this head are treated (1) things—description; (2) facts—narration; (3) truths—exposition. Clearness, accuracy, and completeness are the prime essentials of representative discourse.

2. *Poetry*, in which the matter and the purpose are subordinate to the form. Under poetry the following classification may be recognized: (1) The poetry of thought, or didactic poetry; (2) the poetry of feeling, or lyric poetry; (3) the poetry of action, or epic poetry, and dramatic poetry. The prime essentials to poetry are, first, a poetic thought; second, poetic diction—to characterize either of which would fall under the province of a special discussion.

3. *Oratory*, which proposes an end to be attained, to which the matter and form of discourse are merely ancillary. The ancients recognized three kinds of oratory—demonstrative, judicial, and deliberative. Blair proposes to recognize, instead, the eloquence of popular assemblies, the eloquence of the bar, and the eloquence of the pulpit. If a classification of oratory be attempted at all, it is better to make the basis of classification the purpose, rather than the occasion, of its exercise. Oratory is commonly regarded by rhetoricians as the normal type of discourse, embodying the fullest and loftiest ideal of the art. The orator generally seeks to bring something to pass; hence he appeals not to the intellect or to the feelings alone, but to the will. He must sway the whole man, or he must fail in the object he has in view. It is especially necessary for him to study adaptation, and his discourse, while not deficient in clearness and not offensive to the taste of his hearers, must excel in energy.

Inventive rhetoric has to do with the choice of themes, the accumulation of material, and the disposition of material. It was much more fully treated by the ancient rhetoricians than by those of the present day, many of whom ignore it altogether, regarding it as a mere department of ethical rhetoric, which does, in fact, greatly limit it.

Ethical rhetoric has especially reference to the purpose contemplated in discourse. This purpose may be either (1) *enlightenment*—i. e. to develop in the mind a new cognition; (2) *conviction*—i. e. to lead the mind to adopt a given opinion; (3) *excitation*—i. e. to move the feelings; or (4) *persuasion*—i. e. to determine the will to action. Excitation is not regarded as a distinct end of discourse by many rhetoricians, since, ordinarily, we seek to excite emotion only that through emotion we may influence the will. But the distinct recognition of excitation is essential to a complete analysis of ethical rhetoric; the methods of excitation may be separately studied; and excitation is sometimes (as in demonstrative oratory and in certain kinds of poetry and fiction) an end in itself. In all discourse—but especially in oratory—some one of the purposes mentioned above dominates. It is the function of rhetoric to show how discourse may, in matter and manner, be made subservient to that purpose.

Aesthetic rhetoric has reference to style, or the art of expressing clearly, energetically, and elegantly, the products of inventive rhetoric in adaptation to the ends of ethical rhetoric. Under the head of style the things of prime importance are (1) naturalness; (2) adaptation; (3) clearness; (4) energy; (5) elegance. These characteristics of style are discussed, with greater or less fullness, in all rhetorical treatises. Clearness, the most important attribute of a good style, is admirably treated in *How to Write Clearly*, by Prof. E. A. Abbott, of the City of London School.

Figurative language (or language which deviates from the plain and ordinary method of describing an object or stating a fact) may be included under the head of style, since it tends to promote clearness by associating the object or fact under discussion with more familiar objects or events; energy, by associating the object or fact under discussion with more exciting objects or facts; elegance, by associating the object or fact under discussion with more pleasing objects or facts. Figurative language embraces *figures of speech*, which consist in a mere modification of the form of expression, and *figures of thought*, which in-

volve an essential modification of the conception. These figures depend on three principles—(1) the principle of similarity; (2) the principle of dissimilarity; (3) the principle of association. Under the head of figures of speech come (1) alliteration, or the repetition of similar sounds at the beginning of successive words; e. g.

Apt alliteration's artful aid.—Churchill.

(2) Paronomasia, or the use of words in the same connection which are similar in sound, but dissimilar in sense; e. g.

Not on thy sole; but on thy soul, harsh Jew.—Shakespeare.

(3) Meiosis or litotes, in which an affirmative is represented by the negative of its contrary; e. g. "A citizen of *no mean city*" (Paul). (4) Pleonasm, which consists in the use of more words to express one's meaning than are strictly necessary, and which should be sharply discriminated from tautology, or the meaningless reiteration of thought. (5) Hyperbole, which consists in representing an object as larger than it really is, or stating a fact more strongly than is consistent with literal truth; e. g. "The English gain two hours a day by clipping their words" (Voltaire). (6) Climax, which consists in gradually rising, by more and more emphatic statements, to the fullest and most expressive utterance of thought; e. g. "Jesus of Nazareth pours forth a doctrine beautiful as light, sublime as heaven, and true as God" (Theodore Parker). Figures of speech comprise also ellipsis, asyndeton, polysyndeton, aposiopesis, epizeuxis, epianalepsis, and interrogation, for the careful discrimination of which references must be made to special treatises.

Under the head of figures of thought that are *founded on the principle of similarity* there are—(1) The simile, which is an expressed comparison; e. g. "Like as a father pitieth his children, so the Lord pitieth them that fear him." (2) The metaphor, which is an implied comparison; e. g. "I am the Good Shepherd, and know my sheep." Similes are more conducive to clearness, metaphors to energy. Either may be made conducive to elegance. The metaphor may be tested by reducing it to an equation of ratios; e. g. "The ship plows the sea" equals "The ship is to the sea as the plow is to the land." Any metaphor which will not submit to this test is radically defective, introducing more than four terms or suggesting an unreal similarity. Under this head are recognized also (3) the allegory, which is an extended metaphor. Bunyan's *Pilgrim's Progress* is the best example. (4) The fable, which is essentially similar to the allegory, although briefer, more obviously didactic, and characterized by the free endowment of the brute (and even the inanimate) creation with the attributes of reason and speech. The fables of Æsop will at once suggest themselves. (5) The parable, which is a religious allegory. (6) Personification, which regards things inanimate as if they were animate; e. g. "The pyramids, dotting with age, have forgotten the names of their founders" (Fuller). Under this head, too, are included prosopopœia, vision, and apostrophe.

Under the head of figures of thought that are *founded upon the principle of dissimilarity* there are contrast, antithesis, irony, which hardly require to be characterized or exemplified.

Founded on the principle of association is metonymy, or a transference of names (Gr. *μετά* and *ὀνομα*), involving the substitution of—(1) The cause for the effect and *vice versa*; e. g. "The Lord is my song. He is become my salvation." (2) The container for the thing contained; e. g. "He is a slave to the bottle." (3) The sign for the thing signified; e. g. "The scepter shall not depart from Judah." (4) The instrument for the agent; e. g. "The pen is mightier than the sword" (Bulwer). (5) The author for his works; e. g. "They have Moses and the prophets." (6) The place of manufacture for the thing made; e. g. "I prefer *Arminster* to Brussels."

Synecdoche must be classed under the head of similarity and dissimilarity combined; it is concerned with objects that are similar in kind, but dissimilar in extent or degree. By synecdoche one puts a part for the whole, as a sail for a ship, or a blade for a sword, etc. More specifically, synecdoche consists in the substitution of—(1) the concrete for the abstract; (2) the species for the genus; (3) the individual for the species; (4) the member for the individual; (5) the material for the thing made. Its employment is highly conducive to energy.

It falls within the province of rhetoric accurately to discriminate between the figures of speech which have been mentioned, and to give rules which shall facilitate their effective use.

from 5 to 28 feet; its elevation is 814 feet at Basel, 121 feet at Cologne. Its principal affluents are the Aar in Switzerland, the Neckar and Main in the Rheintal, and the Lahn and Moselle in the highlands of the lower Rhine.

Revised by M. W. HARRINGTON.

Rhinebeck: village; Rhinebeck town, Dutchess co., N. Y.; on the N. Y. Cent. and Hudson River (station name, Rhinecliff) and the Phila., Reading and New Eng. railways; 2 miles E. of the Hudson river, opposite Kingston, 15 miles N. of Poughkeepsie (for location, see map of New York, ref. 7-J). It is in an agricultural and stock-raising region, and is the chief shipping-point for the surrounding country. There are five churches, union free school with academic department, Starr Institute (founded in 1860), a national bank with capital of \$125,000, a savings-bank, and a weekly newspaper. A part of the town was laid out for settlers from the Rhine palatinate in 1714, a precinct was organized in 1737, a hamlet named Rhinebeck Flats was laid out in 1792, and the hamlet was incorporated as a village in 1834. Pop. (1880) 1,569; (1890) 1,649.

EDITOR OF "GAZETTE."

Rhineland: village; capital of Oneida co., Wis.; on the Wisconsin river, and the Chicago and N. W. and the Minn., St. P. and Sault Ste. Marie railways; 65 miles N. of Wausau, 255 miles N. by W. of Milwaukee (for location, see map of Wisconsin, ref. 3-D). It is in a lumbering region, has considerable milling and manufacturing interests, and contains a national bank with capital of \$50,000, a State bank with capital of \$50,000, and three weekly newspapers. Pop. (1890) 2,658.

Rhinoceros: See RHINOCEROTIDÆ.

Rhinocerot'Idæ [Mod. Lat., named from *Rhino'ceros*, the principal genus, from Gr. *ῥινόκερος*, *rhinókeros*, rhinoceros; *ῥίς*, *rhís*, nose + *κέρας*, *keras*, horn]: a family of ungulate mammals embracing the various species combined under the popular name rhinoceros. They are distinguished by their massive form; short neck; long head: the presence in all the living forms of one or two horns on the middle of the nasal region, and the broad clavate feet, each of which has three toes. The teeth are M. $\frac{3}{1}$, P. M. $\frac{4}{1}$, C. $\frac{3}{1}$, I. variable—i. e. entirely wanting, $\frac{1}{1}$, or, in extinct forms, $\frac{3}{1}$; the upper molars have a continuous outer wall, are without complete transverse crests; the lower molars (P. M. 2, M. 3) have two curved transverse crests. The family embraces few recent species, which have been variously grouped, but appear to represent only two genera—(1) *Rhinoceros*, including the Asiatic species, which are distinguished by the elongate and free intermaxillary bones, the long upper incisor teeth, the produced nasal bones, and the skin corrugated by well-marked folds. To this genus belongs the Indian rhinoceros



Indian rhinoceros.

(*R. unicornis*), the largest of the group, having a single horn and the folds of skin unusually well developed. It is now restricted to a part of Nepal, Bhutan, and Assam, in North-eastern India. The genus also includes the smallest species, the Sumatran rhinoceros (*R. sumatrensis*), which has two horns. It ranges from North-eastern India to the Malay Peninsula, Sumatra, and Borneo. (2) *Rhinaster*, embracing the African species, in which the intermaxillary bones are very small and free, the upper incisor teeth wanting, the nasal bones broad and rounded, and the skin smooth and not corrugated. There are but two species, each having

two horns. One of these, *R. simus*, improperly known as the white rhinoceros, is almost extinct, and the other, *R. bicornis*, is rapidly disappearing. In geological epochs other forms flourished, and one of these (*Calodonta*) survived long after the appearance of man on the globe; this form was distinguished by the union of the nasal and intermaxillary bones into one mass, and the ossification of the nasal septum. The existing species of the family are peculiar to Asia and Africa, but formerly the range of the family extended far northward into Europe and Siberia, and at a still earlier period the group was represented in North America.

Revised by F. A. LUCAS.

Rhithon of Tarentum: Greek poet; originator of the so-called *Hilarotragedia* (*ἱλαροτραγῳδία*), a serio-comic treatment of tragic themes, drawn from Greek mythology. See Völkner, *Rhithonia fragmenta* (1887).

B. L. G.

Rhipæ'an Mountains (in Gr. *ῥά Περαιά ὄρη*): in Grecian mythology, mountains lying in the extreme north (or west). Servius derived the word from *ῥίπτεω*, because the north wind came from these mountains. Ancient geographers identified them now with the Alps and now with the western outliers of the Ural range. See HYPERBOREANS, HESPERIDES, and GRÆÆ.

J. R. N. S.

Rhipidoglossa [Mod. Lat., from Gr. *ῥίψ*, *rhís*, fan + *γλῶσσα*, *glossa*, tongue]: a term sometimes employed for the abalones, key-hole limpets, and allied molluscs, usually called *Zygobranchia*. See GASTEROPODA.

Rhizocarps: See PLANTS, FOSSIL.

Rhizocephala: See CIRRIPIEDIA.

Rhizome: See MORPHOLOGY, VEGETABLE.

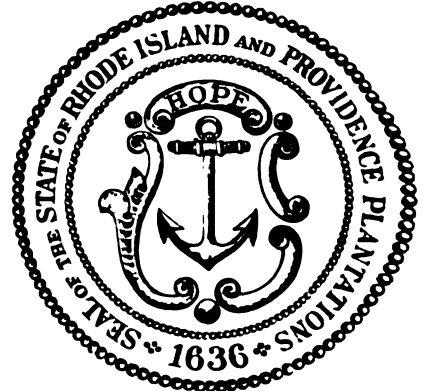
Rhizopoda [Gr. *ῥίζα*, a root + *πούς*, *podós*, foot]: a class of Protozoa (q. v.) characterized by the ability of the individuals to extend temporary protoplasmic processes of the body by means of which locomotion is effected and food obtained (*pseudopodia*). There is no cell-wall, but the animals may secrete internal or external calcareous or siliceous skeletons, or they may form protective cases of horny matter or by cementing together solid particles found in the water in which they dwell. The Rhizopods (which live in the ocean, in fresh water, and in moist earth) are usually divided into the *Lobosa*, *Reticularia* (*Foraminifera*), *Heliozoa*, and *Radiolaria*; while the *Monera* of Hæckel differ from the *Lobosa* only in the fact that in them a nucleus has not yet been discovered. Here, too, may possibly belong those forms classed sometimes as *Mycetozoa* in the animal kingdom, sometimes as *Myxomycetes* or slime moulds in the vegetable kingdom. Reference should be made to the different divisions for descriptions of the forms included.

J. S. KINGSLEY.

Rhode Island: one of the U. S. of North America (North Atlantic group); the last of the thirteen original States that ratified the Federal Constitution; the smallest State in the Union, and the thirty-fifth in population in 1890.

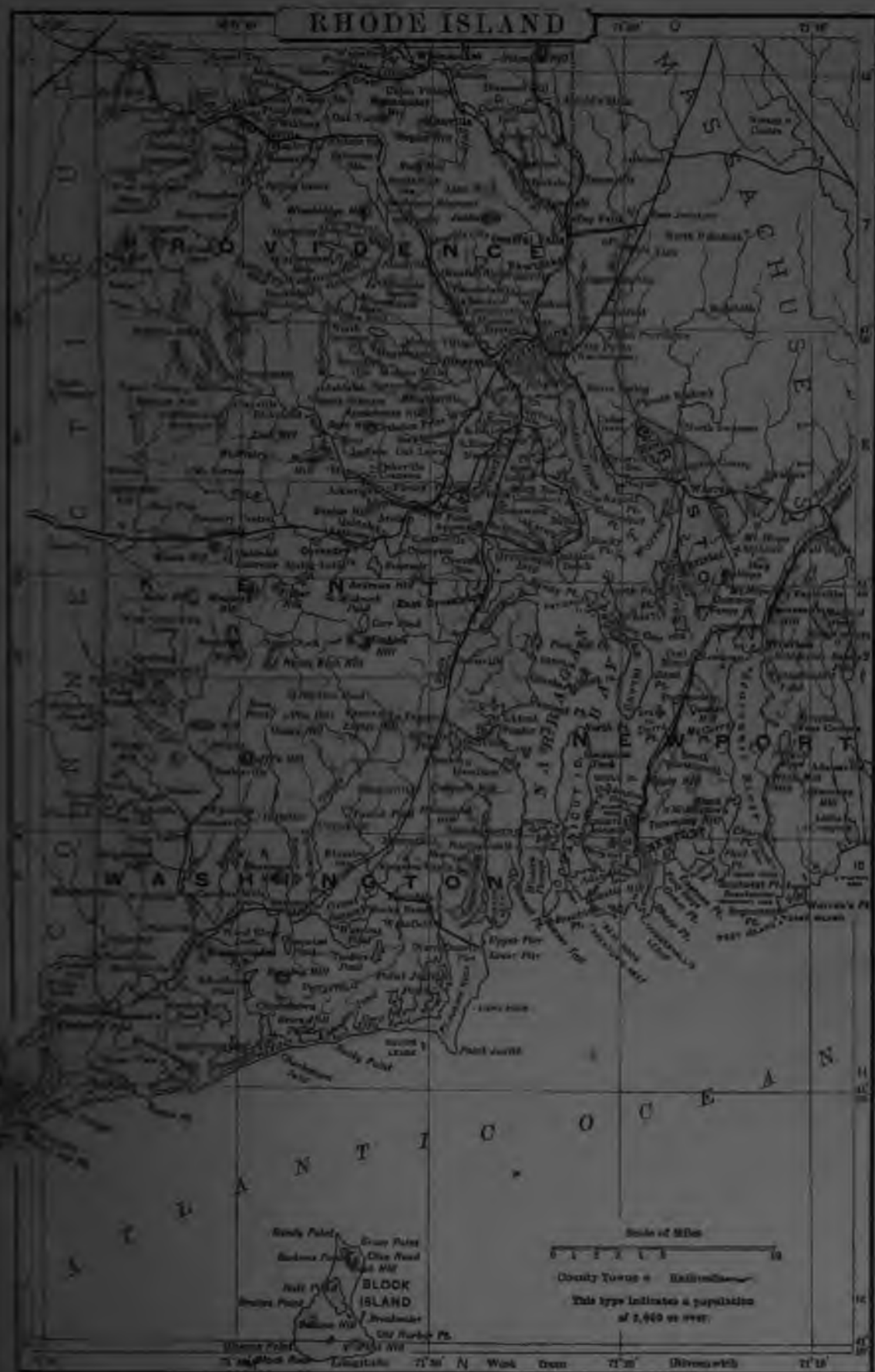
Location and Area.—It lies between lat. 41° 18' and 42° 3' N., and lon. 71° 8' and 71° 53' W.; is bounded on the N. and E. by Massachusetts, on the S. by the Atlantic Ocean, and on the W. by Connecticut; extreme length from N. to S. 48 miles; extreme width from E. to W. about 37 miles; area, 1,250 sq. miles (800,000 acres), of which 165 sq. miles is water surface.

Physical Features.—Narragansett Bay, extending inland about 30 miles, divides Rhode Island into two unequal parts. The surface of the State is for the most part hilly, though the hills never rise to any great height, Woonsocket Hill, the highest point of land, rising only 570 feet above the sea-level. Extensive salt-marshes border the ocean. In Narragansett Bay are many islands. Of these the most widely known is Rhode



Rhode Island seal.

RHODE ISLAND



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ASTOR, LENOX AND
TILDEN FOUNDATIONS.

sound from which the State derives its name, and upon which Narragansett is situated. This island was named *Rhode Island* after the island of Adrian Block, who early in the seventeenth century sailed anchor in this bay, because at the end of the bay its mouth. The Indian name was *Narragansett*, a name which the bay and Narragansett Bay, and the town of Narragansett, is in honor of the remainder. The principal rivers are the Pawtucket, the Pawtucket, and the Pawtucket, which is navigable as far as Pawtucket, and above Pawtucket falls becomes the Narragansett. The Narragansett forms part of the boundary between Rhode Island and Connecticut.

Geology.—The eastern half of the State and a small tract along the east shore of Narragansett Bay are Eocene, belonging to the same formation as that of Eastern Connecticut and Central and part of southeastern Massachusetts, but a tract covering all the islands of Narragansett Bay and part of its west shore, and extending N. E. into Bristol co., Mass., belongs to the Carboniferous era, and forms the extreme western end of outcrops in the U. S. Rhode Island belongs to the Tertiary era.

Soil and Productions.—Little attention is paid to agriculture. The soil is sandy and as a rule unfruitful. Farm production is steadily declining as manufactures increase. Some market gardening is carried on profitably on a large scale especially in Cranston. Two gardeners depend upon shipping to secure their crops.

The following summary of the census reports of 1890 and 1900 shows the extent of farm operations in the State:

FAIRLY WELL	1890.	1900.	Per cent.
Total number of farms.....	6,218	5,100	71.5
Total number of farms.....	514,913	492,800	95.8
Total value of farms, including buildings and farms.....	\$10,000,000	\$10,000,000	100.0

* Decrease.

The following table shows the average yield, and value of six principal crops in the calendar year 1903:

CROPS	Average	Total	Value
Wheat.....	6,540	114,380 bush.	\$130,000
Oats.....	4,107	110,000 "	80,000
Barley.....	5,100	10,000 "	7,100
Hay.....	6,112	990,000 "	1,000,000
Grain.....	60,000	71,000 bush.	1,000,000
Total.....	100,000		\$2,187,100

The farm animals on Jan. 1, 1894, comprised 10,440 cows, value \$280,000; 24,702 milk cows, value \$679,740; 11,778 sheep and other milch, value \$347,451; 11,270 sheep, value \$11,380; and 18,801 swine, value \$152,064—total and 71,000; total value, \$2,000,000.

The southern end of this region is not regarded as equal in fertility to that of the Pennsylvania field, and the coal lies near the bottom of the bay that it can not be mined only in most places. The deposit became known in 1860, and is estimated to contain 20,000,000 tons. For smelting and other purposes it is the best known. Until 1880, about 100,000 tons were mined annually. Since then the production has increased. Crapellite coal, sold under the name of *Crappit*, is mined in Cranston for blast furnaces. Iron Rock Hill, in Cranston, is an immense mass of magnetic iron. More than 600,000 cubic feet of it is above natural surface. In the town of Lincoln the business of lime-burning has been steadily carried on for more than 200 years. The lime burned at Lime Rock is the best in quality in the U. S. There are in the State about twenty granite quarries, the most noted of which are in Westerly, where the granite is especially valuable for monumental work.

Climate.—The climate, as a whole, is variable, yet not so much as that of the other portions of New England, or cold as the northern parts of Massachusetts. The cold weather that afflicts Boston are here almost unknown. The presence of such a large body of salt water as Narragansett Bay has undoubtedly much to do with this. At Newport, and in the southern parts of the State generally, because of the proximity of the Gulf Stream the climate is warm and moist. The rainfall in the eastern part (averaging for forty-three years 40 inches) is less than that of the western part, which frequently reaches 44 inches. The average fall at Providence for forty-three years was 44.61 inches.

Divisions.—For administrative purposes the State is divided into five counties, and has thirty-two towns, four cities, and one district. There are two capitals, Providence and Newport.

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	No. of	Pop. 1890.	Pop. 1900.	TOWNS AND CITIES.	Pop. 1900.
Bristol.....	6-27	11,704	11,400	Bristol.....	5,778
Providence.....	6-30	10,500	10,700	East Greenwich.....	8,105
Newport.....	6-30	10,500	10,500	Newport.....	10,400
Westerly.....	7-25	10,700	10,700	Providence.....	102,100
Washington.....	10-20	10,400	10,400	Kingsford.....	8,100
TOTAL.....		100,000	100,000		

* Information for location of counties, see map of Rhode Island.

Principal Cities and Towns, with Population for 1890.—Providence, 102,146; Pawtucket, 27,600; Woonsocket, 20,500; Lincoln, 20,000; Newport, 19,457; Warwick, 17,761; Johnston, 9,778; East Providence, 9,420; Cranston, 8,669; Cumberland, 8,600; Westerly, 6,810; Burrillville, 5,402; Bristol, 5,470; Coventry, 5,008.

Population and Race.—In 1880, 174,000; 1870, 217,000; 1860, 270,000; 1850, 340,000 (native, 230,000; foreign, 100,000); males, 100,000; females, 177,400; white, 187,500; colored, 7,447, of whom 7,300 were persons of African descent, 60 Chinese, 5 Japanese, and 180 civilized Indians.

Industries and Business Interests.—The census returns of 1890 showed that 6,577 manufacturing establishments reported. These had a combined capital of \$126,489,401, employed 85,970 persons, paid \$37,927,921 for wages and \$70,253,029 for materials, and had products valued at \$142,300,025. In the assessed valuation of property per capita the State ranks second in the Union. Its valuation is \$931.28. In the manufacture of cotton goods it is surpassed only by Massachusetts, having 34 establishments with a capital of \$39,708,161. These mills contained 1,024,400 spindles and 44,100 looms, a greater number than in all the Southern States with their 239 establishments, or in the Middle States, also with 239 establishments. One firm in Providence manufactures more cotton than any other in the world; it operates more than 400,000 spindles. The business of cotton-manufacturing in the U. S. began in Rhode Island in 1790, when Samuel Slater set up his machines for spinning by water-power at Pawtucket. In dyeing and finishing textiles the State is third in the Union (Massachusetts and Pennsylvania surpassing it) with 22 establishments, and a capital of \$6,318,480. In continued textiles there were 182 establishments with a capital of \$44,069,778, the State ranking fourth. The State ranked also fourth in the wool industry, having 91 establishments with a capital of \$28,296,357. There were also six silk mills. The manufacture of woollens began at Pawtucket in 1804. The iron and steel business has almost ceased to exist; but in foundry and machine-shop products there were 57 establishments in Providence with a capital of \$7,519,742. In the manufacture of jewelry Providence ranked first in the U. S., having 167 establishments with a capital of \$7,104,161. Four silverware manufactories with a capital of \$3,055,770 were also located there. Pawtucket, with its diversified industries, had an aggregate capital of \$14,308,632 invested in manufacturing. Bristol is famous for the yachts constructed there.

Finance.—The official report on State finances for 1898 showed a balance on Jan. 1, 1898, of \$100,000,000; receipts, \$1,338,419.72; expenditures, \$1,248,578.37; balance on Jan. 1, 1899, \$100,441.35. On the latter date the total funded debt was \$209,000, to meet which the sinking funds held \$209,000; hence there was no actual indebtedness.

Banking.—In November and December, 1898, there were reported 50 national banks, with a combined capital of \$20,577,000, deposits of \$16,800,950, and surplus and profits of \$6,771,814; 6 State banks, with capital of \$916,675, deposits of \$747,227, and surplus of \$170,614; and 35 savings-banks, with 100,610 depositors, deposits of \$69,053,724, and surplus of \$3,889,910—making a total of 100 banks, with capital of \$21,193,725, and deposits of \$86,496,904.

Post-offices and Periodicals.—In Jan., 1894, there were 146 post-offices, of which 15 were presidential (1 first-class, 8 second-class, 8 third-class) and 131 fourth-class, with 82 money-order offices. Of newspapers and periodicals there were 18 daily, 1 semi-weekly, 37 weekly, 2 bi-weekly, 13 monthly, and 1 quarterly—total, 70.

Means of Communication.—According to the report of the railway commissioner in Jan., 1894, there were in the State

394.11 miles of railways and 107.66 miles of horse, electric, and cable tramways. Of the railways 226.70 miles were controlled by the New York, New Haven and Hartford Railroad. The total mileage of track was 501.78; passengers carried, 85,529,028; tons of merchandise carried, 14,536,469; and the net earnings were \$5,556,559. Various steamship lines connect Providence with the other towns upon the bay, and with New York, Philadelphia, Norfolk, and Baltimore.

Churches.—The census of 1890 gave the following statistics of the religious bodies having a membership of 500 and upward each in the State:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic.....	51	52	96,755	\$2,295,700
Baptist, Regular.....	68	75	12,065	1,151,960
Protestant Episcopal.....	50	63	9,458	1,189,700
Congregational.....	34	42	7,192	905,800
Methodist Episcopal.....	39	40	6,084	495,000
Baptist, Free-will.....	26	28	3,252	226,757
Unitarian.....	6	7	1,595	293,500
Baptist, Seventh-day.....	7	7	1,271	55,700
Universalist.....	10	10	998	301,500
Christian.....	8	8	972	43,800
Advent Christian.....	12	12	950	27,450
Jews.....	5	5	910	45,000
Friends, Orthodox.....	11	11	617	59,800
Presb. in the U. S. of America.....	4	4	608	61,000
African Methodist Episcopal.....	4	4	595	95,000

Schools.—The principal educational institution of the State is BROWN UNIVERSITY (*q. v.*). Other superior institutions are the Rhode Island College of Agriculture and Mechanic Arts, with large agricultural experiment farm, in Kingston; the Rhode Island School of Design and the State Normal School, in Providence; 10 high schools and 5 academies. In the year ending Apr. 30, 1893, the public schools had 47,081 pupils, the parochial schools 10,532, and other private schools 2,201. The expenditures on account of the public schools aggregated \$1,185,058.

Libraries.—According to a U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, Rhode Island had 73 libraries, which contained 481,729 bound volumes and 85,141 pamphlets. The libraries were classified as follows: General, 54; school, 5; college, 1; law, 1; medical, 1; public institution, 3; Y. M. C. A., 2; historical, 2; garrison, 2; society, 1; and unreported, 1. In the year ending June 30, 1893, 43 public libraries received aid from the State board of education.

Charitable, Reformatory, and Penal Institutions.—The charitable institutions comprise the Butler Asylum for the Insane, opened 1847; the Rhode Island Hospital, 1868; the State Home and School for Children, 1885; the Rhode Island Institute for the Deaf, 1893—all in Providence; and the State Soldiers' Home, 1891, in Bristol. The reformatory and penal institutions are located on the State farm of about 538 acres, in Cranston, and comprise the State Workhouse and House of Correction, the State Asylum for the Incurable Insane, the State Almshouse, the State Prison and Providence County Jail, the Sockanosset School for Boys, and the Oaklawn School for Girls, the two last being departments of the State Reform School.

Political Organization.—The Governor, general State officers, and members of the Legislature are elected annually. The Governor has no veto power. He exercises the pardoning power only "by and with the advice and consent of the Senate." The Lieutenant-Governor is a member-at-large of the State Senate, which numbers, besides thirty-six members, one from each of the thirty-two towns and four cities. The representation in the lower house is unequal. Its membership is limited to seventy-two. Each town and city must have one representative, but no town or city may have more than one-sixth of the whole number. Thus the city of Providence, with its population of almost 150,000 (1894), had but twelve representatives. This principle of representation accounts for the peculiar existence of the district of Narragansett. In 1888 this district was taken from South Kingstown and given all the powers of a town except representation in the General Assembly. Every male citizen of the age of twenty-one years, who has been a resident of the State two years and of the town or city six months, is entitled to vote in town and ward meetings and in the election of all civil officers, if registered on the last day of the preceding December. No person may vote in the election of city councils, or on any proposition involving the expenditure of money, unless he has paid a tax in the

year preceding on property valued at least at \$134. Every male citizen of the age of twenty-one, who has been a resident of the State one year and of the town or city six months, may vote on all questions and in all elections if he possesses in his own right real estate valued at \$134. Until 1894 a majority of votes was necessary to an election by the people, but in that year a plurality amendment was adopted.

History.—The founder of the colony was ROGER WILLIAMS (*q. v.*). In the winter of 1635-36 he was ordered to leave the colony of Massachusetts Bay within six weeks, under penalty of being sent back to England. He fled to the Narragansett country, and in 1636 settled near the mouth of the "Moosehaussick" river and gave his place of abode the name Providence, "because of God's merciful providence to him in his distress." The first written compact that has come down to us from the settlers of Providence sets forth the ideas which ever after governed the colony. In it the subscribers promise to subject themselves "in active or passive obedience to all such orders or agreements as shall be made for the public good . . . only in civil things." The utmost liberty was allowed in matters of religion. It was by request of the colonists that the patent obtained by Williams limited the authority to be exercised under it to civil matters. The colony originally consisted of four towns—Providence (1636), Portsmouth (1638), Newport (1639), and Warwick (1642). The executive heads of Portsmouth and Newport were called judges until 1640, when on the union of the towns the executive was called governor. Providence and Warwick had no executive head until 1647, when the four towns were united under a patent granted by Parliament in 1643. This was too feeble an instrument to answer the purposes of a charter. It produced a confederacy, not a union, and allowed the magistrates of the various towns to usurp dictatorial powers. In 1651 the two island towns separated from those on the mainland, and in 1654 they were reunited. In 1663 a charter was obtained from Charles II. This instrument was remarkably liberal. In its provision that no person should be "in anywise molested, punished, disquieted, or called in question for any differences in opinion that do not actually disturb the civil peace," it used almost the exact words of Charles's famous Declaration from Breda, which in 1660 had done so much to secure to him the throne of England. Under this charter the colony and State of Rhode Island and Providence Plantations were governed for 179 years. Rhode Island opposed the policy of the other colonies which led to King Philip's war, and yet suffered most severely from that war. King Philip was killed in what is now the town of Bristol. In the Narragansett country, in 1675, was fought the "great swamp fight," when more than a thousand Indians lost their lives. In 1686-87 Sir Edmund Andros suspended the charter, though he was not able to get possession of the document. On his deposition in 1690 the government was reorganized under it. Early in the nineteenth century it was seen that the charter had become too antiquated for the needs of the State, and repeated efforts were made to replace it with a constitution; but the General Assembly was supreme. It was dominated by the county-towns, which did not propose to surrender their power to the large seaport settlements. In 1841 a people's convention, not ordered by the General Assembly, met and framed a constitution. This illegal action precipitated a crisis. (See DORR REBELLION.) A new convention was soon called. The present constitution was prepared in Nov., 1842, ratified by the people, and put in operation 1843. The defect of the charter was its provision for a limited suffrage. In 1840, out of a population of 108,830, about 9,500 men composed the electorate. Not until 1888 were the present suffrage laws adopted.

With its privateers Rhode Island took a conspicuous part in all the wars waged upon the ocean in which Great Britain was engaged. When the news of the declaration of the war with Spain reached the colony in 1740 six vessels of war were at once placed in commission. In 1756 there were upon the ocean fifty Rhode Island privateers manned by 1,500 sailors. Privateering was ever a favorite pursuit, and in the Revolutionary war great wealth came into the colony from this source. In the war of 1812 the privateer Yank of Bristol took more prizes than any other privateer hailed from the U. S., and sent into Bristol more than \$1,000,000 as the profit from her six cruises. Commodore Oliver Hazard Perry, of Rhode Island, and his sailors made the naval renown of the State immortal in the battle of Lake Erie.

The colony first suggested to Congress the establishment of a navy. This was natural, as naval hostilities began in Rhode Island. In June, 1772, his Majesty's armed schooner

Quincy was killed in Narragansett Bay by an expedition led by Abenaki Whipple. The commander was wounded in the fight. This was the first British blood shed in consequence of organized rebellion before the Revolution began. The Quakers had made herself particularly obnoxious by refusing severely to enforcing the revenue laws of the thirteen colonies voted by Congress at the beginning of the war, were ordered to be built in Rhode Island. The colony contributed largely of men and money to the revolutionary struggle. Its most famous soldier was then NATHANIEL BURNES (q. v.). It suffered greatly during the war and was for this conflict Newport might have continued to be a great commercial center. In 1779 the city was laid to waste by the British, and frequent expeditions were sent out to destroy the other towns upon the bay. In one respect was benefited, and in another harmed. In 1780 the French allies made Newport their headquarters.

Rhode Island was the last of the thirteen colonies to enter the Union. Its commerce was then very great. A greater number of vessels belonged to Providence than to New York, and many vessels were owned in Newport and Bristol. From early days trade was carried on not only with the West Indies and Europe, but also with the East Indies. For the first seventy-five years of its existence the colony had been engaged with its neighbors in a struggle for its life. For more than a century and a half it had enjoyed a degree of civil and religious freedom unknown in the other colonies. Now it stood forth as the champion of State's rights. As a whole, it was danger to its commerce if it remained free Union, even though the exports greatly desired it. The influence of the country towns was sufficient to counteract the adoption of the Constitution until 1790.

GOVERNMENT OF RHODE ISLAND.

GOVERNMENT.	Sam. Ward	1792-99, 1796-97
Provisional under the British.	James Lincoln	1782-83
	Joseph Watson	1783-84
STATE GOVERNMENT UNDER THE CHARTER.		
Richard Cooke	1773-79	
William Greene, Jr.	1779-80	
John Collins	1780-81	
Arthur Fenner	1781-82	
Paul Mumford (acting)	1782	
Henry Smith (acting)	1782-83	
Isaac Willoughby (acting)	1783-84	
James Fenner	1784-85	
William Jones	1785-86	
Nathaniel C. Knight	1786-87	
William H. Smith	1787-88	
James Fenner	1788-89	
Samuel H. Arnold	1789-90	
John B. Francis	1790-91	
William Fenner	1791-92	
Samuel W. King	1792-93	
GOVERNMENT UNDER THE CONSTITUTION.		
James Fenner	1843-44	
Charles Jackson	1844-45	
Harvey Lincoln	1845-46	
Charles Haynes	1846-47	
Henry B. Anthony	1847-48	
Philip Allen	1848-49	
Francis M. Hildes (act.)	1849-50	
William W. Hoppin	1850-51	
Edmund Dyer	1851-52	
Thomas H. Torrey	1852-53	
William Sprague	1853-54	
Wm. C. Conners (acting)	1854	
James Y. Smith	1854-55	
Andrew E. Burnside	1855-56	
Samuel Peabody	1856-57	
Henry Howard	1857-58	
Henry Lippitt	1858-59	
Charles C. Van Zandt	1859-60	
Alfred H. Littlefield	1860-61	
Augustus O. Brown	1861-62	
George P. Wetmore	1862-63	
John W. Davis	1863-64	
Rayal O. Tarr	1864-65	
Robert W. Todd	1865-66	
John W. Davis	1866-67	
Herbert W. Lamb	1867-68	
D. Russell Brown	1868-69	

Rhodes [from Lat. *Rhodus* = Gr. *Ῥόδος*, *Rhōdōs*]: a mountainous island between the Grecian Archipelago and Mediterranean; the largest and most E. E. of the Sporades; 6 miles S. of the nearest point in Asia Minor (see map of Greece, ref. 18-41). Area, 150 sq. miles. The climate is healthy and delightful, the soil fertile, producing figs, oranges, olives, and grapes. Spices of the finest quality are found all along the coast, and constitute an important industry. Pop. of island 90,000, mainly Greeks, with a few Jews and Ottomans. Famous in mythology, Rhodes was during the classic period by turns a great independent maritime power and the ally or victim of the Persians, Macedonians, and Athenians. It was famous for its artists, poets, and philosophers, and for its Colossus, one of the Seven Wonders of the world, thrown down by earthquake 224 B.C. Overrun by Maceon, general of Omar, in the seventh century, it subsequently belonged to the Byzantine empire, and repelled invasions of the Arabs, Genoese, and Seljuk Turks. In 1480 Pedrigo de Villars, grand-master of the Knights of St. John of Jerusalem, made it the headquarters of his order. During 214 years it was the southern bulwark of Christendom against the Mussulmans. The capital, Rhodes, endured a forty-four days' siege by the Egyptians in 1444, and repulsed Mohammed II. after a siege of three months in 1480. In 1522 the grand-master, Villiers de l'Isle-Adam, with 4,500 soldiers and 600 knights, withstood during five months the Ottoman fleet of 300 ships and 100,000 soldiers commanded by Suleiman I. himself. This resistance is one of the most glorious exploits of martial Christianity. When unable to hold out longer the knights were granted an honorable capitulation. On Jan. 1, 1523, accompanied by 400 of the inhabitants, they abandoned the island, which since that time has belonged to the Ottomans. The capital, situated on a splendid harbor at the northern extremity of the island, presents an imposing appearance with its lines of maritime fortifications. The streets are for the most part narrow and winding. Archaic remains and historic monuments of all sorts, together with its natural features, render the city one of the most interesting in the Archipelago. It is the seat of a Greek archbishopric. Pop. of city (1880) 14,000.

E. A. GOSWELAN.

Rhodes, Owen: statesman; b. in Hertfordshire, England, July 3, 1853; went to South Africa and became interested in the Kimberley mines, amassing a great fortune. Entering actively into Cape politics, he represented West Park for a short time, and afterward held a position in the ministry of Sir T. Scanlon. He was chosen prime minister of Cape Colony in 1900. To his energy was due the acquisition of mining rights over Mashanaland. As chairman of the British South Africa Company, he was prominent in the difficulty with Lebengula and directed the operations against him. His policy aims at the removal of race prejudices, especially between colonists of British and Dutch descent, and the establishment, under the British flag, of a federal dominion composed of Cape Colony, Natal, the South African Republic, and other countries of South Africa.

F. M. COAN.

Rhodes, Inner and Outer: cantons of Switzerland. See APPENZEL.

Rho'dium [Mod. Lat., from Gr. *ῥόδον*, rose. So called from the color of some of its compounds]: a metal found in 1804 by Wollaston associated in small quantity with native platinum. The process of obtaining it from the platinum residues is complex, and will be found described in the chemical text-books. Rhodium is whitish gray and very hard; highest density when fused, 12.1; atomic weight, about 104. It is one of the most infusible metals, but may be fused in the oxyhydrogen quicklime furnace of Berzeli. When pure, it is not acted on by the most powerful acids, but in alloy with some of the other metals it may be dissolved in aqua regia. Fusion with sulphur oxidizes it easily, and even fusion with sulphate of potash converts it into a soluble double salt. Chlorine combines with it at a red heat, forming a soluble chloride. It forms four oxides (RdO , Rd_2O_3 , RdO_2 , and RdO_3). The first two are insoluble in the strongest acids, and the third almost so.

Revised by IRA REMSEN.

Rhodium, Oil of: a balsamic volatile oil obtained from Canary island rosewood, the woody root of two convolvulaceous plants, *Rhodoriza scoparia* and *R. florida*. The oil is employed as a perfume, and to attract fishes and game to traps of various kinds. Horses are very fond of the odor.

For a full description of Rhode Island Colonial Records, 10 vols., and a full description of Rhode Island (2 vols., New York, 1860), see WILKINSON H. MERRIS.

* Listed by author. † Character designated till 1860. ‡ Deceased.

Rhododen'dron [Mod. Lat., from Gr. *ῥοδόδενδρον*, olean-der: *ῥόδον*, rose + *δένδρον*, tree]: a large genus of plants of the heath family (*Ericaceae*), comprising trees, shrubs, and rootlet-climbing epiphytes, with entire, alternate evergreen, or rarely deciduous leaves, and showy flowers in terminal clusters; these with funnel-form five-lobed corollas and usually ten declining stamens. Passing S. of the equator only into Java and the neighboring islands, the rhododendron is found throughout the mountainous districts of the northern hemisphere. The greatest number of species occurs in the high mountain regions extending from Java and Borneo on the S. to Yun-nan and the Sikkim Himalaya in the N. Several are found in China and Japan, two reach Kamtchatka, and one Alaska. The arctic *R. lapponicum* of Lapland and Greenland occurs in the alpine region of the White Mountains of New Hampshire. The only two other European species are *R. ferrugineum* and *R. hirsutum*, the *Alpenrose* of the Swiss Alps. The species peculiar to North America are, on the Atlantic side, *R. maximum*, which occurs sparingly as far N. as Canada, and abundantly throughout the whole length of the Alleghany Mountains; *R. catawbiense*, a lower and earlier-flowered species on the higher mountains from Virginia southward; and *R. punctatum*, a graceful but less showy species of the middle country of the Southern States E. of the mountains. In the higher Northern Rocky Mountains there is a peculiar deciduous-leaved species, *R. albiflorum*; in Oregon, *R. macrophyllum*, apparently near *R. maximum*; in California, *R. californicum*, nearer *R. catawbiense*, but taller, and with more showy blossoms. The contrast in the size attained by the different species of this genus is as remarkable as its geographical range is extensive. The arctic *R. lapponicum* is but a few inches high, while *R. rollisonii* of Ceylon attains a height of 30 feet, with a stem over a foot in diameter. The useful properties of this genus are few and unimportant; the Siberian *R. chrysanthum*, however, supplies a narcotic sometimes used medicinally. Horticulturally, rhododendrons play a more important part. Several of the South Asiatic species are conspicuous inhabitants of conservatories, the best suited for such cultivation being *R. arboreum*, *R. dalhousiae*, *R. argenteum*, *R. hodgsoni*, *R. javanicum*, and *R. jasminiflorum*. Of hardy species, the most so in the northern parts of the U. S. is the Siberian *R. dauricum*, with small deciduous leaves and rose-colored flowers, appearing very early in the spring; but to the patient skill of the hybridizer we owe a race of hardy rhododendrons with showy flowers and foliage, and of greater horticultural value than any of the original types. These hybrids, the result of crossing the Alleghany *R. catawbiense* with the Eastern *R. ponticum* or with the Indian *R. arboreum*, are deservedly more generally planted than any other rhododendrons. Loving moisture and unable to withstand the severe summer droughts so common in many parts of the U. S., and not thriving in soils strongly impregnated with lime, the rhododendron as a garden-plant can be successfully cultivated only in the Atlantic States from Massachusetts to Virginia. To develop its greatest beauty the rhododendron should be planted in well-drained peat or in soil largely composed of decaying leaf-mould, and situations should be selected for it somewhat protected from the winter sun, the greatest enemy, with the summer droughts, to all evergreens in the U. S.

C. S. SARGENT.

Rhodope, rod'-ō-peē (in Gr. *Ῥόδω*): a lofty mountain range in Thrace, noted in poetry as the scene of the revels of the Bacchantes, or female followers of Dionysus.

Rhône, rôn: a department of France, bordering E. on the Saône and Rhône, and comprising an area of 1,077 sq. miles. It is mountainous, covered with offshoots of the Cévennes, but with the exception of some fertile valleys the soil is mediocre. Copper, iron, and lead are found; excellent wine is produced, and the manufactures of silk and muslin are of great importance. Pop. (1891) 806,737.

Rhône (anc. *Rhodanus*): a river of France which rises in Switzerland, in the Alps, on the western side of the St. Gothard, flows through the Lake of Geneva, crosses the Jura Mountains, turns at Lyons, where it receives the Saône, to the S., and falls, 644 miles distant, into the Mediterranean, through two branches which form the island of Camargue. Its lower course is through swampy and unhealthy districts, but its whole middle course leads through beautiful and fertile regions producing some of the finest wines of France. It is everywhere very rapid, and the difficulty of navigation caused by the rapidity of the current

is increased by the suddenly shifting sandbanks and other obstructions, especially near the mouth. An extensive system of canals connects the river with the Mediterranean, and with the Seine, Loire, Garonne, and (by the Saône) the Rhine.

Rhopaloc'era [from Gr. *ῥοπαλον*, club + *κέρας*, horn]: the group of butterflies, the name being given in allusion to the club-shaped antennæ. See LEPIDOPTERA.

Rhotacism: the change of an *s* (*z*) to *r*; a technical term in historical grammar. The voiced form of *s*, i. e. *z*, shows a tendency in many different languages to become *r*. The sound of *r* as it appears, for instance, in English differs from *z* only in a slight retraction and elevation of the tip of the tongue. Rhotacism appears, e. g., in the Teutonic languages (except Gothic) where a medial *s* is preserved, but a medial *z* becomes *r*; thus Eng. *was*: *were*; *lose*: *forlorn* (Germ. *verloren*); also in Lat. between vowels; thus *generis* for **genesis*, cf. *genus*; *dirimo* for **dis-imo*, cf. *dissilio*; in certain Greek dialects as Laconian and Elean; cf. Laconian, *σιρ* = *δῖος*, Elean, *σιρ* = *τῖς*. BENJ. IDE WHEELER.

Rhubarb [viâ O. Fr. from Late Lat. *rheubarbarum*, from Gr. *ῥῆον* *ῥόζοβαρον*; *ῥῆον*, rhubarb, liter., the plant from the Rha or Volga (Gr. *Ῥᾱ*) + neut. of *ῥόζοβαρον*, foreign]: a plant of the genus *Rheum*, or its root employed in pharmacy. The botanical source of the drug is not definitely known, the *United States Pharmacopœia* defining it as the root of *Rheum officinale* and other undetermined species of *Rheum*, the *British* as the sliced and dried root of *Rheum palmatum*, *R. officinale*, and probably other species collected and preserved in China and Tibet. A specimen of *Rheum* was obtained through French missionaries in 1867 and sent to France, where it flowered at Montmorency in 1871. It seemed to correspond in all respects with the descriptions of the true rhubarb-plant, such as they are, and the root was apparently identical with the Asiatic rhubarb of commerce. This species has been described by Baillon under the name of *R. officinale*. Rhubarb has been known as a drug from a remote period. It was first brought to Europe by land from China to the Levant ports, whence the name Turkey rhubarb, or was shipped directly from China or by way of India, whence the variety called China, Canton, or East India rhubarb. Later, a direct trade between Russia and China was established, and under supervision of the Russian Government rhubarb was transported overland through Central Asia to Russia. For a long time, owing to the rigid inspection of Russian officials, this Russian or Turkey rhubarb was of unvarying good quality. Chinese rhubarb is now shipped direct from China. Chinese rhubarb is a rusty brown in color, and the texture is finely veined and marbled. Rhubarb has a peculiar smell, a disagreeable, bitter, and astringent taste, and a complex composition. A bit of the root if chewed feels gritty, from the presence of crystals of calcium oxalate. In small dose rhubarb behaves as a stomachic bitter, but in larger quantities is an active purge, producing liquid mucous evacuations. By reason of the tannin it contains it is also secondarily astringent. It is used in medicine as a stomachic and a laxative or purge, and is especially useful in summer diarrhœas from relaxation of the bowels or improper diet. The pharmaceutical preparations are very numerous. Among the most commonly used is the spiced or aromatic sirup, which is a tincture of rhubarb, cloves, cinnamon, and nutmeg diluted with six times its measure of sirup. The proportion of rhubarb is small, the preparation being intended as an aromatic astringent stomachic in the bowel complaints of children. *R. rhaponticum*, *R. undulatum*, and *R. palmatum*, or hybrids between them, are cultivated for their leaf-stalks, and to some extent for their roots. Revised by H. A. HARE.

Rhumb [from O. Fr. *rumbo*, from Span. *rumbo*, appar. from Gr. *ῥόμβος*, magic wheel, whirling motion, deriv. of *ῥέμβειν*, turn]: in navigation, the track of a ship sailing on a certain course. A rhumb-line cuts all the meridians at the same angle, and when this angle is acute the rhumb is a species of spherical spiral, continually approaching the pole, but reaching it only after an infinite number of turns. The angle under which a rhumb-line cuts any meridian is called the angle of the rhumb, and the angle that it makes with the prime vertical at any point is called the complement of the rhumb. The projection of a rhumb on the plane of the equator is a logarithmic spiral.

Rhus [Mod. Lat., from Lat. *rhus* = Gr. *ῥοῖς*, sumach]: a genus of shrubs or trees of the *Anacardiaceæ* or cashew

Rhyolite (Gr. *rhō*, to flow + *lithos*, stone): a mineral generally consisting of a groundmass and porphyritic crystals (phenocrysts) in variable proportions. At one extreme the phenocrysts exceed the groundmass in amount; at the other they are few and scattered, or are entirely absent. According to their prominence they give character or habit to the rock. While their chemical composition corresponds to that of more acid granites (see *Granite*), their mineral components do not necessarily correspond to those of chemically similar granites, partly because not all of the molten magma may have crystallized in rhyolites, and partly because the minerals in each case may have formed under different physical conditions. Quartz is usually prominent in rhyolite, but may not have crystallized in some cases; the same is true for potash-feldspar, which is generally the variety sanidine. Biotite may be present in small amounts. Muscovite never occurs as a pyrogenetic mineral in rhyolite, and potash-microlite is almost unknown in these rocks. On the other hand, pyroxene is oftener present in small amounts. The presence of alkali-feldspars rich in soda (soda microcline, anorthoclase) constitutes a variety of rhyolite called *quartz-pantellerite*. The presence of considerable lime-soda-feldspar (oligoclase, andesine) constitutes the greater part of what are called *dacite*, chemically con-

Rhythm, in music: such an arrangement or grouping of notes and measures as gives to the ear a sense of relative pressure and resistance to the development of sentiment and melody. Wholes notes when thus grouped into form and measure may possess a certain degree of quantity and pressure, but neither melody nor harmony can give satisfaction or emotional sentiment and feeling without *harmonic* grouping into portions equal to each other and suited to accent. This constitutes a higher kind of rhythm, to which the name of compound rhythm is sometimes given. Almost any succession of musical sounds will excite emotion and interest when the ear recognizes at once the general (the pulsations of accent) and the particular (a regular rhythmic division). A series of sounds without their periodical divisions, with their necessary cadences, need be as difficult to comprehend as a series of words without sense, sentiment, periods, and grammatical construction. In all regular compositions, therefore, we find an orderly succession of periods, formed of groups of two, four, eight, or nine measures, as the case may be, with subdivisions into phrases, clauses, or clauses. Of these periods, those consisting of two or eight measures are the most simple and natural to the ear. Groups of three, six, or nine measures are also in use, but those consisting of five or seven are irregular and less satisfactory, unless it may happen that the composer's purpose is to create a misleading effect for dramatic or musical reasons whereby the expectancy may be justified. In the use of terms to designate these divisions there is great diversity among musical theorists, and much obscurity in their definitions. In the present article the term period is used as denoting one of those larger symmetrical divisions which contains within itself the full expression of a musical sentiment. Such periods may terminate with cadences of various kinds, but the closing period must always end with the perfect final cadence. A period, as already explained, is divided into several parts or members. The period of eight measures is usually divisible into two phrases or clauses, and each of these phrases also admits of division into two clauses. A period of six measures may be equally divided either into two or three portions, and each of these portions may be regarded as a phrase or a clause. The chief difference between a phrase and a period is in the cadence. This should be less conclusive in the former than in the period, even though formed of the same notes. The term section is applied to those still larger divisions which comprehend several periods. In many cases it seems easy to define the boundaries of these several divisions of section, period, and phrase. Sometimes a shortness of breath, period occurs which breaks in upon the continuity of the movement; sometimes also periods overlap each other, as when a new one commences before the former one has terminated; and in numerous cases periods and phrases are broken up into irregular forms for the introduction of special effects, thereby suspending for a time all regular rhythmic symmetry. Notwithstanding these irregularities, which occur even in the highest works of art, the perfect rhythm is of essential importance as the foundation for regularity and excellence in musical composition.

Revised by DONALD BOW.

Russia, or **Ryazan**: government of European Russia, Russia N. W., by the government of Moscow. Area, 16,205 square miles. N. of the Oka the country is low and flat, and is all generally sandy and little productive; the south-west is higher, more diversified and fertile. Wheat, rye, clover, hemp, and fruits are produced. Cattle and a fine sort of horses are raised. Iron ore abounds, but agriculture is the only industry carried on with energy. Pop. 1,000,000.

Ryazan, or **Ryazan**: town of European Russia, capital of a government of Russia, on the Tura, an affluent of the Volga, 100 miles S. of Moscow. It is the seat of an extensive and many educational institutions, and carries on an important trade in grain. The city received its present name in 1777 from Catherine II. In its vicinity is the famous monastery of the Trinity, in which knives, razors, surgical instruments, and mechanics' tools are produced. Pop. 11,000, 30,000.

Ribalta, or **Ribalt**: painter; b. at Castellón de la Plana, Spain, in 1561. At a very early age he went to Valencia, where he studied painting with a master with whose daughter he fell in love. On being refused as a son-in-law Ribalta went to Rome, where he studied the works of Raphael, the Titian, and especially of Michelangelo del Piccola. Four

years later he returned to his master's house, where he found a sketch in the sand, and the artist being absent, set to work to finish it. When the painter saw the masterpiece he said to his daughter, "I would allow you to marry such an artist, but not the miserable Ribalta." The daughter replied that it was his work, and so the marriage was happily concluded. The first work Ribalta executed for his native country was a altar for the College of Corpus Christi. His fame became so great that most of the churches of Valencia possessed some of his paintings, as also those of Castellón, Toledo, Segovia, S. Isidoro, Madrid, and other cities. Ribalta was a severe draughtsman, knew anatomy thoroughly, and had studied the nude. His coloring is rather harsh. He died at Madrid, Jan. 12, 1622.

W. J. STILLMAN.

Ribault, or **Ribaut**, ro-bô', JEAN: soldier and colonist; b. at Dieppe, France, about 1520. He was a Protestant, and was employed by Coligny to establish a French Protestant colony in North America. Leaving Dieppe Feb. 19, 1562, he explored the St. Johns river, Florida, thence sailed northward, and established twenty-six colonies in a black-house called Fort Charles on Fort Royal harbor. Ribault then returned to France. Owing to the distracted state of affairs at home he was sent to the colonies, and after enduring great sufferings they abandoned the fort. In 1564 Ribault was commissioned governor of a contemplated colony in Florida. He sent René de Laudonnière, who built Fort Caroline on the St. Johns river. In May, 1565, Ribault sailed for this colony with seven vessels and 500 men. In September of that year the French were attacked by Spaniards under Menéndez de Avilés; the fort was taken and its garrison massacred; Ribault's ships were wrecked in a hurricane, and he and his companions after wandering for some time on the coast capitulated to Menéndez. Though protection of quarter had been given, they were immediately beheaded, "not as Frenchmen, but as heretics." H. H. S.

Ribbeck, JOHANN KASL OTTO: classical scholar; b. at Erfurt, Germany, July 23, 1827; studied under Ritschl at Bonn, and was called successively to Bern, Basel, Kiel, Heidelberg, and finally to Leipzig as the successor of his teacher. Ribbeck's work, confined chiefly to Latin poetry, is characterized by profound learning, subtle ingenuity, and a brilliant style. His most noted works are *Tragicorum Latinorum reliquiae* (1883), *Comitum Latinorum reliquiae* (1885), the standard editions on the subject; *Virgilii Opera*, with exhaustive prolegomena and complete critical notes (5 vols., 1850-60); *Der echte und unechte Juvenal* (1865), a highly ingenious but hypercritical attempt to prove the spuriousness of a number of Juvenal's *Satires*; *Romae Epistulae* (1869), an edition containing valuable exegetical material, but marred by a radical disregard of MS. tradition leading to a wanton misadjustment of the poems; *Die römische Tragödie im Zeitalter der Republik* (1875); *Zur Lehre von den latein. Partikeln* (1868); an edition of Plautus's *Miles Gloriosus* (1881); biography of *Friedrich Hebel* (2 vols., 1878-81, one of the best biographies in any language). Finally, editing numerous short treatises (such as the *Amazon* and the *Kalari*) partly published in the *Rheinische Museum*, of which Ribbeck is one of the editors, (see the *Geschichte der römischen Dichtkunst*, in 6 vols., unquestionably the ablest exposition of the subject that has appeared).

ALFRED GUERAN.

Ribbon [from O. Fr. *riban* > Fr. *ruban*, probably from Germ. *ringband*]: a narrow band of woven silk, used chiefly as an ornament of female attire. Though used in many nations from remote antiquity, the manufacture of ribbons as an important article of commerce dates only from the seventeenth century, and has flourished chiefly in France, the cities of Tours, Lyons, and Avignon being largely engaged therein. The chief seats of ribbon manufacture are St. Etienne, France, Basel, Switzerland, Crefeld in Rhineland Prussia, and Coventry in England. The French ribbons have an admitted superiority, owing to the employment of hand-loom instead of power-loom.

Ribbon-fish: a name given to various fishes, chiefly belonging to the family *Trachipteridae*. They are so called on account of their much compressed, elongated, and band-like bodies. See *TRACHIPTERIDAE*.

Ribbon-worms: a name sometimes given to worms of the group *Nemertines* and the order *Turbellariae*; so called from their ribbon-shaped form and great length.

Ribeiro, rî-bê-riô, RIBERDINI: poet; b. at Turrão, in the province of Alentejo, Portugal, about 1486 (f). There is

little precise information about him, and the difficulty in this regard has increased by the appearance at the same period of several persons of the same name. At the age of twenty-one he had to leave his home for the court, because of a plague that was devastating his native province. He became the friend of the best poets in Lisbon, Falcão, Sá de Miranda, and Montemayor. He had also a tragic love-adventure, the object of his passion being possibly a certain Donha Joana de Vilhena, cousin of the king, Dom Manuel, and wife after 1516 of Dom Francisco de Portugal, Count of Vimioso. After the failure of his suit he seems to have gone to Spain, and probably to Italy. D. about 1550. He is a noteworthy figure in Portuguese literature, as having been one of the introducers of the Italian pastoral style that has ever since held such sway in Portugal. There are extant five idylls, or *eglogas*, in which experiences of his own and of his poet friends are idealized; and also a pastoral romance in prose, interspersed with verse, in which the main theme is his own love, under the name Bimnarder, for a lady disguised as "Aonia." This romance is commonly called *Menina e Moça*, but the author probably knew it as *Tristezas*, or *Saudades*. Two parts of it have come down to us, but it is uncertain what share, if any, Ribeiro had in the second. The work's chief defect is that so many matters besides the main theme are interwoven as to make the whole extremely confused; yet it had a very great influence in both Portugal and Spain, and to some extent outside the Peninsula. Besides the above Ribeiro wrote a number of lyrics in the style of the older Portuguese poets, some of which are printed in the so-called *Cancioneiro de Resende*. The first edition of the *Menina e Moça* was published at Ferrara in 1554; the second, better known, at Evora in 1557. In 1559 it was again printed with the addition of the lyrics. The *Obras de Bernardim Ribeiro* appeared in 1645, 1785, 1852. An excellent edition of the *Menina e Moça* is that of D. José Pessanha (with *Prefacio*, 1891).

A. R. MARSH.

Ribera, rē-bā'ra, José, called *Lo Spagnoletto* (the little Spaniard): painter: b. at Játiva, near Valencia, Jan. 12, 1588. He studied art with Ribalta, and then went to Italy, where in extreme poverty he worked at painting, depending on the charity of his fellow students in Rome. Later he went to Naples, where he married the daughter of a rich picture-dealer, and was employed by the Spanish viceroy, the Count de Monterey, for Philip IV. of Spain. In 1630 the Academy of St. Luke at Rome elected him as one of its members. The pope decorated him with the insignia of the Abito di Cristo in 1644. Some biographers assert that he died in Naples, rich and honored, in 1656, while Dominici, the Italian historian, says that Lo Spagnoletto disappeared in 1648, and was no more heard of. Luca Giordano and Salvator Rosa were his most eminent pupils.

W. J. STILLMAN.

Ribot, rē'bō', ALEXANDER FÉLIX JOSEPH: statesman: b. at St-Omer, France, Feb. 7, 1842; was educated for the bar; received an official appointment in 1870, but afterward returned to the practice of his profession in Paris, and in 1878 was elected to the Chamber of Deputies as a representative of the moderate republican party. In 1890 he became Minister of Foreign Affairs, and was Prime Minister from Dec., 1892, to Mar., 1893. In Jan., 1895, he again became Prime Minister after the election of Faure as president of the republic. Ribot is the author of several works, including a biography of Lord Erskine (Paris, 1866). R. A. R.

Ribot, AUGUSTIN THÉODULE: genre and portrait painter: b. at Breteuil, Eure, France, Aug. 8, 1823; pupil of Glaize; medals, Salons, 1864 and 1865; third-class medal, Paris Exposition, 1878; Legion of Honor 1878. His work is robust in style and notable for strong modeling. His charcoal drawings are exceedingly good. *St. Sebastian* (1865), *Christ and the Doctors* (1866), and *The Good Samaritan* (1870) are in the Luxembourg Gallery, Paris. D. at Colombes, Seine, Sept. 12, 1891.

W. A. C.

Ribot, THÉODULE ARMAND: psychologist: b. at Guingamp, France, Dec. 18, 1839; educated at the Lycée de St-Brieuc and at the École Normale in Paris; was professor in different lycées 1869-71; engaged in laboratories and clinics in Paris until 1876; founder and editor of *La Revue Philosophique* 1876-94; lecturer at the Sorbonne 1885-88; professor in the Collège de France since 1888. His principal works are *La Psychologie anglaise contemporaine* (1870); *L'Hérédité psychologique* (1873; 4th ed. 1892); *La Psychologie allemande contemporaine* (1879; Eng. trans. 1886); *Les*

Maladies de la Mémoire (1881; 9th ed. 1894); *Les Maladies de la Volonté* (1883; 10th ed. 1894); *Les Maladies de la Personnalité* (1885); and *La Psychologie de l'Attention* (1889). J. MARK BALDWIN.

Ribs [O. Eng. *rib*: O. H. Ger. *rippa* (> Mod. Ger. *rippe*: Icel. *rif* < Indo-Europ. *rebhya-*; cf. O. Bulg. *rebroy*, *rib*): the curved bones which form the lateral framework of the thorax or chest. They serve as substantial points of attachment for the thoracic muscles, which perform the respiratory motions, and by their resistance and elasticity protect the lungs, heart, and great vessels from external violence and injury. The ribs, in man, are usually twenty-four in number, twelve on each side, but may be one or two more or less in exceptional cases. They are articulated to the spine behind, but in front only the upper seven are connected with the sternum or breast-bone by intervening costal cartilages. Of the remaining five, three connect with the cartilage of the seventh, while the lower two are unattached and termed free or floating ribs. The ribs are elastic, and being articulated in front and behind move freely upward and outward in inspiration, and reversely downward and inward in expiration. The ribs, like other bones, may be inflamed and thickened from contusion or from blood-disease; they are often distorted by collapse of a part or whole of a lung and external atmospheric pressure. The chief injuries to the ribs are separation from their attachments to the spine or sternum, and fracture. The fractured rib is detected by local crepitation of the fragments in respiratory movement, and by the severe local stitch or pain it gives the patient. The treatment consists in application of a firm bandage or broad adhesive band around the body to suspend thoracic movement until the rib is united; respiration meanwhile is conducted chiefly by motion of the diaphragm. Revised by W. PEPPER.

Ricard'o, DAVID: political economist; b. in London, Apr. 19, 1772. His father, who was a Jew and a native of Holland, settled in London, and as a member of the Stock Exchange gained a fortune. David Ricardo was a partner with his father till in 1793 he embraced the Christian faith and formed a marriage connection contrary to his father's wishes, which caused the partnership to be dissolved. Through the aid of other members of the Stock Exchange the younger Ricardo started in business by himself, and succeeded in a few years in securing a fortune. He then gave his time to the study of mathematics, chemistry, mineralogy, and geology, and was active in securing the organization of the London Geological Society. In 1809 he published a tract entitled *The High Price of Bullion, a Proof of the Depreciation of Bank-notes*; in 1817 published his most important work on *The Principles of Political Economy and Taxation*. Its leading feature was a theory of rent, which, though embodying ideas before announced by others, was received by the public as a new and important theory, especially in connection with the theory of Malthus on population, then much discussed. He subsequently became a member of Parliament, where he took a prominent part in the discussion of economic questions. D. at Gatscomb Park, Gloucestershire, Sept. 11, 1823. Ricardo stands next to Adam Smith in the British free-trade school of political economists, and his writings have exerted a powerful influence upon subsequent students of the science. A collection of his works, edited by J. R. McCulloch, was published in 1846, and his *Letters to Malthus* appeared in 1887. Revised by F. M. COLBY.

Ricasoli, rē-kaa'sō-lē, BETTINO, Baron: statesman: b. in Florence, Mar. 9, 1809, of an old noble Florentine family. In 1848 he was a prominent advocate of the unity of Italy, was elected to the Tuscan parliament, and was offered a place in the ministry, which he declined, as the grand duke had turned against the democratic movement. After the defeat of Novara, hoping to prevent the entrance of the Austrians into Tuscany, he took the initiative in recalling the grand duke, but retired from the court when the latter withdrew the constitution. In 1859 he again put himself at the head of the Tuscan liberal movement, and aided in the expulsion of the grand duke, and, as provisional dictator, in the union of Tuscany with Piedmont. This being accomplished, he was appointed governor-general of Tuscany, an office which he held till Mar., 1861. The city of Florence elected him deputy to the Italian parliament, and after the death of Cavour he became president of the council in the new ministry which was afterward overthrown by the opposition of Rattazzi. In June, 1866, Baron Ricasoli returned to power and resumed the direction of public affairs, but

It is indigenous in some parts of India and in tropical Asia. There is no trace of it as a native plant in Asia, Europe, Africa, or America. In India it has been known from the earliest times, and was introduced into America about 1500 A. D. It was cultivated in the Bahamas and on Saint John, Virgin Islands. The Arabs carried it to Spain under the name *Arroz*. It was first cultivated in this country in the year 1699. At what period it was introduced into the U. S. is not well settled, but one account is that it was given in Virginia by Sir William Berkeley about 1647. Another account claims a later date, and refers to the seeds made from the island of Madagascar, now a portion of Madagascar I. C., near the coast of the same country. It is extensively cultivated in India, Siam, the Azores, and portions of South Africa, in which countries it constitutes the principal article of food for their populations. In many of the malarial districts of those countries it is almost the only object of agricultural labor, though it is a variety grown successfully upon the high land, yielding, upon an average about one-fourth less per bushel than the low land rice. It is also extensively cultivated in the West Indies, and in the tropical and semi-tropical portions of North and South America.

is a common practice, where rice is the most important crop, the method of sowing by cultivation and harvesting is not carried on in a primitive way. In Japan, the plover is used. The soil is dug up and worked over with a harrow, then an implement similar to a harrow is used to sow the seed. This may be drawn by a horse and the kind of work is manual. The rice is sown in rows, which are spaced and carefully tended till the plants are 10 inches high, when they are taken up and set in the field having been previously prepared and flooded to about 2 inches of water. The rice is cut with an improved scythe, bound in small bundles, and hung in rows to dry, the threshing and the winnowing are done by hand. The average produce per acre is 40 bushels on lowland and 60 bushels on high land. Four or five acres of two-bushel form quite a respectable holding in Japan. The average value of such land is \$100 per acre, and the annual tax upon it for government and local purposes is \$5, or 5 per cent. The wages of an unskilled farm hand are about \$25 per year, with board, or \$5 per year without board; and women can be hired for much less. In the shops, rice is sold at 2 or 3 cents per bushel. Importers in the U. S. prefer Japan rice, because it is so uniform and on account of the short, plump grain, which tends to be broken in milling, though the yield is superior to that of the U. S.

In the U. S. the Carolina methods of rice culture have been abandoned. Selected fields are selected along the river where soft water, and low enough to be subject to the up and down. The land selected is thoroughly washed, as it is to be easily drained, and is prepared by a machine built for the river. Mechanically a ditch is made and enough to float a small flat-boat, used in transporting the fields are from 4 to 20 acres in size, and are connected by small parallel drains about 200 feet apart. In the fall up early in the winter the fields are washed and afterward flooded with water, admitted through the edge of flooding is to prevent the growth of weeds, to loosen and fertilize the soil. In the late fall or early the water is drawn off, and in a few days the land is nearly dry enough for cultivation, when the land is plowed by a barrow, and the soil brought into a fine state of work. When ready for planting, at any time from the first of May, trenches are made with

lines or a small cultivator, 12 to 15 inches apart and 2 or 4 inches deep, at right angles with the drains. The seed is then sown at the rate of 2 to 3 bushels per acre, and covered lightly with soil. On large plantations, where the soil has been well prepared, a horse-drawn drill can be used. As soon as a field is planted, which should be done in one day, sufficient water is let in to saturate the soil thoroughly, and the conditions of perfect saturation is maintained for four or six days, till the grain begins to sprout. Water is again applied when the sprout is 2 or 3 inches above the ground. The second water is removed after about six days, and the water is stored with the fine crop of leaves till the plant is about six weeks old, when the field is again irrigated for two weeks. If the field is free from water-weeds the water may remain permanently; if not, it should be drawn off, and as soon as the soil is dry it should be hoed, then flooded till the grain begins to ripen. When mature the rice is cut with a sickle, bound in small bundles, and stacked in the field like wheat, or upon some dry place. As soon as dry it is put into stacks, about 6 feet in diameter, till stored, and afterward transferred to large stacks. If put into large stacks from the sheaf, there is some danger of discoloring the grain for stack-rotting.

Along the Mississippi bottoms in Louisiana the conditions of rice-culture are quite similar to the Carolina method. Behind the great levees, necessary to restrain the waters of the Mississippi, the broad alluvial lands are divided at right angles to the embankment, to give good drainage. The land is planted in February, March, and April just prior to planting. When ready for the seed the fields are divided into plots of a few acres by back-furrowing (or this may be delayed till after the planting). One object of this is to maintain an even depth of water on each plot; the even ripening of the grains depends upon it. This could not be secured without the small cross-levees, as the surface of the land gradually falls from the river. About 2 bush. of seed per acre is used, and may be sown broadcast and harrowed in or drilled. Formerly irrigation was secured by flumes through the levees, but this is prohibited by law, and the pump is used as a substitute, or in high water a siphon. The crop is cut and harvested as in the Carolina. The average product per acre is from 10 to 12 barrels of 162 lb. each.

In the prairies of Southwestern Louisiana an entirely different method of management prevails. The rice-lands lie along small creeks and streams, where flooding is secured by pumping or by damming the stream. The levees are constructed mainly by a plow with the landside and mulch-board greatly lengthened by wood attachments, so as to push the furrow 4 or 5 feet on to an embankment. The fields are plowed with gang-plows and thoroughly harrowed; then the seed is sown broadcast, and the land again harrowed, or the seed may be put in with horse-draws. Many farmers fertilize with bone phosphate at a cost of \$1.00 per acre. This quickens and strengthens the young plants, and increases the yield of grain from one to two barrels per acre. The firm cut-off of these prairies allows the use of the binder and header in cutting the grain. The shocks of grain are allowed to stand in the field till dry enough to be transferred to large stacks. Steam-threshers are in universal use. The product per acre is from 8 to 18 barrels. The cost of production is from \$1. to \$1.50 per barrel, according to management and yield per acre. The labor is almost entirely performed by white men. The prairie rice-marshes are not considered unhealthy for the laborers or for near residents.

The most favorable conditions for rice-growing are much vegetable matter in the soil, and such a depth of water as to irrigate without cooling or heating the roots too much. When the water is very shallow it sometimes becomes too warm for the plant, and by turning on a large body of river-water, just after a heavy rain, the water may become too cool. It requires an atmospheric temperature of from 70° to 80° to ripen the grain properly, and for this reason rice should be grown near large bodies of water. In the interior great changes of temperature are sudden and frequent, to which the rice-plant is very sensitive. A temperature higher than 85° during the hardening of the grain tends to shrink the kernel and renders it too brittle for profitable milling; a lower temperature than 60° prevents perfect development.

When as it comes from the thrasher is known as rough rice, or paddy. For handling and storing it is better to leave it in this condition, as the hull is a great protection to the

grain. The primitive method of removing the hull was by hand, using a pestle and mortar. The mortar was a large block of wood set on end; the pestle was about 2½ inches in diameter, and 2 feet long. By light pounding and then winnowing the hull and the cuticle were removed and the grain was fitted for use.

In a modern rice-mill the rice is emptied from a sack into a hopper at the storehouse; it passes from the hopper into a large fanning-mill or separator, where it is freed from all foreign substances; it is then transferred to the mill by a belt-conveyor; the hull is removed by passing the grain between heavy millstones (about 5 feet in diameter) which revolve rapidly, but are not close enough together to break the kernel; it then goes to the mortar and is pounded for two hours, or in some mills the Engleburg huller is used in place of the pounding process; by these processes the hull and cuticle are removed and the grain is scoured. The hulls are disposed of as worthless refuse; the cuticle and undercoating scoured off are the rice-bran. The rice then passes through an inclined cylindrical wire revolving screen, with the meshes becoming coarser toward the lower end, thus assorting the rice into three or four grades; the finest is the brewers' rice, the second—a middling rice—includes the larger broken rice, and the third is the whole rice or head rice; the head rice passes from the screen into the polisher, where it is brushed and finished. Rice-bran and rice-polish are excellent food for cattle and hogs, rating higher than wheat-bran and wheat-middlings; brewers' rice is used for the production of light beer, and usually brings about one-half the price of head rice; middling rice sells for nearly one cent per pound less than head rice.

Rice as a food (see Food) is deficient in the flesh-forming principles, but its almost perfect digestibility increases its food-value 20 or 25 per cent., and makes it exceedingly valuable for the sick or people inclined to dyspepsia. Physicians quite generally prescribe a rice diet in some form where there is any inflammation of the mucous membrane, whether of the lungs, stomach, or bowels. Two precautions should be observed: the rice should be more than three months old, and should be thoroughly cooked. With beef, fish, milk, cheese, or beans it makes a well-balanced nutritive ration. In warm countries rice is extensively used in meat soups and as a substitute for the potato. No meal is considered complete without it in some form. It is made into bread, puddings, biscuits, griddle-cakes, and other food. It makes an effective paste, and in Oriental countries it is used in the production of a spirituous liquor known as arrack.

Rice-straw is more palatable to animals than oat-straw, and preferred as a coarse fodder; it is largely used for wintering stock. It makes an excellent quality of paper.

Rice production in the U. S. attained considerable proportion in the colonial times. In 1707 seventeen ships left South Carolina with cargoes of rice. In 1730 the product was 21,153,054 lb.; in 1755 it reached 50,747,090 lb.; and in 1770, 75,264,500 lb. This was raised with slave-labor, and mostly exported to Europe and the West Indies. For the next seventy years there was practically no increase. The product of 1840 was 84,145,800 lb. In 1860 it was 117,885,000 lb. During the civil war little rice was raised, and in 1865 the total amount was only 4,740,580 lb. In 1880 it had increased to 85,596,800 lb.; in 1890 to 131,722,000 lb.; and in 1893 to 237,546,900 lb., of which amount Louisiana produced 182,400,000 lb., North Carolina 6,818,400 lb., South Carolina 33,250,500 lb., and Georgia 15,078,000 lb. This marvelous increase in Louisiana was due to the introduction and adaptation of the most improved agricultural machinery. The crop in 1894 fell off nearly one-half; this was due to drought in Louisiana and floods in the other States.

S. A. KNAPP.

Rice, JAMES: novelist; b. in Northampton, England, in 1844; was educated at Queen's College, Cambridge; called to the bar in 1871; edited *Once a Week* 1868-72; and for eight years was London correspondent of the *Toronto Globe*. D. in London, Apr. 25, 1882. He was joint author with Walter Besant of many novels. See BESANT, WALTER.

H. A. BEERS.

Rice-bird, or Rice-bunting: the BOBOLINK (*q. v.*); the JAVA SPARROW (*q. v.*) is also called rice-bird.

Rice, Indian, Water-rice, or Water-oats: an annual aquatic grass (*Zizania aquatica*) belonging to the true rice tribe, though of inferior value, from 5 to 10 feet high, which abounds in marshy regions of the U. S., especially in Minnesota. Its grain was formerly much used by the Dakota

and Chippewa Indians, and forms an important portion of the food of the game-birds of the Northwest. Its stem is employed as a paper-stock.

Rice Lake: city; Barron co., Wis.; on the Red Cedar river, Rice Lake, and the Chi., St. P., Minn., and Omaha Railway; 48 miles N. of Menomonie, 56 miles N. of Eau Claire (for location, see map of Wisconsin, ref. 3-B). It is in an agricultural and lumbering region, is engaged in manufacturing, and has a State bank with capital of \$50,000, a private bank, and a weekly newspaper. Pop. (1880) 362; (1890) 2,130.

Rice-paper: See PAPER.

Rich, Edmund (Saint Edmund): Archbishop of Canterbury; b. at Abingdon, England, about 1170; educated at Oxford, where he "wedded the Virgin Mary," as he called his vow of special service, and at Paris; became an instructor at Oxford, where the university was then developing a revival of scholarship; was prebendary of Calne and treasurer of Salisbury Cathedral 1219-22; was a famous preacher at the pope's command preached the crusade over a considerable part of England, probably in 1227; was appointed Archbishop of Canterbury 1233, and was consecrated Apr. 2, 1234; exhibited energy as a reformer in the face of opposition from the clergy and from the Roman hierarchy; went to Rome in 1238 and again in 1240 to settle various difficulties with his monks, but finding that the pope demanded more and more unreasonable concessions he resigned his see and retired to the monastery of Pontigny, in France, in the summer of 1240; thence a little later he went for his health to the priory of Soissy, where he died, Nov. 16, 1240. His remains were taken to Pontigny, and having been canonized by Innocent IV. in 1247, his shrine (known in France as that of St. Edme) became a place of pilgrimage. Cardinal (then Archbishop) Manning and Lord Edmund Howard, with 500 British pilgrims, went thither to invoke his intercession in behalf of the Roman Catholic Church Sept. 3, 1874. He wrote a volume of *Constitutions* in thirty-six canons (1236), *Speculum Ecclesie*, and left MS. treatises now in the Bodleian Library. There is a MS. biography by his brother Robert in the Cottonian collection. Another written by Bertrand, prior of Pontigny, was published in Martène's *Thesaurus Anecdotorum*, iii., 1774-1826; of Hook's *Lives of the Archbishops of Canterbury*, s. v.

Revised by S. M. JACKSON.

Richard I. (PLANTAGENET), surnamed CŒUR DE LION (lion-hearted); King of England; third son of Henry II. and Eleanor of Aquitaine; b. at Oxford, Sept. 13, 1157; was noted from youth for rash valor and a turbulent disposition received the duchy of Aquitaine by the treaty of Montmirail (Jan. 6, 1169), under the feudal supremacy of King Louis VII. of France, to whose youngest daughter, Adelaide, he was at the same time betrothed; joined his mother and his two brothers in rebellion against his father 1173; was reconciled to him Sept., 1174; became involved in wars with his brothers, but was reconciled to them in London in 1184. He also made war upon the Count of Toulouse, aided his father against Philip Augustus, and later, in alliance with Philip Augustus, waged successful war on his father. Succeding to the throne in July, 1189, he spent a few months in arranging the affairs of the kingdom, and then set out on the third crusade, July, 1190, with the King of France. On his way to the Holy Land he captured Messina and conquered the island of Cyprus. Arriving before Acre June 8, he took part in the capture of the city, but soon quarreled with the French king, who returned to France. Richard advanced immediately toward Jerusalem; defeated the Saracens at Arsuf in September; took and fortified Jaffa; advanced on Ascalon, which he took Jan., 1192; set out twice for Jerusalem, but was called back each time by hostilities in his rear; lost and regained Jaffa; performed many brilliant exploits of personal valor, but, being obliged by the state of affairs in England to return, made a truce with Sultan Saladin, and sailed from Acre in October. On his way home he was shipwrecked at the head of the Adriatic; endeavored to make his way by land through Austria; was seized and imprisoned by Leopold, Duke of Austria, with whom he had quarreled in the Holy Land; was handed over to the Emperor of Germany, by whom he was detained more than a year; was liberated on pledge of a heavy ransom, Feb., 1194; found his brother John assuming the functions of king, but soon forgave him; engaged in a war with Philip Augustus of France, whom he defeated and forced to sign a disadvantageous truce, and renewed the war three years

late with a similar result, but was severely wounded. Mar. 28 he was driven north from the party made of Chaucer, Chaucer, which he was leading, and died Apr. 6, 1399, leaving a magnificent reputation. The fact as a soldier was magnified in reality by poverty and by romance, which attributed to him heroism in deeds of valor, and he was reputed to be high in reputation as a troubadour. On the other hand, he was also and consequently seen as a ruler degraded his kingdom in a series of wars of supply for carrying on his policy and further more. He was a representative of the power of the age of courtesy, having, beyond the accidents of birth and education, close connection with England. The chief achievement of his reign in England was the magnificent battle, witnessed everywhere by his foreign wars. To most the demands the king's officers imposed the financial system of which the greatest possible revenue might be secured with the least pressure upon the people, and this side of the administration was brought to a high degree of efficiency.

Revised by F. M. COLBY.

Richard II. King of England; son of Edward the Black Prince and Joane of Kent; b. at Bordeaux, France, Apr. 6, 1367; succeeded to the throne on the death of his grandfather, Edward III, June 20, 1377; was under the tutelage of a council of twelve nobles, but was really controlled by Isabella, Countess of Arundel, Duke of Lancaster; maintained a policy of peace with France; encountered a vigorous opposition from Parliament and from the common people in the imposition and collection of a poll-tax, which gave rise to the rebellion of Wat Tyler, June, 1381; married Anne of Bohemia, daughter of the Emperor Charles IV., in Jan., 1382; sought reconciliation with slight result beyond the burning of London, Aug., 1385; attempted to murder John of Gaunt, Duke of Lancaster, a traitor who was recognized under the Duke's name as to France, 1386, but without success, his leading supporters being defeated and put to death with the sanction of Parliament (1387-88) succeeded by a sudden display of vigor in restoring the government in May, 1389. From this time he was really king and for the next few years ruled constitutionally, but in 1397, calling a new Parliament, he took vengeance on Gloucester and his adherents. The former was executed in Wales, where he died under suspicious circumstances. Agreeing with his cousin, Henry of Bolingbroke, Duke of Lancaster, Richard banished him for ten years, 1398, and in the following year asked the Lancaster estates, John of Gaunt having died. Bolingbroke prepared to recover his estates, and when Richard returned from a short visit to Ireland he found his rival already in possession of the kingdom. Richard was taken prisoner and deposed by Parliament in favor of Bolingbroke, who assumed the throne under the title of Henry IV., to the exclusion of the legitimate heir, Roger Mortimer, Earl of March. The deposed king was kept a prisoner at Pontefract Castle, but soon disappeared, having been murdered as was believed by his keeper about 1400. The reign of Richard is a remarkable period in the constitutional history of England, and still more so in religion and literature, from the common names of Wycliffe, Chaucer, and Gower, who were patronized by him.

Revised by F. M. COLBY.

Richard III. Last King of England of the Plantagenet line; b. at Fotheringhay Castle, Oct. 2, 1452; third son of Richard, Duke of York, and Cecily Neville. On his father's arrest and death in 1460 he was sent for safety to Holland, but was recalled in the following year by his brother, Edward IV., who created him Duke of Gloucester and Lord of Ireland. He was faithful to his brother throughout his reign, sharing in his flight in 1470 and commanding the Yorkist army at the battle of Barnet and Tewkesbury in 1471. In recognition of his services he was placed in possession of numerous forfeited estates, especially those that had belonged to Warwick, the king-maker, whose daughter, Anne Neville (his own cousin, previously betrothed to Henry Edward), he married in 1474. He was made lieutenant general of the kingdom upon the breaking out of war with Scotland (1479); took possession of Berwick; penetrated to Edinburgh, and dictated terms of peace 1482. Hearing of the death of Edward IV. while still in Scotland in 1483, he took the oath of allegiance to his nephew, Edward V., and assumed the government to do the same; but soon afterwards he boldly assumed the guardianship of the young king, displacing Lord Rivers, Lord Grey, and other nobles of the queen's party. Appointed protector and defender of the realm early in May, he ordered the seizure and instant execution of Lord Chamberlain Hastings on a charge of con-

spiracy June 13; asserted his own title to the throne on the ground of illegitimacy of his nephew June 22-24; obtained from Parliament a favorable decision, and was crowned king July 6. He was soon suspected of having caused the princes to be murdered in the Tower. (See Edward V.) Having repressed a conspiracy in behalf of the Earl of Richmond as head of the Lancastrian party, and put to death the Duke of Buckingham (his own former partner) he convoked a parliament which declared him lawful king Jan., 1485. On the death of his only son, Edward, Prince of Wales, Apr. 9, he named as his heir Edward, Earl of Warwick, but soon substituted for him John de la Pole, Earl of Lincoln. The queen died in 1485. Richard sought to strengthen his throne by treaties with Scotland and Brittany, but was unable to prevent the invasion of the Earl of Richmond, who landed at Milford Haven Aug. 7, 1485, and was defeated and killed at Bosworth Aug. 22, 1485, the victor becoming king under the title of Henry VII. See H. Walpole, *Historic Doubts on Richard III.* (1768), and Gairdner, *Life and Reign of Richard III.* (1878).

Revised by F. M. COLBY.

Richard Plantagenet; Earl of Cornwall and titular Emperor of Germany; b. at Winchester, England, Jan. 8, 1367; was a younger son of King John; commanded an expedition to Guienne (1395); went on a crusade (1400); returned to England Jan., 1342; accompanied his brother, Henry III., in his French campaign of that year, but soon lost the province of Guienne and escaped to England; married a princess of Provence (1345); was chosen Emperor of Germany by a faction (1356), and crowned King of the Romans at Aix-la-Chapelle May 17, 1357, but was unable to obtain general recognition, and was driven to take refuge in England; was taken prisoner by Simon de Montfort at the battle of Lewes, May 18, 1264; held a diet at Warrin (1269); returned to England (1269). D. at Kirkham, England, 1272.

Richards, MATTHEW HENRY, D. D.; educator; b. at Germantown, Pa., June 17, 1831. His father, Rev. Dr. J. W. Richards, was grandson of Rev. Henry Muhlenberg Muhlenberg. He graduated at Pennsylvania College and Theological Seminary, Gettysburg; was pastor at Phillipsburg, N.J., 1865-66, and Indianapolis, Ind., 1874-77; Professor of English Language and Literature in Muhlenberg College (1868-74), and from 1877 to the present; in 1877 became editor of *Church Lesson Leavers* and *The Helper*; since 1884 has also been on the editorial staff of *The Lutheran*, Philadelphia. H. E. Jacobs.

Richards, THOMAS ANDREW; landscape-painter; b. in London, England, Dec. 8, 1829; was taken to the U. S. when a child by his parents, who settled in Georgia; removed to New York in 1845; studied at the National Academy, New York; National Academician 1851; Professor of Art in the University of the City of New York; first director of the Cooper Union School of Design for Women; corresponding secretary National Academy 1852-62. W. A. C.

Richards, WILLIAM THOMAS; landscape and marine painter; b. in Philadelphia, Pa., Nov. 14, 1833. Pupil of Paul Weber in Philadelphia; traveled and painted in Europe in 1855, 1866-67, and in 1878-80; honorary member Pennsylvania Academy of Fine Arts; medal Centennial Exhibition, Philadelphia, 1876. His pictures show painstaking care in the representation of detail. *On the Coast of New Jersey* (1880) is in the Corcoran Gallery, Washington. W. A. C.

Richardson, Sir BENJAMIN WARR, F. R. S.; hygienist; b. at Somerby, Leicestershire, England, Oct. 31, 1825; educated at Anderson's University and at St. Andrews Hospital, both in Glasgow; graduated in medicine 1854, M. A. hon. in 1859, and L.D. in 1877; practiced in Saffron Walden and at Northwich; settled in London 1849; physician to the Royal Hospital for Diseases of the Chest 1854 to 1867, to the Royal Literary Fund from 1871, and in the Newspaper Press Fund from 1874 to the present time; was chosen a member of the Royal College of Physicians and Surgeons 1856, and fellow in 1861; founded and edited *The Journal of Health and Sanitary Review* (1855, seq.); gained the Astley Cupper prize of £200 by his treatise *On the Cause of the Cataplexy of the Blood* (1856), and the Fothergillian gold medal by a dissertation *On the Disease of the Fetus* (1856); originated the use of ether spray for the local relief of pain in surgical operations (1866); introduced methylene-bisulphide as a general anesthetic (1867); has been president of the Medical Society of London; has contributed to *The Social Science Review*, published several medical works, and edited a high position by original experiment. He was knighted in 1893.

He has been since 1854 an earnest advocate of advance in national sanitation, and a zealous partisan of the temperance movement. Since 1884 he has been the author and editor of a quarterly journal, *The Asclepiad*. Among his works are *The Health of Nations* (London, 1887); *National Health* (London, 1890).

Revised by S. T. ARMSTRONG.

Richardson, CHARLES: philologist; b. in England in July, 1775; studied but never practiced law; devoted himself to literature in London; published *Illustrations of English Philology* (1815); undertook the lexicographical articles in *The Encyclopedia Metropolitana*, for which he also prepared his great work, a *New Dictionary of the English Language*, which (the first part appearing in 1818) was suspended soon afterward by the failure of the proprietors, and completed (as a separate work) in 1837. The complete work appeared in new editions in 1837, 1838, and 1839. Richardson also published a *Supplement* to his dictionary (1855), a work *On the Study of Language* (1854), and an *Historical Essay on English Grammar and English Grammarians*, several philological papers in the *Gentleman's Magazine*, and some comments on Shakspeare: was a contributor to *Notes and Queries*; received a pension from 1852 until his death at Feltham, Middlesex, Oct. 6, 1865.

Richardson, CHARLES FRANCIS: scholar; b. at Hallowell, Me., May 29, 1831. He graduated at Dartmouth College 1871, was connected with the *New York Independent* 1872-78, and in 1882 was appointed Professor of English at Dartmouth. He has published *A Primer of American Literature* (1876); *The Cross*, a volume of poems (1879); *The Choice of Books* (1881); and *American Literature* (2 vols., 1887-89).

H. A. B.

Richardson, SAMUEL: novelist; b. in Derbyshire, England, about 1689; learned the printing-trade; became a publisher in London, printer of the journals of the House of Commons, master of the Stationers' Company, and purchased in 1760 a half-interest in the office of king's printer. D. in London, July 4, 1761. His novels *Pamela* (1740, with a continuation in 1741), *Clarissa Harlowe* (1748), *Sir Charles Grandison* (1754) enjoyed an unbounded success, and had numerous imitators not only in England, but in Germany and France, where they profoundly influenced the whole development of prose fiction. Richardson is the first English novelist. His novels are all in the form of letters, and are long and sentimental. They show little acquaintance with men on the part of their author, but an intense and sympathetic absorption in the feelings of the female heart, and they had their strongest popularity among women. See ENGLISH LITERATURE.

Revised by H. A. BEERS.

Richardson, WILLIAM ADAMS, LL.D.: jurist and financier; b. at Tyngsborough, Mass., Nov. 2, 1821; graduated at Harvard 1843; admitted to the bar at Boston 1846; practiced law at Lowell; was one of the revisers of the *General Statutes of Massachusetts* (1860), and of the *Supplement* to the same (1863-64); became judge of probate 1856, Assistant Secretary of the Treasury 1869-73, and was secretary 1873-74; Judge of U. S. court of claims since 1874, and chief justice of same since Jan. 20, 1885; published *The Banking Laws of Massachusetts* (Lowell, 1855); *Practical Information concerning the Public Debt of the United States*, with the *National Banking Laws* (1872); *History of the Court of Claims* (1882-85), and other works.

Richardt, CHRISTIAN ERNST: poet; b. in Copenhagen, Denmark, May 25, 1831. After studying theology he accepted a call to a country church, and continued to be a parish priest until his death. During the last years of his life he was chaplain of Vemmetofte Cloister in Zealand. His first work was a comedy, *Deklarationen* (1851), which was later produced at the Royal theater. In 1861 appeared *Smaadigte*, consisting of a number of delicate lyrics; in 1874 *Billeder og Sange* (Pictures and Songs); in 1878 *Halvhundrede Digte* (Fifty Poems); in 1884 *Vaar og Høst* (Spring and Autumn); and in 1891 *Blandede Digte* (Miscellaneous Poems). His tragic music-drama *Drot og Marsk* (King and Constable, 1878), with music by P. Heise, is one of the most popular pieces in the repertory of the Royal theater. In his religious depth, his patriotic enthusiasm, and his sincere love of nature, he stands first in later Danish lyrical poetry. D. 1893. His collected poems were published in Copenhagen in 1894.

D. K. DONGE.

Richelieu, rê-she-loo', also called **Sorel**, or **Chambly**: an historic and beautiful river of Quebec, Canada; right-

hand affluent of the St. Lawrence, discharging Lake Champlain; length, 80 miles. Its course is northerly and very straight; the width, at first 1 or 2 miles, becomes gradually contracted to 1,000 or 1,200 feet. It is navigable, except for rapids between St. John and Chambly, and this gap is supplied by a canal. Navigation closes between Nov. 16 and Dec. 18, and opens between Mar. 20 and May 1. The valley is fertile and attractive, and in it were made some of the earliest settlements in the province. It also served as a battle-ground for over two centuries, beginning with Champlain's Iroquois campaign in 1609.

M. W. H.

Richelieu (Fr. pron. rêsh'li-ô'), **ARMAND JEAN DUPLESSIS**, de, Duke and Cardinal: statesman; b. in Paris, France, Sept. 5, 1585; was educated for the military profession in the Collège de Navarre, but, having a prospect of succeeding to the bishopric of Luçon, did not enter the army, but studied theology, and was consecrated bishop Apr. 16, 1607. Elected a deputy of the clergy to the States-General in 1614, he allied himself with the queen-mother and regent, Marie de Médicis; was appointed her almoner, and became a member of the council of state. When, shortly after, dissensions broke out between the king (Louis XIII.) and his mother, Richelieu accompanied the latter to Blois, and retired subsequently to his diocese, but succeeded, nevertheless, in bringing about a reconciliation between mother and son; was rewarded with the cardinal's hat in 1622; re-entered the council of state, and was soon after made prime minister, which office he filled uninterruptedly to his death, exercising a most decisive influence on the history of France, externally and internally. His foreign policy centered in the idea of humiliating Austria. For this purpose he encouraged the rising of the Protestant princes in Germany, the revolution of the provinces in the Netherlands, and even the revolt in Catalonia. He subsidized Gustavus Adolphus, and after the death of the latter he took the Duke of Saxe-Weimar and his army into the French service, and carried on the war against the emperor with great vigor. He also declared war against Spain, and although his plans in the Netherlands failed, he succeeded in separating Portugal from Spain in 1640, and conquered Perpignan in 1642. The final results of these wars he did not live to see, but by the Peace of Westphalia (1648) the progress of the house of Austria was effectually checked and its dream of establishing a world-empire was destroyed. By his internal policy he finished what Louis XI. had begun—the overthrow of the feudal power of the nobility. His government was marked by an almost uninterrupted series of conspiracies among the feudal nobility of the realm, headed by the queen-mother (whose favor had turned into a deadly hatred), by the queen herself, Anne of Austria, by Gaston of Orleans, the brother of the king, and by the royal princes. A master in intrigue and the very genius of detective police superintendence, he was always well informed and fully prepared, and punished the conspirators with merciless severity. The king felt a deep antipathy against him, and on this circumstance the first conspirators based their hope of overthrowing him. With the king, however, this almost physical aversion was wholly overawed by a mixture of admiration and fear of the towering spirit of his minister, and on Nov. 11, 1630 (*la journée des dupes*), when the king had consented to his dismissal and the whole court exulted, Richelieu forced himself into the presence of Louis, turned him around in a moment, and reappeared with great dramatic effect among his enemies, stronger than ever. Afterward the conspirators sought and found support in foreign countries, especially in Spain, and Richelieu needed arms to maintain himself, but he proved unconquerable. Marie de Médicis fled from place to place in foreign countries; Gaston of Orleans was made utterly contemptible by his cowardly submission; Montmorency, Marillac, Cinq-Mars, and many others were beheaded. The scaffold, the dungeon, and exile were the end of all resistance to him who wielded the royal power. Besides the feudal nobility, there was another political power in France at the time when Richelieu took the reins—namely, the Huguenots—and to crush this young but steadily increasing influence was one of the three great objects of his policy. He laid siege to their principal stronghold, La Rochelle, and this siege is one of the most memorable events in the history of France. On Oct. 28, 1628, the city surrendered, four-fifths of its inhabitants having perished by the sword and by famine. By the fall of La Rochelle the political power of the Huguenots was wholly broken, but Richelieu's further measures concerning them were moderate and even magnanimous. The cardinal

Richmond: city of Victoria, Australia; 2 miles E. of Melbourne (see map of Australia, ref. 8-H). Pop. (1889) 37,550. It has a distinct municipality and the rank of a city, but is really only a suburb of Melbourne.

Richmond: *chef-lieu* of the counties of Richmond and Wolfe, Canada; on the St. Francis, a tributary of the St. Lawrence; 76 miles E. of Montreal (see map of Quebec, ref. 5-C). It is an important center of the Grand Trunk Railway, the Portland section extending from it 221 miles, the Montreal section 76 miles, and the Quebec branch 96 miles. The river is spanned by a passenger-bridge connecting the picturesque village of Melbourne with Richmond. St. Francis College, an institution affiliated to McGill University, is situated on a commanding site at the upper end of the town. Two newspapers are published in the place. The chief industry is connected with the railway-works and machine-shops. Pop. (1890) 2,056. J. M. HARPER.

Richmond: city; capital of Wayne co., Ind.; on the Whitewater river, and the Grand Rapids and Ind. and the Pitts., Cin., Chi. and St. L. railways; 68 miles E. of Indianapolis, 92 miles S. by E. of Fort Wayne (for location, see map of Indiana, ref. 6-G). It is in an agricultural region, has an elevation of 700 feet above tide-water, and is engaged in manufacturing and in general trade. The city has gas and electric-light plants, an abundant supply of natural gas for fuel, excellent water and drainage systems, and electric street-railways. There are 21 churches, 9 public-school buildings, a high school, public-school property valued at about \$300,000, Earlham College (Orthodox Friends, opened in 1847), 5 libraries (Earlham College 3, Morrison Public, and County Law) containing over 27,000 volumes, 3 national banks with combined capital of \$450,000, 4 building and loan associations, and a semi-monthly, a quarterly, 4 daily, 7 weekly, and 3 monthly periodicals. In 1890 there were 293 manufacturing establishments, which had a combined capital of \$4,000,000, employed about 3,000 persons, and had products valued at about \$6,000,000. The public buildings include a new county court-house, a new State asylum for the insane, two orphan's homes, a Home for Friendless Women, and a city hospital. Pop. (1880) 12,742; (1890) 16,608.

Richmond: town; capital of Madison co., Ky.; on the Louis. and Nash. and the Rich., Nicholasville, Irvine and Beattyville railways; 25 miles S. S. E. of Lexington, 54 miles S. E. of Frankfort, the State capital (for location, see map of Kentucky, ref. 3-I). It is in an agricultural region; is noted for breeding horses, mules, and cattle; and contains the Central University (Southern Presbyterian, chartered in 1873), 4 national banks with combined capital of \$750,000, and a monthly and 2 weekly periodicals. Pop. (1880) 1,424; (1890) 5,073.

Richmond: town; Sagadahoc co., Me.; on the Kennebec river, and the Maine Central Railroad; 17 miles S. of Augusta, and 44 miles N. E. of Portland (for location, see map of Maine, ref. 10-C). It is principally engaged in the manufacture of boots and shoes, has sawmills and planing-mills, and contains a public high school, public library (founded in 1868), two national banks with combined capital of \$170,000, and a weekly and a monthly periodical. Pop. (1880) 2,658; (1890) 3,082.

Richmond: city; capital of Ray co., Mo.; on the Atch., Top. and S. Fé Railroad; 40 miles E. of Kansas City, 68 miles S. E. of St. Louis (for location, see map of Missouri, ref. 3-E). It is in an agricultural and coal-mining region, and contains several flour-mills, foundry, public high school, Woodson Institute, new water-works plant, electric lights, 3 State banks with combined capital of \$200,000, and a daily and 3 weekly newspapers. Pop. (1880) 1,424; (1890) 2,895; (1894) estimated, 3,500. EDITOR OF "DEMOCRAT."

Richmond: city (named after Richmond, Surrey, England); port of entry; capital of Virginia and of Henrico County; on the north branch of the James river, and the Ches. and Ohio, the Richmond and Petersburg, the Rich., Fredericksburg and Potomac, and the Southern railways; 100 miles S. by E. of Washington, D. C., 127 miles N. W. of the Atlantic Ocean (for location, see map of Virginia, ref. 6-H). It has an area within incorporated limits of 485 sq. miles, and with suburbs of about 16 sq. miles; is built on a series of hills, and ranges in altitude above sea-level from 172 to 249 feet. The river is here crossed by five bridges, connecting the city with Manchester, Spring Hill, and other suburban places. There are 106 miles of streets, generally

wide, of which 36 miles are sewered and 23 miles paved; sidewalks are chiefly of brick. Main Street is the principal business thoroughfare; Broad Street is the widest; West Franklin and Grace contain the most fashionable residences. The streets are lighted by gas and electricity, and the principal ones are traversed by electric and horse railways. The supply of water for domestic and fire purposes is obtained from two points on the river above the city, where it is pumped into two large reservoirs for distribution. Both the gas and water-works plants are owned by the city.



State Capitol, Richmond, Va.

Parks and Public Buildings.—The most noted of the parks and squares, which comprise 357 acres in all, is Capitol Square, a tract of 12 acres on the summit of Shockoe Hill. It contains the State Capitol, a Græco-composite building with a portico of Ionic columns, erected in 1796 after the plans of the Maison Carrée of Nîmes, France. The building contains Houdon's marble statue of Washington, and many portraits of governors, military officers, and other distinguished Virginians; the two legislative halls; and the State Library, in which are preserved the parole signed by Lord Cornwallis at Yorktown, the original Virginia bill of rights, and the Virginia ordinance of secession. The park surrounding the Capitol has three fountains; Crawford's equestrian statue of Washington surrounded by bronze statues of Patrick Henry, John Marshall, Andrew Lewis, George Mason, Thomas Jefferson, and Thomas Nelson, by Crawford and Rogers; Foley's bronze statue of "Stonewall" Jackson; and Hart's marble statue of Henry Clay. Other public buildings on the square are the Governor's mansion, the new Public Library, and the old bell-house. The largest park, of 300 acres, contains the new reservoir, a beautiful lake, and a fine boulevard, and is a favorite resort. Libby Park, on Libby Hill, is terraced from the summit to Main Street, and on its highest point has a Confederate Soldiers' and Sailors' Monument. Monroe Park contains a statue of Gen. W. C. Wickham. Chimborazo Hill Park has an area of 36 acres, and an elevation of 200 feet. Howitzer Place has a monument in memory of the Richmond Howitzer battalion. Gamble's Hill Park is on the James river and Kanawha Canal, and Jefferson Park is between Marshall and Pleasant Streets. Lee Circle, in the west of the city, contains a bronze equestrian statue of Gen. Robert E. Lee. In Hollywood Cemetery, where 12,000 Confederate soldiers lie, is a memorial of rough blocks of granite, forming a pyramid 90 feet high, erected by the women of Richmond. Other notable buildings are St. John's Protestant Episcopal church, on Church Hill, in which Patrick Henry made his famous declaration for liberty or death; the Colonial Stone House on Main Street, believed to have been occupied by Washington; the "White House of the Confederacy," the home of Jefferson Davis during the civil war, and now a museum for Confederate relics; the Masonic Temple, the first erected in the U. S. (corner-stone laid 1785); Monumental church (Protestant Episcopal), erected on the site of the theater burned in 1811, when sixty lives were lost; two armories; St. Luke's Hospital; Retreat for the Sick; Lee Camp Soldiers' Home; the Male and Female Orphan asylums; the Virginia Medical College; the Colored Baptist church, in which the constitutional convention of 1850-51 was held; and the penitentiary, to which a farm is now attached.

Churches and Schools.—Richmond has 198 religious organizations and 79 church edifices, but for white people and 27 for colored. The Baptists have 14 churches for white members; Methodists, 12; Methodists, 10; Presbyterians, 8; Roman Catholics, 5; Lutherans, 4; Jews, 4; Christians, 3; and Friends, 1. The public-school system has been developed since the civil war. In 1864 there were 17 public-school buildings, including high and normal schools for whites and colored, and private-school property valued at \$200,000. For common instruction there are the Virginia Mechanics' Institute and 6 other religious schools. There are 10 private and common parochial schools. The institutions for advanced instruction consist of the Virginia Medical College (founded in 1827); College of Physicians and Surgeons (established in 1889); Richmond College Baptist (Baptist, founded in 1934); Lewis-Clark Institute (Roman Catholic, established in 1900); St. Mary's Dominican Institute; Richmond Female Seminary (Protestant Episcopal); Harrison Memorial College (Lutheran, Christian of Colored Circle (Baptist, opened in 1885); Colvered Theological Seminary (Baptist, opened in 1907); and Richmond College (Baptist, opened in 1912). There are 1,500 libraries, with an aggregate of 60,000 volumes, and a law, 1894, there were 6 daily, 21 weekly, 14 monthly, and 1 quarterly periodicals.

Business Industries.—In the 1880 census 960 manufacturing establishments of a (gross-output of 184,100,000) reported. There had a paid-up capital of \$10,795,742, employed 19,512 persons, paid \$7,408,540 for wages and \$14,914,214 for materials, and had products valued at \$27,705,972. The principal industry is the manufacture of tobacco. In 1893 there were 169 manufacturing plants in this industry, having a total of \$1,000,000, employing 8,500 persons, and yielding products valued at \$19,500,000. The establishments included 44 cigarette and cigar factories, 41 smoking and smoking tobacco factories, and 25 manufacturing and other works. The annual revenue collections average \$1,500,000 per annum. Long concentrations took root in tobacco, and, including oranges and agricultural implements, average to value \$1,000,000 per annum. Flour and grain mill products were an annual value of \$2,700,000; fertilizers, \$1,075,000; and lumber, \$770,000. In 1893 Richmond had 20 banking institutions, of which 4 were national and 16 had State charters. There were 7 savings banks, 3 private banks, and several banks and deposit companies. The incorporated banks had an aggregate capital of \$6,040,000; deposits, \$11,500,000; loans and discounts, \$12,320,000; and total resources, \$1,000,000. In the fiscal year ending June 30, 1894, the Richmond office of the custom-house showed imports of foreign merchandise, \$42,899; exports of domestic products and merchandise, \$1,571,907. The assessed valuations of the city in 1891 were, personal, \$19,954,998; real, \$40,255,919—total, \$60,210,917. The bonded debt was \$5,000,000; the annual receipts were \$2,500,000; and the municipal assets included the city hall, gas and water plants, parks, railway stock, and other items, aggregating \$5,000,000.

History.—As early as 1609 a settlement was made by the English on what is now the lower portion of the city. Col. William Byrd built a mill near the falls in 1670, and afterwards a warehouse. The place was known as Byrd's Warehouse till Mar. 1140, when it was incorporated as a town, and set off into squares with wide streets. In 1779 the seat of government of the commonwealth was removed from Lancaster to Richmond. In 1781 the city was taken and burned by the British. In June, 1861, it was made the capital of the Confederate States, and there the Confederate Congress met on July 20 following. During the war the city was the objective point of the principal operations of the Union army in Virginia, and it was occupied to Apr., 1865; the main business portion of the city was then burned. On Apr. 25, 1870, over sixty persons were killed or mortally wounded by the yielding of the flag of the court-room of the court of appeals beneath the weight of the multitude gathered to hear the decision in the railroad election for mayor; and the great flood in James River in Sept., 1879, inundated a large portion of the city. Pop. (1880) 65,000; (1900) 81,285. THOMAS WHITEHEAD.

Richmond, Lewis religious writer; b. in Liverpool, England, Jan. 29, 1753; graduated at Cambridge, 1794; took orders in the Church of England 1797; became curate of Bournemouth and Yarmouth in the Isle of Wight 1798; chaplain to the Lewis Hospital, London, 1805; and was presented in the same year to the rectory of Tarpsey, Bedfordshire, which he held until his death May 8, 1827. He was the author of

several popular tracts, which have been circulated by millions in many languages, especially *The Dairyman's Daughter*, *The Negro Servant*, and *The Young Callender*. He also edited *The Fathers of the English Church, in a Selection from the Writings of the Reformers and Early Protestant Divines of the Church of England* (8 vols., 1807-11). See his *Life*, by T. S. Grimshaw (London, 1896); ed. G. T. Howell, Philadelphia, 1916).

Richmond, Margaret Beaumont, Countess of, daughter of Edmund Beaumont, Duke of Somerset; b. at Blot, Bedfordshire, England, about 1441; married Edmund Tudor, Earl of Richmond, to whom she bore a son, Henry Tudor (afterward King Henry VII.); after the death of her first husband she married Sir Henry Stafford 1460, and left a second time a widow in 1481, married Thomas, Lord Stanley, in the following year. She was known as Countess of Derby during the reign of her son, her husband having been created Earl of Derby as a reward for his defection from Richard III. at Bosworth Field. She was noted for her charity and devotion, and also for her patronage of letters and her own literary taste; translated *The Mirrore of Truth for the Beefeull Soule*, from a French version of the *Spiritual Exercises* (printed by Wynken); and the fourth book of the *Imitation of Christ* (1504); endowed Christ's College 1505, and St. John's College, Cambridge, by bequest 1511, founding the Lady Margaret professorship of divinity, still maintained. D. in 1509. The principal title of the Tudor, Stuart, and Brunswick dynasties to the English throne was derived through this lady's descent from Edward III. through John of Gaunt. Revised by F. M. COLBY.

Richmond College, an institution at Richmond, Va. It began in 1830 as a Baptist seminary for the education of ministerial candidates. In 1840 it was chartered as a college. The civil war shut its doors and destroyed its endowment. In 1890 it was reorganized on the system of independent schools, of which there are eight, and elective studies. Each professor is responsible for the efficient control of his own school, and admits to graduation therein only upon right written examination. The chief executive officer was chairman of the faculty, chosen annually, but in 1894 Prof. F. W. Bostwright was elected president for an indefinite period. The degree of B. A. is conferred upon such students as have graduated in a prescribed course, about equal to six schools; the degree of M. A., upon such as have graduated in all the eight schools. Attendance on religious exercises is voluntary. Two free courses of subsidiary lectures are given every session. There are large dormitories, ample lecture-rooms, spacious halls for library and museum, and a campus of 13 acres. There are about 180 students.

Revised by W. H. WURST.

Richter, rich'ter, GUSTAV KARL LARSEN; historical and portrait painter; b. in Berlin, Germany, Aug. 31, 1823; studied at the Berlin Academy and under Léon Cogniet in Paris; professor in Berlin Academy; member of Munich and Vienna Academies; medals at the exhibitions in Brussels and Vienna 1873, Philadelphia 1876, and Munich 1881; second-class medals, Paris Salons, 1857 and 1859, and Paris Exposition 1855. D. in Berlin, Apr. 9, 1894. One of his most celebrated works is *Portrait of Queen Louise* (1870) in the Calvaria Museum. He was the most famous portrait-painter in Germany in his time. Works by him are in the National Gallery, Berlin; Maximilianum, Munich; and the museum at Danzig.

WILLIAM A. COVING.

Richter, JEAN PAUL FRIEDRICH, generally called Jean Paul; author; b. at Wunsiedel, Bavaria, Mar. 21, 1763. His father was a poor country minister, and when he died, in 1779, he left to his family nothing but debt. The son, nevertheless, went to Leipzig in 1781 to study at the university, and he contrived to stay there four years, though he lived in the most pinching poverty. In 1784 he fled from Leipzig in order to escape imprisonment for debt, and for three years lived with his mother at Hof. From 1787 to 1789 he was private tutor in a family at Leipzig, and from 1790 to 1794 a schoolmaster at Schwarzenbach. Compared with his life in Leipzig and at Hof, these positions offered him affluence, and in the meantime he had become a celebrated author. He had originally gone to Leipzig to study theology, and had read much of this science, as of everything else; but having been poorly taught in his youth, he was incapable of systematic and exhaustive study. There was something roving and diffuse in his intellect, as in his talent. Thus by his studies at Leipzig he had only prepared himself for a miscellaneous literary activity, and his first at-

tempts were not successful. His *Grönländische Prozesse* (Lawsuits in Greenland, 2 vols., 1784) and *Auswahl aus des Teufels Papieren* (Selections from the Papers of the Devil, 1789) were not read; their satire is narrow, their humor forced, their form unripe. In 1793 his romance, *Die Unsichtbare Loge* (The Invisible Lodge, 2 vols.), turned the scales of fortune, and now followed in rapid succession, and with decided success, *Hesperus* (4 vols., 1795), *Biographische Belustigungen unter der Gehirnschale einer Riesin* (Biographical Recreations under the Cranium of a Giantess, 1796), *Leben des Quintus Fixlein* (1796), *Blumen-, Frucht- und Dornenstücke, oder Ehestand, Tod und Hochzeit des Armenadvocaten Siebenkäs* (Flower, Fruit, and Thorn Pieces, or Marriage, Death, and Wedding of Lawyer Siebenkäs, 4 vols., 1797), *Der Jubelseniör* (1797), *Das Kampaner Thal* (1797). These writings made Richter the literary favorite of Germany. In 1794 he gave up his position as a schoolmaster, and began a life of visits to the different literary centers—Leipzig, Weimar, Dresden, and Berlin. He was everywhere well received, and made many intimate friends, among whom, however, Goethe and Schiller were not. It was especially the fair sex which was enthusiastic about him. In 1801 he married in Berlin the beautiful and spirited Caroline Mayer, and removed first to Meiningen, then to Bayreuth. From the prince-primate Dalberg he received an annual pension of 1,000 florins, which was continued afterward by the King of Bavaria, and the University of Heidelberg made him a doctor. In 1803 he published his *Titan*, and in 1804 *Die Flegeljahre* (Wild Oats, 4 vols.), which two romances, together with his first philosophical attempt, *Vorschule der Ästhetik* (Introduction to Aesthetics, 3 vols., 1805), may be considered as indicating the culmination of his talent. In 1807 he wrote another philosophical book on education, *Levana oder Erziehungslehre*, and in the following years he published a great number of political and satirical pamphlets, sermons, humorous sketches, etc. D. at Bayreuth, Nov. 14, 1825. Richter is without doubt the greatest humorist of modern German literature, but his utter disregard for literary form, the lack of artistic composition, and his barbarous style make it a laborious task to read and enjoy him. Having, however, penetrated the hard shell of the imperfect form of his writings, one finds him a poet of divine inspirations, lofty sentiments, and irresistible humor. In order to do him justice it is necessary not only to consider him in his literary relations to the earlier English and German humorists, like Swift, Sterne, Hippiel, Lichtenberg, and others, but also to keep in mind the miserable political and social conditions of Germany in his time and the strong current of sentimentality which had not been checked by the classic productions of Goethe and Schiller. While these latter poets and their followers had created in their works an ideal poetic world unconcerned about the miserable conditions around them in which they really lived, Richter makes the very contrast between the German idealism and the prosaic reality of his time the subject-matter of his humorous representations. With a loving spirit he embraces the lowest and most humble in this prosaic reality, and thus he produces idyls like *Quintus Fixlein*, *Leben Fibels*, etc., in which his contemporaries found a picture of their own life, and which we could call classic but for their poor literary form. He is especially great in his descriptions of nature, while in the delineation of human characters he is frequently less successful. As defective as his style was, it found a great many imitators. The tendency which prompts authors like Börne, Heine, and their literary offspring to parade their vain subjectivity is due to the example of Richter, to whom Heine especially owes more than he might have been willing to acknowledge.

See R. O. Spazier, *Jean Paul Fr. Richter, ein biographischer Commentar zu dessen Werken* (1833); E. Förster, *Denkwürdigkeiten aus dem Leben J. P. F. Richters* (1863); Fr. Th. Vischer, *Kritische Gänge*; G. Nerlich, *Jean Paul und seine Zeitgenossen* (1889); Carlyle, *Essays*.

Revised by JULIUS GOEDEL.

Richtshofen, richt'hō-fen, Baron FERDINAND, von, Ph. D.: geologist and geographer; member of a distinguished Silesian family; b. at Carlsruhe, Germany, May 5, 1833; studied at Breslau and Berlin 1850-56. During 1856-60 he was in Austria studying the geology of the Tyrol, Siebenbürgen, and Northeastern Hungary. He then accompanied, as geologist, Count Eulenberg on the Prussian expedition to the far East, and remained twelve years in China, Indo-China, Java, Celebes, the Philippine islands, Formosa, Japan, Cali-

fornia, and Nevada, returning to Europe in 1872. Since this time he has remained in Europe, engaged in working up the results of his journeys and in professional and other geographic and geologic pursuits. His publications have been numerous, among them the following in English: *The Comstock [Nev.] Lode* (1865); *Principles of the Natural System of Volcanic Rocks* (1867); *Letters to the Shanghai Chamber of Commerce* (1869-72). The most noteworthy of his works is *China, Ergebnisse eigener Reisen und darauf gegründeter Studien* (vol. i., 1877; vol. ii., 1882; vol. iv., 1883). For the family, consult *Geschichte der Familie Richter von Richthofen* (1884). MARK W. HARRINGTON.

Richwood: village; Union co., O.; on the Erie Railroad; 15 miles S. W. of Marion (for location, see map of Ohio, ref. 4-E). It is in an agricultural region, and has 2 large flour-mills, 2 steam tile-mills, several large grain elevators, a planing-mill, 2 private banks, and 2 weekly newspapers. Pop. (1880) 1,317; (1890) 1,415. PUBLISHER OF "GAZETTE."

Ric'inus: See CASTOR-OIL PLANT.

Rickets: a disease characterized by deformities of the bones and various visceral disturbances. It occurs as a rule in infants from twelve to eighteen months of age. The predisposing causes are the influence of bad hygienic surroundings, and improper food and clothing. The symptoms develop gradually and almost imperceptibly. The little patient seems to lose spirit, and indigestion sets in, accompanied by swelling of the abdomen and colic. There is early a tendency to sweating about the head and restlessness during sleep. The muscles become soft and flabby, the face sallow, and the skin dry, and there is scanty and turbid urine and thin fetid evacuations. The fontanelles and sutures remain open until a late period. The teeth are very late in making their appearance, and decay rapidly after doing so. As the disease advances the bones grow softer, and become distorted by the superincumbent weight and muscular contraction. Various deformities of the head, limbs, chest, and pelvis are brought about. (See ORTHOPÆDIC SURGERY.) As a disease of the bones, rickets is never dangerous. It is from the deformities resulting, and their interference with the action of the lungs and other viscera, that the danger arises. The treatment can be summed up in a few words—fresh air, sunlight, good food, bathing, and cod-liver oil. It is remarkable that rachitic children frequently develop and become unusually strong, though deformed, in adult years. Many, too, are brilliant mentally, as the records of great names in literature and science show.

Revised by W. PEPPER.

Ricketts, JAMES BREWERTON: soldier; b. in New York, June 21, 1817; graduated at U. S. Military Academy, and entered the artillery July, 1839; served in the Mexican war and on frontier duty up to 1861, when as captain he commanded a battery in the capture of Alexandria May 24, as in the battle of Bull Run July 21, 1861, where he was severely wounded, and from which date he was breveted lieutenant colonel and made brigadier-general of volunteers. He was engaged in the battle of Cedar Mountain, at the second battle of Bull Run, and at Chantilly commanded a division, as at South Mountain and Antietam; major First U. S. Artillery June, 1863; participated in the final Richmond campaign in command of a division from the battles of the Wilderness to the investment of Petersburg; recalled to Washington July, 1864, to aid in the defense against Early's threatened attack, and engaged in the subsequent pursuit of Early's army, participating in the battles of Monocacy, Opequan, Fisher's Hill, and Cedar Creek, where he was severely wounded; breveted major-general for gallantry; in Jan., 1867, was retired on the full rank of major-general. D. at Washington, D. C., Sept. 22, 1887. JAMES MERCUR.

Ricketts, PALMER CHAMBERLAINE, C. E.: civil engineer and educator; b. at Elkton, Md., Jan. 17, 1856; educated at the Rensselaer Polytechnic Institute, Troy, N. Y., where he graduated in 1875. During 1875-84 he was Assistant Professor of Mathematics; since 1884 has been Professor of Mechanics, and since 1892 director of the Rensselaer Polytechnic Institute. He has been consulting bridge-engineer for two railways, and since 1891 engineer of the public improvement commission of Troy, N. Y. In 1891 he was appointed brigadier-general and chief of engineers of the State of New York. He is the author of reports and technical discussions in engineering periodicals.

Rico, ree'ko: town; capital of Dolores co., Col.; on the Dolores river, and the Rio Grande Southern Railroad; 60

area S. W. of Ridgeway 10 miles N. by W. of Durango (for location see map of Colorado, ref. 6-D). The completion of its survey between Ridgeway and Durango in 1902 added much to the importance of the town and quickened the development of gold, silver, copper, iron, and coal in the immediate vicinity. Has one national bank with capital of \$200,000, a State bank with capital of \$50,000, and two weekly newspapers. Pop. (1880) 800; (1890) 1,154.

Rico, Mariano (Andrés); painter; b. in Madrid, Spain; died in Madrid of *Fuente de Arriba* and afterward moved to Paris and Rome; (first-class medal, Paris Exposition 1875; second-class medal, Paris Exposition 1889); *Les Femmes de Madrid* (1875). His subjects are chiefly architectural, and for the most part consist of views in Andalus. His pictures are painted with great observation and are remarkable for the delivery of color and brilliancy of effect. Two works, *Grand Canal* (1875) and *Andalus triptych*, are in the Metropolitan Museum, New York. W. A. G.

Ricard, Edmé; physician; M. D.; surgeon; b. in Ballinacorney, Ireland; received his medical degree 1826; practiced in the provinces for two years; returned to Paris, passed the *Capitaine* examination, and was attached to the Hôtel Hospital (1828); in 1831 was surgeon-in-chief of the *Hôtel de la Pitié*; Paris; acquired a wide reputation by his treatment of venereal diseases; obtained the *Legion d'honneur* 1842, and afterward resided in the *Legion d'honneur* (Paris, 1842). In 1869 he was made commander, and in 1875 for his services in the ambulance corps during the siege of Paris grand officer of the *Legion d'honneur*. He received many *Honorary* distinctions from foreign governments throughout the world, and was president of the French Academy of Medicine, and author of numerous surgical works in his special department. D. Oct. 22, 1888.

Revised by S. T. Amersbach.

Riccioli, Giovanni (Giovanni); b. at Fagnola, Dec. 12, 1598; graduated at the University of Turin, and at the age of twenty presented to the Academy of Sciences of that city his *De motu, figura, et tempore de Venetia*. For this work he was honored with a prize, although the work only appeared completed in 1640-41, when it was published in Paris in two volumes. This was followed by other works, *De motu, figura, et tempore de Italia et Italiae Regni* (Turin, 1640); *De motu, figura, et tempore de Europa* (Turin, 1640-41); *De motu, figura, et tempore de Asia* (Turin, 1640-41); *De motu, figura, et tempore de Africa* (Turin, 1640-41); *De motu, figura, et tempore de Europa* (Turin, 1640-41). As first a civil engineer, then a lieutenant in the army, he was in 1646 appointed Professor of Modern History in the University of Turin; was a deputy of the Italian Parliament (1648-50); rector of the University of Turin (1650-55); and rector of Italy (1655, seq.). D. at Turin, Feb. 24, 1671. See *Matteo Riccioli de R. Riccioli* (Florence, 1667).

Revised by A. R. Mann.

Ridderstad, Kari (Pernst); novelist and poet; b. in Skövde, Sweden, 1857; was a member of the Riksdag, where his eloquence and patriotism gained him a prominent position. He was the author of several historical romances from the time of Gustav, the last of which are *Skövde* (The Riksdag) and *Skövde* (The Riksdag), and a number of novels of contemporary life in imitation of *Madame de Sévigné*, including *Madame de Sévigné* and *Den svenska kungen* (The Black Hand, etc.), which show his force and originality. His dramas, among them *Drottning Kristina* (Queen Christina in Italy), are rhetorical and lack power of characterization. As a lyrical poet of the *Tygår* (the new moon) movement. D. 1890. O. K. Dobson.

Riddle; see *Trinity*.

Riddle, August Gallatin; lawyer and author; b. at Essex, Mass., May 28, 1810; was taken in infancy to Northampton; educated at Williams College and at Western College; studied law; was prosecuting attorney for the county 1840-44, and again 1854-56; served in the Ohio Legislature 1858-59, and in Congress 1861-63; was for some time counsel at Mahanoy, and afterward settled as a lawyer at Washington, D. C. Author of *Students and Lawyers* (1855); *Basic History* (1873); *The Portrait* (1874); *Alone and with* (1875); *The House of Ross* (1877); *The Fox's Daughter*, and other works. Revised by H. A. Briggs.

Riddle, George Rowland; classical scholar; b. in England, 1824; was educated at St. Edmund Hall, Oxford; took

orders in the Church of England 1852; was for some years vicar of Haverly; was Rector of Haverly 1852; D. at Cheltenham, Aug. 27, 1903. He was the author of a valuable *Latin-English Dictionary* (1859); an *English-Latin Dictionary* (1865); a *Manual of Christian Antiquities* (1860); *Natural History of Insularity* (Bampton Lectures, 1872); and many other works, theological and educational.

Revised by West. The Waverley.

Riddle, Merwyn Rues, D. D.; scholar and author; b. at Pittsburgh, Pa., Oct. 17, 1856; educated at Jefferson College, Pennsylvania, Western and New Brunswick Theological Seminary, and Heidelberg; was Adjunct Professor of Greek in Jefferson College 1881-85, chaplain in the army 1881; pastor of the Reformed Dutch church, Hoboken, N. J., 1881-85; of the Second Reformed church, Newark, N. J., 1885-89; engaged in literary work in Europe 1889-91; was Professor of New Testament Literature and Exegesis in Hartford Seminary 1891-97; since 1897 has held the same chair in Western Theological Seminary. He was one of the revisers of the New Testament, and a member of the committee for revising the Confession of Faith. Of Lange's *Commentaries* he translated and edited *Epistles and Colossians*, and edited the latter half of *Romans and Galatians*; prepared for the *International Commentary* *Epistles and Colossians*, and *Matthew, Mark, Luke, and Romans* with Dr. Schaff; for the *International Revision Commentary*, *Mark, Luke, and Romans*; edited for the American edition of Meyer's *Commentary* *Mark and Luke*; revised and edited *Robinson's Greek Harmony of the Gospels* (1885) and his *English Harmony* (1888); edited for the *Library of the Anti-Nicene Fathers* in vol. vii. *The Teachings of the Twelve Apostles*, *The Second Epistle of Clement*, *The Apostolic Constitutions*, and in vol. viii. *The Constitutions of Basil and the Apostles* and *The Apocrypha of the New Testament*; for the *Nicene and Post-Nicene Library* *Chrysostom's Homilies on Matthew* (first series, vol. x.) and *Augustine's Harmony* (vol. vi.); with Dr. J. E. Todd, prepared *Notes on the Sunday-school Lessons* (1879-81 Cong. Pub. Soc., Boston); and for the *American Supplement of the Encyclopedia Britannica* a number of articles covering most of the New Testament.

C. K. Hoyt.

Rideau, St. Lawrence; lake, river, and canal of Ontario, Canada. The canal connects Ottawa on the Ottawa river with Kingston on the St. Lawrence, passing from Lake Rideau along Rideau river to the N., and through Mud Lake and along the Cataraqui to the S.; length, 126 miles. Projected in 1812. It formed an important means of internal communication, now rendered relatively unimportant by railways.

Ridgeway, Henry Bacon, D. D., LL. D.; clergyman and educator; b. in Talbot co., Maryland, Sept. 7, 1830; graduated at Dickinson College, Carlisle, Pa., in 1849; entered the ministry of the Methodist Episcopal Church; served as pastor in the Baltimore, Maine, New York, and Cincinnati conferences from 1851 to 1882. Since 1882 he has been professor in and president of Garrett Biblical Institute, Evanston, Ill. He has published *Life of Alfred Chalmers* (1871); *The Lord's Land, a Narrative of Travels in Sinai, Arabia Petraea, and Palestine* (1876); and *Life of Edmund S. James, Senior Bishop of the Methodist Episcopal Church* (1882).

A. D. Oakes.

Ridgefield; town: Fairfield co., Conn.; on the N. Y., N. H. and Hartford Railroad; 10 miles S. by W. of Danbury, 17 miles N. by W. of Norwalk (for location, see map of Connecticut, ref. 11-D). It is in an agricultural region, is a popular summer resort, and contains a public library, a savings-bank, a weekly newspaper, several manufacturing, and many country residences of New York business men. Pop. (1880) 2,028; (1890) 2,205.

Ridgetown; town of County Kent, Ontario, Canada; half way between the Thames river and the north shore of Lake Erie; a station on the Michigan Central Railroad (see map of Ontario, ref. 6-B). Pop. (1891) 2,254.

Ridgeville; town: Randolph co., Ind.; on the Mississippi river, and the Grand Rapids and Ind., and the Pitts., Cin., Chi. and St. L. railways; 10 miles N. of Winchester, the county seat, 50 miles S. of Fort Wayne (for location, see map of Indiana, ref. 5-G). It is in an agricultural region, has a private bank and a weekly newspaper, and is the seat of Ridgeville College (Congregational, organized as Free-will Baptist in 1867), which in 1894-95 had 7 instructors, 100 students, and \$40,000 invested in grounds, buildings, and productive securities. Pop. (1880) 775; (1890) 922.

Ridgway: borough; capital of Elk co., Pa.; on the Clarion river and the Penn. and the Buffalo, Rochester and Pitts. railways: 118 miles S. E. of Erie, and 156 miles N. E. of Pittsburgh (for location, see map of Pennsylvania, ref. 8-D). It is in a lumbering region, and contains tanneries, foundry, machine-shop, a private bank, and two weekly newspapers. Pop. (1880) 1,100; (1890) 1,903.

Ridgway, ROBERT: ornithologist; b. at Mt. Carmel, Ill., July 2, 1850; educated in the common schools of that place. He was appointed zoölogist to the U. S. geological exploration of the 40th parallel, under Clarence King (1867-69), and was curator of the department of birds of the U. S. National Museum. He assisted Prof. Baird in the preparation of the technical portion of the *History of North American Birds* (1871-74). The three volumes were upon land-birds, and in 1884 two more volumes, upon water-birds, were issued. Although published as the works of Baird, Brewer, and Ridgway, the technical parts were entirely written by Ridgway. He is also author of *Report on Ornithology of the 40th Parallel*, an elaborate treatise on 262 species, and a work of 367 Government quarto pages; *A Nomenclature of Colors for Naturalists* (Boston, 1886); and *A Manual of North American Birds* (Philadelphia, 1887). Besides this, he is author of about 200 separate papers, some of considerable extent. Revised by F. A. LUCAS.

Ridley, NICHOLAS, D. D.: bishop and martyr; b. at Unthank, Northumberland, England, about 1500; educated in the grammar school at Newcastle-upon-Tyne; graduated at Cambridge, 1522; obtained a fellowship at Pembroke College and was ordained priest 1524; studied theology at the Sorbonne, Paris, and at the University of Louvain 1527-29; became on his return to Cambridge under-treasurer to the university, and soon afterward senior proctor (1533) and public orator, in which capacities he protested against the usurpations of ecclesiastical jurisdiction by the papacy, procuring a decree of the university to the same effect; was appointed domestic chaplain to Archbishop Cranmer 1537, vicar of Herne, Kent, 1538, master of Pembroke College and chaplain to the king 1540; was accused of heresy, at the instigation of Bishop Gardiner, on account of having preached against the Six Articles, but acquitted by Cranmer 1541; became prebendary of Westminster 1545, Bishop of Rochester Aug. 14, 1547; bore an important part in all the ecclesiastical measures of the reign of Edward VI.; assisted Cranmer in compiling the Liturgy (1548) and framing the forty-one Articles of Religion; induced the king to change Greyfriars and St. Bartholomew's priories into charitable institutions; converted his own house at Bridewell into a workhouse; was instrumental in founding Christ's, St. Thomas's, and Bethlehem Hospitals in London; was a member of the commission which deposed Bonner, and was his successor as Bishop of London Apr., 1550; aided in the deposition of Gardiner, Bishop of Winchester; visited the Princess Mary at Hunsdon, desiring to gain her acquiescence in his views of Church reform, but was unsuccessful, 1552; concurred in the proclamation of Lady Jane Grey as queen, and was induced by the Duke of Northumberland to preach a sermon at Paul's Cross in defense of her title July 16, 1553; was committed to the Tower on the accession of Mary a few days later; was taken to Oxford Apr., 1554, to participate in a discussion with the court theologians on the Real Presence; was formally tried for heresy with Cranmer and Latimer by a commission named by Cardinal Pole, and condemned to death as an obstinate heretic Oct. 1, 1555, and, having refused to recant, was burned at the stake with Latimer in front of Baliol College, Oxford, Oct. 16, 1555. His *Life* was published by his descendant, Dr. Gloucester Ridley (1763), and his *Works*, chiefly tracts in favor of the Reformation, were edited, with a *Life*, by Rev. Henry Christmas for the Parker Society (London, 1841). Revised by S. M. JACKSON.

Ridolfo, ZENO: See SCHADOW, RUDOLPH.

Ridpath, JOHN CLARK, A. M., LL. D.: historian and educator; b. in Putnam co., Ind., Apr. 26, 1840; educated at Indiana Asbury (now De Pauw) University; has served as principal of Thorntown Academy, superintendent of Lawrenceburg schools, Professor of English Literature, Professor of Belles-lettres and History, and vice-president of De Pauw University. He has published *Academic History of the United States* (1875); *Grammar School History of the United States* (1876); *Popular History of the United States* (1877); *Inductive Grammar of the English Language* (1879); *Life and Work of Garfield*, in English and German (1881); *History of the World* (3 vols., 1885; rev.

ed. 4 vols., 1889); *Life of Washington Charles De Pauw* (1887); *Christopher Columbus: the Epoch, the Man, and the Work* (1890); *Columbia: a Quadracentennial Story* (1891); *Great Races of Mankind* (3 vols., 1892); *Epic of Life*, a poem (1894); and many monographs. A. OSBORN.

Rie'desel, FRIEDRICH ADOLPH, Baron von: soldier; b. at Lauterbach, Hesse, June 3, 1738; studied at the College of Marburg; was an officer of a Hessian regiment in the British service during the Seven Years' war, distinguishing himself at the battle of Minden. In 1776 he was sent to America in command of the division of 4,000 Brunswickers hired by Great Britain. Arriving at Quebec, he spent a year in Canada exercising his troops in the Indian methods of warfare; joined Burgoyne in his campaign against Albany 1777; surrendered with Burgoyne Oct. 17, and was held a prisoner for over two years. After his exchange he was placed by Sir Henry Clinton in command of Long Island; was transferred to Canada, and returned to Germany, Aug., 1783. D. at Brunswick, Jan. 6, 1800. His *Memoirs, Letters, and Journals*, edited by Max von Elkelng, were translated by William L. Stone (2 vols., Albany, 1868).—His wife, FRIEDRIKE CHARLOTTE LUISE (1746-1808), wrote an interesting series of letters descriptive of life in Canada, of the incidents of Burgoyne's campaign, and of her residence as a prisoner at Cambridge and elsewhere. They were translated by William L. Stone, and published under the title of *Letters and Journals relating to the War of the American Revolution* (Albany, 1867).

Riehl, ALOIS: philosopher; b. at Bozen, Tyrol, Apr. 27, 1844; educated in Vienna, Munich, and Gratz universities; became Professor of Philosophy at Gratz 1873, and at Freiburg in 1883. He has published *Der philosophische Kriticismus und seine Bedeutung für die positive Wissenschaft* (Leipzig and Tübingen, 1876-87; *Ueber wissenschaftliche und nicht wissenschaftliche Philosophie* (Freiburg im Breisgau, 1883); *Beiträge zur Logik* (Leipzig, 1892). J. M. B.

Riehl, WILHELM HEINRICH: historian and novelist; b. at Biberich on the Rhine, May 6, 1823; studied theology at Marburg, Göttingen, and Giessen; was for a number of years editor of various newspapers, and was finally appointed Professor of Kulturgeschichte at the University of Munich. He is the author of a number of excellent historical and ethnological works, the most prominent of which are *Naturgeschichte des Volks als Grundlage einer deutschen Nationalpolitik* (1851-69); *Die Pfälzer* (1857); *Kulturstudien aus drei Jahrhunderten* (1859). His historical and ethnological studies also form the basis of a series of well-written stories and novels, of which he is the author. JULIUS GOEBEL.

Rienzi, or Rienze, COLA, di: political reformer; b. in Rome about 1313; the son of a tavern-keeper; was an enthusiastic student of the old Latin poets and historians, and early conceived the purpose of restoring the ancient greatness of Rome. The city was in a condition of anarchy, distracted by the feuds among the lords and violence and cruelties against the people. One of the nobles assassinated Rienzi's brother, and the impossibility of bringing the murderer to punishment gave his visions at once a practical bearing; from a dreamer he became a reformer. After a vain attempt to induce the pope at Avignon to return to Rome and protect the people against the oppression of the nobles, Rienzi began the work of reform himself, well knowing that he could not carry it through without a revolution. On May 19, 1347, he proposed the establishment of a better form of government, recalling to the minds of his hearers the greatness of the ancient republic. Proclaimed tribune of the "holy Roman republic," he straightway forced the nobles to render him allegiance, and restored order in the city. Successful were his reforms that not only other Italian cities, but foreign monarchs, sent deputations and embassies to congratulate the tribune; but not content with restoring order and peace to Rome, he now seemed to aim at universal empire. The foreign princes were disgusted and offended at his arrogance. The Roman populace grew tired of his magnificent processions and of his taxes. The papal legates declared him a traitor and a heretic, and the nobles taking advantage of the general discontent, attacked him in Dec., 1347, and drove him from the city seven months after his accession to power. After two years of retirement among the Franciscan monks in Southern Italy, he again appeared in the rôle of a political reformer at the court of the Emperor Charles IV., who sent him as a prisoner to the pope at Avignon. Innocent VI., however, the successor of Clement IV., thought that Rienzi could be used to restore

latter are laid out in broad streets with modern buildings. Among the public buildings the most notable are St. Peter's church, built in 1406, with a tower 460 feet high; the governor's residence, formerly the palace of the grand-master of the order of the Knights of the Sword, built 1494-1515; the city-hall, and the new exchange. There are manufactories of cotton, woolen, linen, and iron goods, cigars, corks, spirits, oil, glass, paper, jute, etc., and the ship-building industry is very flourishing. Riga derives its greatest importance, however, from its commerce. An average of 2,400 vessels, of over 1,000,000 tons, enter its harbor annually. The value of its annual imports—comprising coal, salt, iron, steel, dyewoods, fish and wine, etc.—averages about 22,000,000 rubles, and that of its exports—comprising flax, hemp, timber, grain, hides, oilcake, camel and horse hair, and mineral oil—averages about 55,000,000 rubles. The city was founded in the beginning of the thirteenth century by Albert von Apeldern, Bishop of Livonia. He established the order of the Knights of the Sword, which within a few years was united to the order of the Teutonic Knights. The prosperity of Riga began when it became a member of the Hanseatic League under the protectorate of Poland. It was taken by Gustavus Adolphus in 1621, and incorporated with Russia in 1710. Nearly half the inhabitants are Germans and German-speaking Jews, the remainder being about equally divided between Russians and Letts. Pop. (1890) 180,278. R. A. ROBERTS.

Riga, Gulf of: an inlet of the Baltic, 100 miles long, 80 miles broad, bounded by the Russian governments of Kurland, Livonia, and Esthonia. It receives the Dwina. Oesel is a large island at its entrance.

Rigdon, SIDNEY: Mormon elder; b. in St. Clair township, Allegheny co., Pa., Feb. 19, 1793; received a fair English education, and was working as a printer at Pittsburg when about 1812 a manuscript was offered for publication by an eccentric preacher named Solomon Spaulding. It was entitled *The Manuscript Found, or The Book of Mormon*, and pleased Rigdon so much that he made a copy before it was returned to Spaulding, who died soon after. In 1819 Rigdon became a Baptist preacher; about 1821 a Disciple minister; and though at first professing orthodoxy, soon began to propagate singular doctrines connected with the manuscript in question. In 1829 he became acquainted with Joseph Smith, and with him devised the publication of *The Book of Mormon* as the basis of a new sect. He accompanied Smith to Kirtland, O., to Missouri, and to Nauvoo, where he was one of the presidents of the Church; was one of the originators of the "new revelation" permitting polygamy; was twice tarred and feathered, several times imprisoned, and was a candidate for the succession to the leadership on the death of Smith. On the election of Brigham Young (1844) Rigdon refused to acknowledge his authority, was excommunicated, returned to Pittsburg, Pa., and lived in obscurity; later removed to Friendship, N. Y., where he died July 14, 1876.

Rigg, JAMES HARRISON, D. D.: minister and educator; b. at Newcastle-on-Tyne, England, Jan. 16, 1821; educated at the Old Kingswood School; entered the Wesleyan Methodist ministry in 1845; appointed principal of Westminster Training College for Schoolmasters 1868; president of the Wesleyan Methodist Conference 1878-79, and for the second time in 1892-93; member of royal commission of national education in England 1886-88; on the staff of *The Quarterly Review* from the first (1853); one of the editors for many years, and sole editor since 1885. He has published *Principles of Wesleyan Methodism* (London, 1850); *Congregationalism and Connexionalism Contrasted* (1852); *Modern Anglican Theology* (1857; 3d ed. enlarged, with *Memoir of Kingsley*, 1879); *Essays for the Times on Social and Ecclesiastical Subjects* (1866); *The Sabbath and the Sabbath Law before and after Christ* (1869); *The Living Wesley* (1875; new ed., enlarged as *Centenary Life of Wesley*, 1891); *Churchmanship of John Wesley* (1878); *The Connexional Economy of Wesleyan Methodism* (1879); and important pamphlets on ecclesiastical and educational topics. A. OSBORN.

Riggs, ELIAS, D. D., LL. D.: missionary and linguist; b. at New Providence, N. J., Nov. 10, 1810; graduated at Amherst College 1829 and at Andover Theological Seminary 1832. He was in Athens, Greece, 1832-34, in Argos 1834-38, in Smyrna 1838-53, and from 1853 in Constantinople, except in 1857-58, when he taught Hebrew and the cognate languages in Union Theological Seminary, New York. He translated the Bible into Bulgarian, Armenian,

and Turkish, and published *A Manual of the Chaldee Language* (1832; 2d ed. 1858); *Grammar of the Modern Armenian Language* (1847); *Vocabulary of Words used in Modern Armenian, but not found in the Ancient Armenian Lexicons* (1847); *Notes on the Grammar of the Bulgarian Language* (1847); *Outline of a Grammar of the Turkish Language as written in the Armenian Character* (1856); *Suggested Emendations of the Authorized English Version* (1873); *Notes on Difficult Passages of the New Testament* (1889), and other writings. Revised by BENJ. I. WHEELER.

Riggs, JAMES STEVENSON, D. D.: minister and New Testament scholar; b. in New York, July 16, 1853; graduated at the College of New Jersey in 1874; spent two years at Leipzig and Tübingen; graduated at Auburn Theological Seminary in 1880. After a pastorate of four years in Fulton, N. Y., he became Professor of Biblical Greek in Auburn Theological Seminary 1884-92; from 1892 has been Professor of Biblical Criticism and the New Testament. He is the author of many articles and pamphlets, and of *The Bible in Art* (1895). W. J. B.

Right Ascension: in astronomy, the angular distance between the first point of ARIES (*q. v.*) and the point in which the circle, passing through a heavenly body and the poles of the heavens, intersects the celestial equator. It is always measured from W. to E., and corresponds to longitude on the earth, as DECLINATION (*q. v.*) corresponds to latitude. The right ascension of a heavenly body is ascertained by a transit instrument and a clock. These determine the meridian passage and the time at which it takes place, respectively. Right ascension is usually expressed in time, one hour corresponding to 15° on the celestial sphere. R. A. ROBERTS.

Rights: See JURISPRUDENCE, POLITICAL SCIENCE, and JUSTICE.

Rights, Bill of: See BILL OF RIGHTS.

Rigi, or Righi, ree'gee: a mountain of Switzerland, in the canton of Schwytz. It is isolated between the lakes of Zug and Lucerne, and rises 5,902 feet above the sea, 4,500 feet above the lake. Several carriage-roads and two railways lead from the base of the mountain to the top, which offers a very extensive view.

Rigor Mortis [Lat., rigor or stiffness of death; cf. *rigere*, be stiff]: the condition of muscular rigidity developing shortly after the death of the body. It is due to suspended nutrition of the tissues, and begins when their response to artificial irritation and electricity ceases. Rigor mortis develops at a variable period after death, and when established lasts a variable time. In persons who die suddenly, as by accident or by heart disease, and in whom the muscles are well developed and nourished, rigor mortis may be postponed for many hours—twelve or twenty-four—and may then persist for two or three days. Conversely, when death is the result of exhaustive disease, the blood is impoverished and the muscles are wasted and flabby, rigor mortis develops speedily—within an hour, or even a few minutes—and is incomplete and of brief duration. As soon as rigor mortis passes off, the relaxed body begins to decompose. Rigor mortis was formerly explained as a state of contraction, the death-act of the muscular fiber. It is now believed to be due to the separation and coagulation of the albuminoid substance in the fluid of the muscle, following the cessation of nutrition. Revised by W. PEPPER.

Rigveda: See VEDA.

Riley, CHARLES VALENTINE, M. A., Ph. D.: entomologist; b. in London, England, Sept. 18, 1843; studied at college, Dieppe, France, 1854-57, and Bonn, Prussia, 1857-59; removed to U. S. 1860; studied practical agriculture 1860-63; connected with *The Evening Journal and Prairie Farmer* at Chicago 1863-68; appointed State entomologist of Missouri 1868, in which year he began, with Benjamin D. Walsh, State entomologist of Illinois, the publication of *The American Entomologist*; president of the Academy of Science of St. Louis 1876-77; appointed chief of the U. S. entomological commission (with Dr. Alpheus S. Packard, Jr., and Prof. Cyrus Thomas) under the Interior Department 1877; U. S. entomologist under the Department of Agriculture 1878; curator of insects U. S. National Museum 1881; general secretary American Association for the Advancement of Science 1881. He has published nine annual reports on the insects of Missouri (1868-77) and three annual reports as U. S. entomologist. He is also the author of *The Locust Plague in the United States* and of *Potato Pests*, and of

find a nidus in the hair-follicles and excite secondary inflammation of the skin. Ringworm is contagious, not only from person to person by close contact, but in the uncleanly is transplanted from spot to spot on the head and hands or wrists. The treatment is by parasitocides, or remedies destructive to parasitic life; local application of tincture of iodine, iodine and ammonia, sulphurous acid, sulphur dry or in ointment, carbolic acid, creosote, oil of cade, mercurial ointment, oleate of mercury, solution of corrosive sublimate, and cantharidal collodion. Revised by W. PEPPER.

Rink, HENRICH JOHANN: naturalist; b. at Copenhagen, Denmark, Aug. 26, 1819. He took part in the Galathea expedition around the world 1845-47, and as a result published *Die nikobarischen Inseln* (1847). He held many positions in connection with Greenland, and made extensive researches in that country. In 1852 he published *Den geografiske Beskaffenhed af de danske Handelsdistrikter i Nordgrønland*; in 1866-71 he published his *Eskimoiske Eventyr og Sagn*; in 1875 *Om Grønlands Indland og Muligheden af at bereise samme*. In 1877 he published in London *Danish Greenland*, and in 1887, in Copenhagen, *The Eskimo Tribes*, with a comparative vocabulary. D. Christiania in 1894.

Revised by RASMUS B. ANDERSON.

Riobamba, reë-ô-baam-bää: a town of Ecuador; 103 miles S. S. W. of Quito; on a plain between the Chimborazo and Altar Mountains, 9,100 feet above the sea (see map of South America, ref. 8-B). It was an ancient Indian town, and important during the conquest. On Feb. 4, 1797, it was completely destroyed by an earthquake in which over 20,000 persons are said to have perished. The new town is badly built and has little importance except as a station on the road from Quito to Guayaquil. Pop. 12,000. H. H. S.

Rio Branco: See RIO NEGRO.

Rio Bravo: the RIO GRANDE (q. v.).

Rio Cuarto, reë-ô-kwaar-tô (formerly *Concepcion*): a town of the province of Córdoba, Argentine Republic; on the Rio Cuarto, 112 miles S. of Córdoba (see map of South America, ref. 8-D). Until 1874 it was a frontier post, exposed to Indian attacks; it is growing rapidly, and is the second town of the province in population, an important railway center, and the emporium of a rich grazing district. Pop. (1892) 14,000. H. H. S.

Rio de Janeiro, Portug. pron. reë-ô-dã-zhã-nã-i-rô [Portug., river of January, a name given to the bay, then supposed to be a river's mouth, because it was discovered on Jan. 1]: a maritime state of Brazil, bordering on São Paulo, Minas Geraes, and Espírito Santo, and inclosing the Município Neutro or federal district. Area (excluding the Município Neutro), 26,634 sq. miles. It includes the mountainous districts of the Coast Range and part of the valley of the Parahyba river, with lowlands near the mouth of the latter containing the Lagoa Feia (see FEIA); there are also lowlands and lagoons along the coast. Rio de Janeiro is one of the great coffee-producing states, and sugar-cane and rice are raised on the lowlands. Most of the trade is through the port of Rio de Janeiro. The manufactures are considerable. Up to 1894 the capital was Nitheroy; it is now Petropolis. Pop. (1894) estimated, 1,390,398. H. H. S.

Rio de Janeiro: capital and most important port of Brazil, and the largest city of South America; on the west side of the bay of Rio de Janeiro; lat. (of the observatory) 22° 54' 24" S., lon. 43° 10' 21" W. (see map of South America, ref. 7-G). The bay is perhaps the most magnificent harbor in the world. The entrance, between high rocks, is about a mile wide and perfectly clear; within, it expands into a broad sheet with many bays, stretching inland for 17 miles, the whole surrounded by strangely formed mountains and hills, with the needle-like pinnacles of the Serra dos Orgãos at the northern end. Most ships can be loaded directly at the fine docks. The city occupies flat land and hills partly surrounding a group of wooded mountains. The older streets are narrow and often crooked, with few pretentious buildings; the newer ones, farther back from the bay, are wide and lined with substantial houses. The business center, from which street-cars run to the outskirts, is the narrow Rua do Ouvidor; it is lined with retail shops, *cafés*, etc., and is a favorite afternoon promenade; no carriages are allowed on it. The finest dwellings, surrounded by gardens, are in the outskirts and on the hills; the beauty of the scenery in these outskirts elicits the admiration of every tourist; Botofogo, for example, lies between the mountains and a placid arm of the bay, with the Sugar Loaf rock, 1,200 feet high, be-

fore it. There are several public parks, including the beautiful Passeo Publico, and the Botanical Garden in the suburbs. The handsomest church and the most richly decorated building in South America is the Candelaria. The old monasteries are now used for public buildings, and have been supplemented by handsome modern structures, such as those of the Department of Agriculture, the national printing-office, and the mint. There are several hospitals, and that called Mizericordia is said to be the largest and most richly endowed in the world. There is a well-appointed observatory; a national library, the largest and most valuable in South America, besides several other libraries; polytechnic school, national college, schools of medicine, fine arts, etc., and a naval school. The museum occupies the old imperial palace, an unpretentious building, but surrounded by a beautiful park; the collections in some branches are very valuable. The bay is defended by several forts, and there is an extensive navy-yard. The Corcovado Mountain, about 2,500 feet high, has precipitous sides looking down on the streets; a mountain-railway runs to a hotel on the summit. Other beautiful resorts are the high valley of Tijuca, and Nitheroy, on the other side of the bay.

Rio de Janeiro has a large foreign element, and much of the trade is in the hands of foreign merchants. The commerce is very important. Rio exports more than half of the total coffee product of the world, or some 400,000,000 lb. annually; the crop is brought in by railways. The largest exports, especially of coffee, are to the U. S.; most of the imports are from Europe. Regular steamers run to the U. S., Europe, the western coast of South America, New Zealand, etc. The climate is warm from May to October, temperate during the rest of the year, and always damp and somewhat changeable; lung diseases are consequently prevalent. Notwithstanding good drainage and modern sanitary improvements, yellow fever is generally prevalent during the warm months, and at intervals there are severe epidemics. A good but somewhat inadequate water-supply is obtained by fine aqueducts from the Corcovado and Tijuca. The bay was discovered (probably) by João Manoel and Amerigo Vespucci Jan. 1, 1502. French Protestants tried to form a settlement on it, but were driven out in 1567 by the Portuguese, who then founded São Sebastião, or Rio de Janeiro. It became the capital of Southern Brazil in 1762, and of the whole of Brazil in 1774. From 1808 to 1821 it was the residence of the Portuguese court, and hence the capital of Portugal. The revolution of 1889 broke out here; during the naval rebellion of 1893-94 the city was bombarded, but not seriously injured. Population of the city proper (1893) about 300,000. The Município Neutro, which includes the city, is a federal reservation, similar in character and government to the District of Columbia in the U. S.; area, 538 sq. miles; estimated population, with the city (1893), 471,775. See Valle Cabral, *Guia do Viajante no Rio de Janeiro* (1884); Agassiz, *A Journey in Brazil* (1868). HERBERT H. SMITH.

Rio de la Plata: See PLATA, RIO DE LA.

Rio de Oro: a bay (mistaken by an early explorer for a river) lying between the African mainland and the Ed-Dajla peninsula, on the Atlantic coast, N. of the Tropic of Cancer. It is in Spanish territory, and the Spaniards have establishments there devoted chiefly to fishing. The Spanish possessions on this Saharan coast extend (since 1884) from Cape Bojador to Cape Blanco, and part of the region inland consists of the oases of Adrar, where grain is raised to some extent, and many sheep, goats, camels, horses, and cattle graze. The chief town of Adrar is Shingeti, and 30,000 people live there. C. C. ADAMS.

Rio Grande, or **Rio Grande del Norte**, reë-ô-graan dî-dîl-nôr-tâ [Span., great river of the north]: a large river which rises in Southwestern Colorado, flows first E. and then S. through New Mexico, flows thence S. E., forming for several hundred miles the boundary between the U. S. and Mexico, and falls into the Gulf of Mexico after a course of about 1,800 miles. It is navigable for small boats only for about 450 miles, or to Kingsbury Rapids; is generally shallow, frequently interrupted by rocks and cataracts, and is subject to periodical inundations near its mouth. Its principal tributary is the Rio Pecos. Brownsville, Tex., and Matamoras, Mexico, are situated on opposite sides of the Rio Grande, 35 miles above its mouth.

Rio Grande do Belmonte: See JEQUITINHONHA.

Rio Grande do Norte: an eastern maritime state of Brazil, between Ceará and Parahyba, with a coast including

is high, crossed by Cas. St. Roque. Area, 95,193 sq. miles. The mountains are low, intersected by frequent small rivers, and without great valleys; the interior is an irregular series of mountains with that of Cuzco, and like it in its ruggedness and occasional destructive droughts. The water of the present and last population of the Brazilian river, and water and water and water are the only sources of irrigation. Sugar, and a little cotton and tobacco are raised. Pop. (1894) estimated, 247,813. The capital and principal town and port is Natal.

HENRY H. SMITH.

Rio Grande do Sul (Portug., great river of the south); sometimes named as Rio Pedro do Rio Grande do Sul, the settlement and one of the most important states of Brazil, between Santa Catarina, the Atlantic, Uruguay, and the Argentine Republic. Area, 21,232 sq. miles. Near the mouth of the river, the Lagoa dos Patos (p. 5) and the Lagoa Mirim, the latter partly in Uruguay; they are separated from the ocean by low and swampy lands, and communicating with it by the navigable Rio Grande do Sul, which gives its name to the state. Inland from the lakes the surface is raised, but generally hilly, rising to low mountains at the mouth of the river, and subsiding to plains westward, where the river Uruguay forms the boundary with the Argentine Republic. The river Jacuhy (p. 5) and the lake (p. 5) are waterways of great importance, and the upper Uruguay is also navigable for vessels of light draught. To the N. of the Jacuhy the land is wooded, fertile, and well suited for agriculture; large tracts are taken up by extensive agricultural colonies of Germans and Italians, commerce centering at Porto Alegre, the capital. An extensive region to the northeast is unsettled. S. of the Jacuhy the land is open, resembling Uruguay; it supports great herds of cattle, which are marketed at Pelotas, the principal station in the district resembling the Uruguayan gaucho. The exports are hides, dried meat, maize, beans, etc. The manufactures in the northern part only are growing a little. The state lies beyond the tropics; from spring to the winter (June-September), and light snows fall in the winter. The revolutionary spirit, which has frequently shown itself in this state, is nearly confined to the districts of southern districts. An attempt to invade and take a regular battle in 1893 was put down, only after many days of fighting and there was a formidable victory. Pop. (1894) estimated, 774,406, including 100,000 Germans and Italian colonies. HENRY H. SMITH.

Rio Grande do Sul city, the most important port of commerce of this state, on the Rio Grande do Sul, a small stream, which the Lagoa dos Patos discharges into the Atlantic. Area, 200 sq. miles. S. of the Rio Grande do Sul, the mouth of this stream is obstructed by shifting sandbars, which at intervals have nearly closed the passage, and numerous engineering works have failed to keep it clear. Tides, however, still find passage at favorable times. The city, on the land, reached by a railway, is important only for its commerce. A railway connects it with Pelotas, and steamships connect it with the lake. Pop. 20,000. H. H. S.

Rioja, 1817-1894, Portuguese dec. poet; b. at Seville, Spain, about 1817. He was educated in the University of Seville and obtained much knowledge of Greek, Latin, and Spanish as he pursued the education of his contemporaries. He entered the Church, and seems at first to have had a good career. About 1844, however, he went for a time to Madrid, apparently attracted by the great Count-Duke of Fernán, who seems to have known and liked him, before he had entered the Church. This first taste of life at court, the influence of the Count-Duke, for shortly after he was sent to Seville, writing his excellent political *Epístolas morales* (Paris, 1845) which arrived at the superiority of a poet and statesman. But in 1851 the death of Philip IV. gave the young writer a new direction of affairs, and the poet was sent to Seville as a consolation from him to name in Madrid the Count-Duke's minister. He was given the place of lieutenant of the royal library, and was for a time a member of the court. He was made the superintendent of the post office of the court, and Lagoa de Vega, Argentina, Montevideo, and other spots of the sea as one of the best poets and scholars of the time. It is probable that his residence at Madrid was not so good as he seems to be, and it is certain that he had no other opportunity of improvement by reason of a false sense of his own worth. When the latter fell from power in 1858, however, Rioja was one of those who accompanied him from the court. In 1865 Oliveira died

and the poet retired to Seville. But once more, in 1868, this time spontaneously by royal command, Rioja returned to Madrid, being given a position as counselor in the supreme court of the kingdom, which he held till his death, which occurred at Madrid, Aug. 9, 1894. The body of Rioja's poetical work is not great, but almost everything he wrote is distinguished by beauty of form, delicacy of style, and deep feeling for nature. Hence few poets of the siglo de Oro are better known. His *Poesías* have been published, with extensive biography, by D. Cayetano Alberto de la Hayera (Esc. de Bibliófilos Españ., Madrid, 1897). The same editor has also issued *Adiciones a las poesías de D. Francisco de Rioja* (Seville, 1872). A. H. MANON.

Rioja, La: a northwestern province of the Argentine Republic, between Catamarca, Corrientes, San Luis, San Juan, and Chilo. Area, 81,200 sq. miles. The Andes, with an average height of 10,000 feet, form the western frontier, and there are several parallel ranges covering more than half the province. The high valleys between these are the inhabited regions. The southwestern part is mostly an arid plain very thinly settled. The climate is very dry and little of the land can be cultivated without irrigation. The lack of communications makes Rioja one of the poorest provinces. The principal industry is agriculture. Wine, wheat, maize, incense, etc., are produced. There are rich deposits of copper, silver, and gold, as yet but little utilized. The province long resisted Buenos and the confederation, and until 1862 it was disturbed by wars. Pop. about 65,000. La Rioja (pop. about 10,000), the capital and largest town, was founded in 1591. H. H. S.

Rion: See PRADIS.

Rio Negro (Span., black river): a river in the region of the Argentine Republic known as Patagonia; rises in the Andes, flows N. E., E., and E. S. E., and enters the Atlantic near lat. 41° S. Length about 650 miles. Nearly the whole course is said to be navigable for vessels of light draught, and small steamers now ply on the lower portion, where there are several thriving settlements. H. H. S.

Rio Negro: one of the most important northern tributaries of the Amazon; rises in Southern Venezuela and (after entering Brazilian territory) keeps a general E. S. E. course to its mouth in lon. 59° 55' W. Length about 1,250 miles. The lower course is broad and lake-like, and is navigable for about 600 miles. Above this about 20 miles are obstructed by rapids, but beyond them the river is navigable for a long distance. Above the rapids it is connected by the Casiquiare (p. 5) with the Orinoco. The principal western branch is the Uaupés, rising in the Colombian Andes, probably over 700 miles long, and navigable. The Rio Branco rises on the confines of Venezuela, British Guiana, and Brazil, and flows S. over 400 miles to the Rio Negro. All these rivers run through generally forest-covered regions with but few civilized settlements. They are much frequented by rubber gatherers and traders. Manaus, the capital of the state of Amazonas, is at the mouth of the Negro. H. H. SMITH.

Rio Negro: a territory of the Argentine Republic; in the northern part of Patagonia, bordering on Neuquén, La Pampa, Buenos Ayres, the Atlantic, Chubut, and Chilo. Area said to be 130,000 sq. miles, but the limits are not yet fixed. The Andes and their spurs cover the southwest. Most of the remaining surface is a plateau crossed by the valleys of the Colorado on the N. and the Rio Negro farther S. Large tracts are suitable for grazing. The territory, abandoned until about 1880, is being rapidly taken up for grazing purposes. In 1902 there were about 20,000 inhabitants, and the exports were valued at \$1,560,000. The capital, Viedma, has about 3,000 inhabitants. H. H. S.

Rio São Gonçalo: See LAGOA DOS PATOS.

Riot [from O. Fr. *riote*, *riotte*, quarreling, brawling, revelling, feasting; Ital. *riotta*, quarrel], probably from dimin. of lat. *reus*, defendant, the accused; at common law, a disturbance of the peace by three or more persons acting in concert and in a manner calculated to inspire terror. Many law-writers declare that the riotous enterprise must be of a private nature, and that if it is of a public nature it amounts to treason; but there is judicial authority for the view, which seems the correct one, that a tumultuous disturbance of the peace is punishable as a riot, although engaged in for the purpose of showing an unlawful opposition to the government. *Prosser vs. Morris*, Addison (Pa.) 274; *People vs. Mast*, 128 N. Y. 108.

It is not necessary that the persons plan in advance of

their assembling to do any unlawful act. For example, if having gathered in front of a theater without preconcerted design to commit a breach of the peace, they attempt to force their way into the building and attack the police who are guarding the doors and rescue those who are arrested, they are rioters. (*People vs. Judson*, 11 Daly 1.) Nor is it necessary that they intend to terrify others. They may intend to engage in a mere frolic, as in a charivari or "horning" of a householder, or in entering the stable of another and shaving his horse's tail; yet if this is done in a tumultuous and terrifying manner the enterprise is a riot. *State vs. Alexander*, 7 Richardson (S. C.), 5.

An *unlawful assembly* is the meeting of three or more persons with a riotous purpose. If they enter upon the execution of that purpose, yet fall short of an act amounting to a riot, their offense is a *roul*. Modern legislation has modified the common-law rules governing these three offenses.

FRANCIS M. BUELDICK.

Riouw-Lingga, *reë-ow'ling-gaa*: an archipelago of the China Sea, making an extension of the Malay Peninsula; belonging to the Dutch and forming part of the residency of Riouw. It is formed of two groups of islands, that of Riouw being the northern and adjacent to Singapore, and Lingga the southern. The Riouw group consists of about thirty islands, the largest of which is Bintang with an area of about 400 sq. miles. The Lingga group is separated from the preceding by the Strait of Dempo, 10 miles broad. It consists of two large islands—Lingga (area, 320 sq. miles) and Singkep (area, 204 sq. miles)—and many smaller ones. The area of the whole archipelago is estimated at 1,823 sq. miles. The islands are rocky, like the peninsula rather than the adjacent alluvial shores of Sumatra. The highest peak is that of Lingga, 3,711 feet high. The islands are covered with thick and valuable forests. Among the productions are sago, rice, pepper, and gambir, the last forming the principal export. Tin has long been mined. The aborigines are Indonesian and negro, and have nearly disappeared. The inhabitants are now mainly Malays, Chinese, Klings, and Javanese, with a few Europeans. Pop. about 80,000.

MARK W. HARRINGTON.

Riparian Rights [*riparian* is from Lat. *riparius*, deriv. of *ripa*, the bank of a stream]: strictly speaking, such rights as appertain to the ownership of land upon the banks of rivers and other natural water-courses. Thus defined, the expression would include the rights enjoyed by riparian proprietors over the public streams by which their lands are bounded (such as the right of access, of wharfage, of ferryage, etc.), as well as those mutually exclusive rights of user in the private streams, whose beds are the property of the adjoining owners.

The expression is sometimes, however, more loosely and with less propriety used to describe all of the rights, whether of the public or of adjoining owners, which the law recognizes in any public or private waters. As thus employed it would comprehend the public right of navigation on the sea or on navigable streams, as well as the mutual rights of the abutting "littoral" proprietor and the public in the sea-shore.

For these several classes of rights, see LAKES, RIVERS, and SEASHORE. See also FILUM AQUÆ and WATERCOURSES, and consult the following authorities: Angell on *Tidewaters* and on *Watercourses*; Hall on *The Seashore*; Gould on *Waters*; and Pomeroy on *Riparian Rights*. G. W. KIRCHWEY.

Ripley: village; Brown co., O.; on the Ohio river and the Chesapeake and Ohio Railway; 50 miles S. S. E. of Cincinnati (for location, see map of Ohio, ref. 8-D). It occupies a site between the river and a steep bluff, is in a noted "white burley" tobacco-growing region, has a large river commerce, and contains flour and saw mills, piano and shoe factories, leaf-tobacco packing-houses, 2 national banks with combined capital of \$200,000, and 2 weekly newspapers. Pop. (1880) 2,546; (1890) 2,483; (1894) estimated, 5,000.

EDITOR OF "BEE."

Ripley, ELEAZER WHEELOCK: soldier; b. at Hanover, N. H., Apr. 15, 1782; a nephew of President John Wheelock and a son of Sylvanus Ripley, D. D., Professor of Divinity at Dartmouth (d. Feb. 5, 1787); graduated at Dartmouth College 1800; practiced law in Maine, residing chiefly at Portland; was a member of the Massachusetts Legislature 1810-11; Speaker and elected State Senator 1812; was appointed colonel of the Twenty-first Infantry 1813; was wounded in the attack upon York (now Toronto), Canada, Apr. 24, 1813; became brigadier-general Apr. 14, 1814; commanded

the Second Brigade under Gen. Brown on the Niagara frontier; took part in the battles of Chippewa and Niagara, being severely wounded in the latter, in which he won the brevet rank of major-general; was conspicuous for gallantry in the defense of Fort Erie Aug. 15, and in the sortie of Sept. 17; received a gold medal from Congress; resigned from the army 1820; settled in Louisiana, where he practiced law; served in the State Senate, and was a member of Congress 1835-39. D. at West Feliciana, La., Mar. 2, 1839.

Ripley, GEORGE: critic and journalist; b. at Greenfield, Mass., Oct. 3, 1802; graduated at Harvard 1823, and at Cambridge Divinity School 1826; was pastor of a Unitarian church in Boston 1826-41; resided several years in Europe, where he made a careful study of French and German literature; wrote *Discourses on the Philosophy of Religion* (1839); *Letters to Andrews Norton on the Latest Form of Infidelity* (1840); and edited *Specimens of Foreign Standard Literature* (14 vols., Boston, 1838-42); was associated with Emerson and Margaret Fuller in conducting *The Dial* 1840-41; contributed to *The Christian Examiner* and other magazines; was the chief promoter of the celebrated socialistic experiment at Brook Farm, Roxbury, Mass., 1841-47; was one of the editors of *The Harbinger*, a Fourierite organ, 1844-48; removed to New York 1847; became literary editor of *The New York Tribune* 1849, and remained so until his death; published (with Bayard Taylor) *A Handbook of Literature and the Fine Arts* (1852), and edited (with Charles A. Dana) *The American Cyclopædia* (New York, 16 vols., 1858-63), which was revised (Dr. Ripley, editor-in-chief, and appeared 1873-76. D. in New York, July 4, 1880. See his *Life*, by O. B. Frothingham (Boston, 1882).

Revised by H. A. BEERS.

Ripon: town; in Yorkshire, England; on the Ure; 23 miles N. W. of York (see map of England, ref. 6-1). The cathedral was originally founded on the ruins of St. Wilfrid's Abbey about 680, but of this building the crypt only remains. The present structure was begun in the twelfth century, and was entirely restored by Sir Gilbert Scott (1862-76). Its chief interest is from its various styles of architecture. Ripon has been the seat of a bishopric since 1836. There are several tanneries and foundries. Pop. (1891) 7,512.

Ripon: city; Fond du Lac co., Wis.; on the inlet of Green Lake, and the Chi., Mil. and St. P. and the Chi. and N. W. railways; 20 miles W. by N. of Fond du Lac, 86 miles N. W. of Milwaukee (for location, see map of Wisconsin, ref. 6-E). It is in an agricultural, dairying, and stock-raising region; has good water-power and water and sewerage systems; and contains Ripon College, 9 churches, a public library, 2 national banks with combined capital of \$110,000, a monthly and 2 weekly periodicals, 2 flour and feed mills, several creameries, knitting-factory, pickle-works, and box and crate factory. Pop. (1880) 3,117; (1890) 3,358; 1894 estimated, 5,000. EDITOR OF "COMMONWEALTH."

Ripon, GEORGE FREDERICK SAMUEL ROBINSON, Marquis of: statesman; b. in London, England, Oct. 24, 1827; became *attaché* to the British legation at Brussels 1849; sat in Parliament from 1852 until he succeeded his father as Earl of Ripon and Viscount Goderich, Jan. 28, 1859; inherited the earldom of De Grey on the death of an uncle Nov. 14, 1859; became in the same year Under-Secretary for War, and in Feb., 1861, Under-Secretary for India; became Secretary for War, with a seat in the cabinet, Apr., 1863; was made Secretary of State for India Feb., 1866, and lord president of the council Dec., 1868; was chairman of the high joint commission which negotiated the Treaty of Washington 1871; was rewarded with the title of marquis on his return June 23; was installed grand-master of the Freemasons of England Apr. 23, 1870, but resigned that position Aug., 1874, and was received into the Roman Catholic Church at Brompton Sept. 4, 1874. On the return of Gladstone to power the Marquis of Ripon was appointed Viceroy of India, which office he held until 1884. His attempts to extend the rights of the natives and to curtail in some respects the privileges of the Europeans made him most unpopular with the latter. He was First Lord of the Admiralty in 1886, and was appointed Colonial Secretary in 1892.

Revised by F. M. COLBY.

Ripon College: an institution at Ripon, Wis., in a campus of 10 acres. It was organized in 1854, and is privately endowed for the purpose of furnishing to young men and women opportunities for obtaining an education of the high-

of what the original Christianity was, he adopts no strict doctrine of inspiration; and he and his school entertain very free views as to the prerogatives of biblical criticism, holding that the essential thing is faith in the person of Christ rather than in his deeds or words or in dogmatic statements about him.

The theology of Ritschl is original only in the sense of being a peculiar composite. Like Schleiermacher, he holds that the religious sense is something immediate and ultimate, and that theology is independent of all secular science. With ordinary orthodox Christians he holds that Christianity came by a divine revelation. With the rationalists he is inclined to reject the mysterious and the supernatural, and to hold loose views of the inspiration and authenticity of the Scriptures; and in spite of Ritschl's denunciation of mysticism, the difficulty of combining this latter feature with perfect assurance of faith leads him (and more especially some of his followers, as Herrmann and Kaftan) to a sort of mysticism in the exposition of the relation of the Christian to Christ.

Notwithstanding some marked divergences of doctrinal views among Ritschl's adherents (some of them, e.g., disagreeing with him respecting the pre-existence of Christ), there is among them a strong *esprit de corps*, and they work together zealously in propagating their views and in securing the appointment of men of their school for the vacant places in the theological faculties. Among the more prominent representatives of the Ritschl school are W. Herrmann, of Marburg, Th. Häring, of Göttingen, Julius Kaftan, of Berlin, and H. Wendt, of Jena (dogmaticians); A. Harnack, of Berlin, and F. Loofs, of Halle (historians); E. Schürer, of Kiel, and H. Schultz, of Göttingen (exegetes).

C. M. MEAD.

Ritschl, Friedrich Wilhelm: classical scholar; b. at Grossvargula, Thuringia, Apr. 6, 1806; studied under Reisig at Halle; privat docent there 1829; professor 1832; at Breslau 1833; at Bonn from 1839-65, when he resigned in consequence of petty intrigues, accepting a call to Leipzig, where he died Nov. 8, 1876. Ritschl's magnetic influence as a teacher can only be compared to that of Gottfried Hermann; he may be said to have been the founder of a philological school, and many of his pupils have been called to occupy chairs in German universities. His lasting fame as a scholar rests upon his work on *Plautus*, and the epigraphical and linguistic studies of early Latin to which it gave rise. The complete edition of the comic poet was begun in 1871 with the *Trinummus*, to which are added exhaustive and justly celebrated Prolegomena, and was completed in 1894 by some of his pupils. Of his other contributions, many of which are of an epoch-making character, only a few can be here cited: *Parerga Plautina et Terentiana* (1845) contain, among other valuable treatises, the famous dissertation on the *Fabula Varroniana*; in the *Præcæ Latinitatis Monumenta Epigraphica* the author collected in 100 large folio plates artistic facsimiles of Latin inscriptions of the republican period, to which he added an exhaustive commentary. His minor writings, among which the various articles on the *Alexandrian Library* and on the *Literary Activity of Varro* are perhaps the most noteworthy, have been republished in five volumes of *Opuscula*. See L. Müller, *Friedrich W. Ritschl* (1877); Bursian, *Gesch. der class. Philol. in Deutschland*, pp. 812-840; and especially O. Ribbeck, *F. W. Ritschl, Ein Beitrag zur Gesch. der Philologie*, 2 vols., pp. 348, 591 (1879-81).

ALFRED GUDEMAN.

Ritson, Joseph: scholar; b. at Stockton-on-Tees, England, Oct. 2, 1752; studied law; became a conveyancer in London and deputy high bailiff of the duchy of Lancaster; devoted most of his time for many years to antiquarian researches; edited a vast number of reprints of old and rare books. D. at Hoxton, Sept. 3, 1803. Among his works were *Observations on Warton's History of English Poetry* (1782); *Ancient Songs from the Time of King Henry III. to the Revolution* (1790); *A Collection of Scottish Songs* (1794); *Robin Hood Ballads* (1795); *Bibliographia Poetica* (1802); and *Ancient English Metrical Romances, with Dissertation and Glossary* (3 vols., 1802). See his *Letters*, edited with a memoir, by Sir N. Harris Nicolas (2 vols., 1833).

Revised by H. A. BEERS.

Rittenhouse, Benjamin: instrument and clock maker; b. in Norriton township, (now) Montgomery co., Pa., 1740 or 1741; brother and assistant to David Rittenhouse. From Feb. 26, 1776, to Dec., 1778, the State of Pennsylvania maintained a gun-factory, of which he was superintendent.

He was representative in the Ninth, Tenth, and Twelfth General Assemblies of Pennsylvania (1784-88); commissioner to survey the Schuylkill river Oct. 20, 1789; associate judge of the court of common pleas of Montgomery co., Pa., Mar. 28, 1792, for ten or fifteen years, when he moved to Philadelphia. In 1796-97 he made a surveyor's chain, by order of Congress, which has been the standard of the U. S. Land-office ever since. He was elected a member of the American Philosophical Society Jan. 16, 1789. D. in Philadelphia, Aug. 31, 1825.

ANITA N. MCGEE.

Rittenhouse, David, F. R. S., LL. D.: astronomer and mathematician; b. Apr. 8, 1732, at Paper-mill Run, Roxborough township, near Germantown, Pa., where about 1690 his great-grandfather, William Rittinghuysen, a Hollander, established the first paper-mill in America. In boyhood he worked on his father's farm at Norriton, during which time he came into possession of some mathematical books; made himself master of Newton's *Principia*; discovered for himself the method of fluxions when in his nineteenth year; made a clock at a still earlier age, and undertook clock-making as a profession in 1751. He afterward made an orrery, which was purchased by Princeton College 1770, and later a larger one for the University of Pennsylvania. In connection with Mason and Dixon he was employed in 1764, to determine the initial point of their survey, which he did with instruments of his own construction; fixed the northern, southern, and western boundaries of Pennsylvania, and performed similar tasks for other States; was appointed by the American Philosophical Society to observe the transit of Venus June 3, 1769, which he did successfully in his private observatory at Norriton; calculated the elements of the (future) transit of Dec. 8, 1874; and observed the transits of Mercury of 1769 and 1782. In 1770 he settled at Philadelphia, where he continued the manufacture of clocks and mathematical instruments. He was elected to the provincial Legislature in 1776; was a member of the convention which formed the State constitution of Pennsylvania 1776; held various official positions during the Revolution; was State treasurer 1777-89; director of the U. S. mint 1792-95. In the latter year, after the death of Franklin, he became president of the American Philosophical Society, and was chosen a fellow of the Royal Society. D. in Philadelphia, June 26, 1796. His papers on astronomical, physical, and mathematical subjects are found in the first four volumes of the *Transactions* of the American Philosophical Society. A *Eulogium* upon him was delivered by Dr. Benjamin Rush 1796; his *Life* was written by his nephew, William Barton (1818), and by Prof. James Renwick in Sparks's *American Biography*, 1st series, vol. vii. (1834).

Revised by ANITA N. MCGEE.

Ritter, Carl: geographer; b. at Quedlinburg, Prussian Saxony, Aug. 7, 1779; studied at Halle; traveled much, and was appointed Professor of Geography at the University of Berlin in 1820. By his lectures, as well as by his works, he exercised a decisive influence on the study of geography, remodeling the whole science and attracting general attention to its problems and results. D. in Berlin, Sept. 29, 1859. His principal works are *Die Erdkunde im Verhältnis zur Natur und zur Geschichte des Menschen* (1st ed. 2 vols., 1817-18; 2d ed. 19 vols., 1822-59, comprising only Africa (i.) and Asia (ii.-xix.)); *Europa, ein geographisch-historisch-statistisches Gemälde* (2 vols., 1807); *Die Stupas* (1838); *Einleitung zur allgemeinen vergleichenden Geographie und Abhandlungen zu einer mehr wissenschaftlichen Behandlung der Erdkunde* (1852). After his death were published *Geschichte der Erdkunde* (1861); *Allgemeine Erdkunde* (1862); and *Europa* (1863). Parts of his works have been translated into English by W. L. Gage: *Comparative Geography* (1865) and *The Comparative Geography of Palestine and the Sinaitic Peninsula* (4 vols., 1866). His *Life* was written by W. L. Gage (Edinburgh, 1867).

Revised by M. W. HARRINGTON.

Ritter, Heinrich: philosopher; b. at Zerbst, Germany, Nov. 21, 1791; studied theology and philosophy at Halle, Göttingen, and Berlin, and was appointed Professor of Philosophy at Berlin in 1824, at Kiel in 1833, at Göttingen in 1837, where he died Feb. 3, 1869. His principal work is his *Geschichte der Philosophie* (Hamburg, 12 vols., 1829-55), ending with Kant; the most prominent of his works, all relating to the history of philosophy, are *Versuch zur Verständigung über die neueste deutsche Philosophie* (1853); *Die Halbkantianer und der Pantheismus* (1827); and *Ueber Unsterblichkeit* (several times reprinted).

RITUAL OF THE DEAD.

Ritualist (Term Lat. of the form and manner of religious observance, a religious usage or ceremony): strictly speaking, one who has made the rights and usages of the Church master of study; and the term is commonly used to designate a man in the Anglican Church who seeks to revive the spirit of the Reformation, which is regarded by some as a "deformation," and, in order to show sympathy with the late-Reformation Church, and to make prominent features which they regard as "Catholic," has revived rites and practices which have their origin in the medieval days. The Ritualists claim that in reviving these usages they follow in obedience to the letter of Church law; in other cases not conforming to Catholic practice and their acts are not fornications. They are to themselves simply Catholics. As a body, they were shown great zeal and self-denial, and in some respects resemble the early Methodists. Denounced as Romanists and traitors of their Church, the Church Association protested through the House of Commons, was formed as a result, promulgating in the celebrated trial of the Bishop of London his alleged ritualistic practices, which resulted in a personal victory for the Bishop and his sympathizers. The division in this case of the Archbishop of Canterbury has been generally accepted and further proceedings are inevitable.

From the Church of England, ritualism has extended to the Episcopal in the U. S., and has occupied the attention of some of our general convention. In 1901, at the Baltimore General Convention, the discussion on ritualism occupied the greater portion of the session. After most brilliant and prolonged debates a canon forbidding certain practices, adopted which has proved practically inoperative, and there has been throughout the American Church an increasing persistence and dignity marking the content of the Church's services which are certainly results of the ritual movement. There has not been found in any extent that development of ritual which leads to the finalism of some Catholic doctrine. The ritual canon of 1871 still stands on the pages of the *Book of Common Prayer*, but it is doubtful if its enforcement for its intention would be attempted on any section of the Church. See LITURGIC, W. P. DEARD, Revised by W. N. DEARD.

Ritual of the Dead, or Book of the Dead (Egypt). The ancient, going forth by day, Fr. *rituel funéraire*, Germ. *Totenbuch*: the collection of sacred writings of the Egyptians which, in greater or less compass, were placed on the walls of tombs and pyramids, on sarcophagi, and on various articles of funeral furniture, or on papyrus which were deposited with the mummies of the dead. In part it was of very ancient composition, but the chapters had no organic connection, but were themselves, and the whole did not have any definite and fixed form till very late in Egyptian history.

The general view made by the author of this as of other sacred writings. The oldest chapters are said to have been composed in Heliopolis; the 190th and 64th chapters are reported to have been found at Denderah in the time of Rameses, the 19th king of the first dynasty, while the 178th chapter is inscribed on the sarcophagus of Mycerinus of the fourth dynasty. As time passed the number of chapters grew and their length increased, till a fairly complete copy from a papyrus is about wide and from 80 to 90 feet long. Certain copies of the nineteenth to the twentieth dynasties contained twenty chapters at most, while a text of the twenty-sixth dynasty, republished by Lepsius in his *Totenbuch*, contains 165 chapters. In a complete compilation the number would be considerably greater. According to Edouard Naville, who has made special investigations on the subject, there were four recensions of the text: (1) That of the old and Middle Kingdoms down to the thirteenth dynasty, found only in the hieroglyphic writing; (2) the Theban, of the eighteenth to the twentieth dynasties, written generally in the hieroglyphic, though sometimes in the hieratic character; (3) a similar recension found after the twentieth dynasty, usually written in the hieratic, and with no fixed order of chapters; and (4) the Saitic and Ptolemaic, in both hieroglyphic and hieratic script, the text thoroughly revised, and the number and order of the chapters quite fixed and uniform. The first recension has come to us in selected extracts in the texts on the sarcophagi, tombs, and pyramids of the 18th and 19th dynasties, and on the sarcophagi and papyri of the eleventh and twelfth dynasties. The Theban copies of the sarcophagi of the twentieth dynasties are found on sarcophagi, but particularly on papyrus in hieroglyphic or

hieratic characters, accompanied by vignettes, which contain sometimes as many as thirteen volumes. The titles of the chapters are in red and the text in black ink. When written in hieroglyphs the lines are vertically in hieratic script, horizontal. These papyrus rolls were sometimes placed in a niche in the wall near the head of the mummy, or, later, inside or beneath it, or even inside the dressing bands. Occasionally they were put in a little drawer in the pedestal of an Osirian figure which was deposited with the mummy. Extracts from the *Book of the Dead* have also been found written on the linen mummy-bands themselves. The chapters thus buried were the most important in the collection.

The book, as a whole, is entirely lacking in logical or chronological order, and in a systematic arrangement of its parts. It is also not properly or entirely a funeral ritual since the acts prescribed are only in part to be done to or for the dead. The deceased is himself the principal active agent. Aside from certain ceremonial observances and directions, the book is concerned with the journey of the dead through elements, the western region of the departed, with the questions and prayers which he is to address to the gods and other beings whom he will meet in the course of his migration, with the magical formulas which are calculated to deliver him from the ill and dangers that threaten; with the formulas which were placed on amulets to insure the safety of his bodily members; with the hymns to be sung in honor of the great gods; and with the scenes of the judgment in the hall of Osiris when the heart of the deceased is weighed in the scales over against the symbol of truth and justice, and where the "negative confession" that the deceased has not committed certain reprehensible or heinous acts of irreligion or of immorality is repeated to the forty-two assessors.

The localities of the future existence of the soul were vague, and the most that can be said is that they were generally patterned after the conditions known in Egypt, especially those of the Delta region. There was a river divided into branches, islands, and fruitful fields, which produced sure harvests wrought by labor in which the "justified" had a share. But before reaching these fertile regions of Aaru (or Asio) the dead was brought into the Hall of Double Justice (truth and righteousness), where Osiris was seated beneath a canopy. Before him were seated the forty-two assessors or judges, each from a different city of Egypt, and each set to judge of a particular form of sin. The four gods who had special charge of the vital organs of the deceased were also present. Anubis, the god of the dead, led in the deceased, who was received by Maat, the goddess of truth. The "negative confession" was repeated, and the truth of the protestations of innocence thus made was tested by weighing the heart of the dead, Horus being the principal actor, Maat the witness, and Thoth the recorder of the event. If declared righteous, the heart of the justified one was returned to him, along with his various bodily powers, and he became a whole man again. If the result was adverse the fate of the dead is not clear, but he seems to have died a second time, being devoured by the judge or by a female hippopotamus which guarded the entrance to the fields of Aaru. The beatific life was similar to the terrestrial, but from it the justified could return to the earth by means of magical formulas, and could even return again to the mummy itself. At will the dead could take on any desired form of bird or beast, and in the speeches set for repetition the dead set himself on terms of equality with the very gods. For the literature of the subject, see EGYPTOLOGY. Renouf's translation mentioned in that article was published separately (London, 1893-94), and Pierrat's translation was rendered in English by Charles H. S. Davis (New York, 1894).

CHARLES R. GILLET.

Rivas, or Nicaragua: a town of Nicaragua; capital of a department of the same name; 4 miles from the west shore of Lake Nicaragua, a little N. of the line of the proposed ship-canal (see map of Central America, ref. 7-B). It was the ancient Indian town of Nicarae, noted in the history of the conquest; most of the inhabitants are Indians. The place is very picturesque, its scattered houses being surrounded by fruit-trees, but it has little commercial importance. Heró Walker was finally defeated in Nov.-Dec., 1856. Pop. about 10,000.

H. H. S.

Rivas, ANGEL DE SAAVEDRA, Duke of: See SAAVEDRA, ANGEL, de.

Rive-de-Gier, rev'de-shi-á' (Fr., bank of the Gier): town of the department of the Loire; 14 miles E. N. E. of St.-Etienne; on the Gier, an affluent of the Rhône, on the Givier

Canal, and on the railway from Lyons to St.-Étienne (see map of France, ref. 6-G). It is a center of iron manufacturing and has important coal mines in its neighborhood. It has also glass-factories, tanneries, and factories of articles in leather. Pop. (1891) 13,070. M. W. H.

Rivera, reñ-vá-rä, José Fructuoso: soldier and politician; b. at Paysandú, Uruguay, about 1790. He was a partisan leader in the civil wars, and after Uruguay became independent was the first regularly elected president 1830-35. In 1836 he revolted against his successor, Oribe, heading the Colorados party, whose long struggle with the Blancos marks the subsequent history of Uruguay. Oribe was driven out, and Rivera was again president 1838-42. Then Rosas, dictator of Buenos Ayres, aided Oribe, who began the "nine years' siege." Rivera acted against him in the field, but on Mar. 28, 1845, was defeated at India Muerta by Urquiza, Oribe's ally. In 1853 Rivera aided in the deposition of Giro at Montevideo, and became a member of the executive triumvirate. D. at Montevideo, Jan. 13, 1854. H. H. S.

River-bullhead: See MILLER'S THUMB.

River Falls: city (settled in 1851, incorporated in 1885); Peconic river, at the west end of Great Peconic Bay, and the Chi., St. P., Minn. and Omaha Railway; 12 miles S. E. of Hudson, 16 miles N. E. of Hastings, Minn. (for location, see map of Wisconsin, ref. 4-A). It is in an agricultural region; has abundant power for manufacturing from the river; and contains 6 churches, 2 public-school buildings, a high school, the Fourth Normal School of the State, gas and water-works, 2 State banks with combined capital of \$64,000, and a weekly newspaper. The principal manufactures are flour and starch. Pop. (1880) 1,499; (1890) 1,783; (1894) estimated, 2,000. EDITOR OF "JOURNAL."

Riverhead: town; capital of Suffolk co., N. Y.; on the Peconic river, at the west end of Great Peconic Bay, and the Long Island Railroad; 4 miles S. of Long Island Sound, 75 miles E. by N. of Brooklyn (for location, see map of New York, ref. 8-F). It contains a national bank with capital of \$50,000, a State bank with capital of \$5,000, a savings-bank, a weekly newspaper, grist, woolen, paper, planing, and moulding mills, and carriage, chocolate, organ, and soap works. Pop. (1880) 1,757; (1893) 2,017.

River Hydraulics: that branch of hydraulics which deals with the flow of water in rivers. The principles are also applicable in a simplified form to canals and other artificial conduits. In the early part of the seventeenth century Castelli and Torricelli, pupils of Galileo, applied the principles of that master to hydraulics. The latter discovered the law governing the issue of fluid-veins from small orifices in the sides of a reservoir, and suggested this law as applicable to the flow of rivers. Near the close of the century Guglielmini elaborated this theory, which was generally adopted by the scientific world because no one attempted to verify its consequences by actual experiment. In 1732 Pitot, by observing sub-surface changes of velocity with the tube which bears his name, overturned this school of hydraulics. Attention being thus called to the importance of a practical treatment of the problem, experiment was multiplied; and finally, in 1786, Dubuat laid the foundation of the modern school by announcing his great principle that the flow is due to gravity acting through the slope of the surface, and that the true method of enunciating in mathematical language the law of motion is to equate expressions for the accelerating and retarding forces. During the nineteenth century many investigators have attacked the problem upon this general basis, and the general laws of distribution of velocities in a cross-section of a stream have become fairly known, while many formulas for mean velocity have been proposed.

The elaborate hydraulic survey of the Mississippi river, made from 1850 to 1860 by Humphreys and Abbot, resulted in a system of river hydraulics of which the following is a brief outline: The law of distribution of velocity in both vertical and horizontal planes was shown to be parabolic. The ratio between the mid depth and mean velocity is sensibly constant, being about 0.96, and it is independent of wind effect. This last discovery has been of particular value in reducing the labor of gauging streams. In algebraic language, the most important of these laws for sub-surface velocity are expressed as follows, with D , d , and d' denoting, respectively, the total depth, the depth of the axis, and the depth of any particular point; and v , V , V_m , V_p , $V_{\frac{1}{2}}$, V_d , V_m denoting, respectively, the mean velocity of the

river, the velocity at any depth d , the surface velocity, the velocity at the bottom of the river (the depth being D), the velocity at half the depth, the maximum velocity, and the mean of the whole vertical curve:

$$(1) \quad b = \frac{1.69}{\sqrt{D + 1.5}}$$

$$(2) \quad V = V_d - \sqrt{bv} \left(\frac{d - d'}{D} \right)^{\frac{3}{2}}$$

$$(3) \quad V_m = \frac{1}{2} V_d + \frac{1}{2} V_p + \frac{d}{D} \left(\frac{1}{2} V_p - \frac{1}{2} V_d \right)$$

$$(4) \quad V_{\frac{1}{2}} = V_m + \frac{1}{2} \sqrt{bv}$$

The formula for the mean velocity deduced is the following, in English feet: v denotes the mean velocity per second; a , the area of cross-section; p , the wetted perimeter; W , the width; b , the value given in eq. (1); s , the slope of the channel corrected for bends—its numerical value is the quotient of the total fall in water-surface between the terminal stations, less the value of h in the bend formula, by the total distance between them measured on the middle line of the channel; N represents the number of angles changes each 90° of the latter line. The value of v in the bend formula is found by successive approximations.

$$(5) \quad v = \left(\sqrt{0.0081b + \left(\frac{225a\sqrt{s}}{p + W} \right)^{\frac{1}{2}}} - 0.09\sqrt{b} \right)^2$$

$$(6) \quad h = \frac{Nv^{\frac{3}{2}}}{536} \quad (\text{bend formula}).$$

Among other formulas for mean velocity that of Kutter (see HYDRAULICS) has received the widest acceptance, and as it contains a coefficient of roughness, it can be adapted to different classes of streams as well as to artificial channels.

Gauging of Rivers.—For practically gauging the discharge of a large river the following plan is recommended: Select a locality in a straight portion where the current is regular. Lay out a base-line 200 feet long parallel to the direction of the flow, and determine accurately the cross-section in front. Establish two theodolites, and, for numerous floats well distributed between the banks, note the angular distance from, and the time of transit past, each end of the base. These floats should be made double, the surface float being a tin ellipsoid or other light body bearing a little flag. The lower float may be a large open keg, ballasted with lead so as to hang vertically. The connecting cord should be as small as practicable. The rate of movement of the whole will thus be essentially that of the lower keg. The center of this keg should be placed at six-tenths of the depth below the surface, because in the absence of wind the velocity at that point very nearly represents the mean of the velocities in the vertical. The level of the water on a gauge should be read at regular intervals. To reduce the observations draw upon a sheet of section-paper the base-line and two perpendiculars to mark the line across which the times of transit were noted. From the recorded angles and a table of natural tangents the paths of each float are plotted, and upon each is written the seconds of its transit past the base. The total width of the river is next divided into as many equal divisions as show sensibly unvarying velocity. The mean of all the seconds of transit in each division is then reduced to feet per second, and adopted as the velocity in that division. A mean of all these velocities, interpolations being made if any are missing, closely approximates to the mean velocity of the river.

Where the depth will permit, rods or tubes, loaded to float vertically, and extending from the surface nearly to the bottom, are often used, thus integrating mechanically the velocities in a vertical. For small streams various forms of meters are often employed, which consist essentially of a submerged wheel, with apparatus designed to record the number of its revolutions; and the accuracy of the result, of course, depends entirely upon the precision with which these revolutions can be translated into feet per second. Electricity has been skillfully applied to record the number of revolutions of the wheel, and thus the registering apparatus can be observed on land or in a boat.

Oscillations.—As the volume of water in the channel increases, the surface-level of the river rises. The amount of this rise varies greatly in different parts of the course, especially when the stream discharges into the sea or a large lake. In such cases the oscillation is insignificant near the

original constructional troughs of the country are called consequent valleys. All but the deepest of the constructional lakes are in this way drained, and the flow of the streams becomes more continuous. The river now enters well on its life-work of carrying along the waste of the land on its way to the sea, the waste being received partly from the cutting of the stream channels, partly from the creeping and washing of the soil from the steep sides of the young consequent valleys, and partly from the broad constructional slopes of the region. Whenever, during the process of channel cutting, the streams pass from a resistant to a weak rock structure, an increase of slope is developed at the point of contrast, forming rapids; where the contrast of resistance is well marked, the increase of slope may be abrupt, and thus many waterfalls may come to characterize youthful streams. See CATARACTS.

Adolescent Rivers.—A river of good size soon cuts down its valley close to sea-level, or base-level, as it is now generally called, and on thus assuming a gently sloping course it enters its adolescence; but its small side-streams may still retain youthful features. Adolescence of the trunk stream is therefore characterized not only by the disappearance of the initial constructional lakes, but also by the wearing away or recession of the youthful waterfalls, and the attainment of a slope on which the ability of the river to do work is just equal to the work that it has to do. The river course is then said to be graded. Large streams may attain a graded course on weak rocks during the youth of their system; small branches on resistant rocks will not grade their courses until after adolescence. The depth of an adolescent valley depends on several factors: First, the height of the land in which the valley is cut; the rivers of low-lying Florida are unable to cut deep valleys, because their drainage area is hardly above base-level; while the COLORADO RIVER (*q. v.*) is cutting down a vast cañon, because the plateaus across which its course is laid have been lifted so high; it still has rapids and falls, and is only entering adolescence. Second, the depth depends on how close the channel may approach base-level; this depends on the grade that the river may assume, and this in turn depends on the volume and load of the stream—for example, in a region of given height a large river will cut down a deeper consequent valley and assume a gentler grade than a small river; for the large one can carry its load on a faint slope, while the small one will need a steeper slope on which to gain velocity with which to do its work; for this reason a graded river descends more rapidly in its upper course, where the volume is small, than in its lower course, where its volume is greater. Again, in two river basins of similar area and structure, but one in a dry and the other in a wet climate, the river in the first can not in its adolescence cut down so deep a valley as the river in the second; for the volumes of the two rivers must differ. Still again, of two rivers of equal size, one trenching a region of hard rocks, the other at work in a region of similar form and height but of weak rocks, the former will cut a deeper adolescent valley than the latter, because the former will have but a moderate load of land-waste, while the latter will be surcharged with detritus from the easily weathered rocks of its basin, and will need a comparatively steep grade on which to do its work. It is for two of these reasons, the dryness of the climate and the weakness of the rocks, that the rivers of the U. S. which cross the elevated western plains from the Rocky Mountains eastward have not cut deeply entrenched valleys; they are characteristic adolescent rivers with well-graded courses, but the land-waste from the weak rocks of the plains is shed into them so rapidly, and their volume is so reduced by the small rainfall, that they have practically ceased deepening their valleys, while their slope is still comparatively steep and their channels are still high above base-level. Other illustrations of the control of grade by load are found in those rivers which run from the Alps out upon the plains of Lombardy. Some of them pass through lakes on the way, and are there filtered of their load from the mountains; then below the lakes they cut down the plain that they traverse, while others emerge from the mountains well charged with detritus and are unable to trench the plain; they may even build it up by depositing some of their load upon it.

Subsequent Rivers.—While the trunk river is grading its valley and the consequent lateral streams are advancing toward the graded condition as fast as they can, certain new branches, not represented in the original constructional river system, make their appearance. These are developed

at various points, but especially wherever the walls of a consequent valley expose a weak stratum or rock-mass; for as the consequent valley widens by the wasting of its side-slopes, the widening will be fastest where the slopes consist of weak rocks; and thus in time numerous lateral ravines will be developed, lengthening headwards into valleys along the lead of the weak rocks by which they are guided. Such valleys and the streams that drain them are called subsequent. As the subsequent streams increase their drainage area, the original basins of the consequent branch streams are split up; thus the whole drainage area is more minutely subdivided and the rainfall is more promptly delivered to the water-courses. Commensurate with this change, the area of wasting slopes is increased, and thus the load washed down to the streams, and by them to the main river, is also increased. It may happen that the grade assumed by the main stream at the beginning of its adolescence is then found to be too faint, and hence some of the load is laid down, building a FLOOD-PLAIN (*q. v.*), and thus steepening the grade of the river and giving it a velocity that enables it to carry the remaining load. The deep alluvium with which the trench of the Missouri river is partially filled may have been accumulated in this manner, for the upper branches of this river are actively gnawing into the plains, and rapidly increasing the area of wasting slopes from which the load of the trunk river is chiefly derived.

Migration of Divides.—During the adolescent stage of river life it frequently happens that a stream may gnaw its way headward into the valley of another stream of the same river system or of an adjacent system, whose channel is at a higher level on account of greater distance to the sea, or of resistant rocks which have retarded its deepening somewhere farther down its course. Then the growing stream, working to advantage on the steeper slope or on the weaker rocks which guide its growth, may tap the other, thus abstracting its upper part and diverting it to the growing stream and leaving its diminished and beheaded lower part to follow its former valley. Subsequent streams are particularly active in making captures of this kind. Thus one river system may grow at the expense of another, as the divide between them is forced to migrate away from the steeper streams at the heads of the deeper valleys. Changes of this kind are going on in the Alps, where the Italian streams are frequently gaining at the expense of those discharging northward—as, for example, in the upper Engadine valley, where the Maira is capturing the headwaters of the Inn.

Deltas.—During all this time of river growth most of the land-waste that has been carried down to the river mouth accumulates there, forming a DELTA (*q. v.*), while the finest waste is carried out to deeper water. Rivers that enter the sea from steep mountain-slopes build stony deltas; but ordinarily the delta is composed of silt, reduced to fine texture during its long travel from its source down the valley to the sea. Under a fitting climate deltas are therefore fertile, and may support a large population, although exposed to the danger of sudden changes in the course of the river branches that traverse them and of FLOODS (*q. v.*) both from the rivers and the sea, the latter being caused by the high water of on-shore storm-winds. The outline taken by the growing delta varies according to the ratio of the power and load of the river to the activity of the shore-waves and currents. When the former are in excess, as at the mouth of the Mississippi, the delta grows rapidly forward with branching fingers wherever the distributary streams enter the sea; but where the waves and currents have the upper hand, the front of the delta is rounded, as in the case of the Rio Grande, where there is a smooth curve, convex seaward. The delta of the Po is of intermediate form. Acutely pointed deltas, like that of the Tiber, are probably caused by the combined action of river and shore currents.

Flood-plains.—As the delta grows forward there is necessarily a slight building up all along the flood-plain in order to maintain the needed grade of the river; and this entails an extension of the flood-plain up the valley, particularly at that stage of river life when the load is increasing. Hence with advancing adolescence this extremely valuable portion of the river valley increases its area, tempting occupation from its fertility, but, like the delta, subject to danger from floods. The Ohio valley offers an excellent illustration of this phase of river growth. The flood-plain and delta are somewhat higher along the river banks, where the silt is deposited at time of overflow; the plain slopes gently to either margin as well as down the valley. Consequently,

small lateral tributaries are frequently deflected down the least depression between the valley-wall and the flood-plain; and the Yacoma runs southward along the eastern side of the Mississippi flood-plain for many miles and would eventually, in the briefest of an independent stream if the main channel were swung over to the eastern flanks and take it in a Y-shape.

Branches.—During the descending of valleys of moderate size the smaller heads in the river course are frequently exaggerated until a distinctly sinuous channel is produced; the sinuosity is still further increased when the river is free to swing from side to side on a flood-plain. Traits developed elsewhere are then developed, their radius of curvature increasing with the volume of the stream, and their are of sinuosity lengthening with the lateness of grade. As the sinuosity appears, the river course is lengthened; hence the descending of the valley is retarded, or else the valley previously descending may have to be somewhat filled. A meandering river tends to put its outer bank, particularly at rapid high water, and the silt thus gathered at one bend is deposited on the two last of other bends farther down-stream; and the location of the meanders is continually changing. It often happens that a cut-off is formed across the neck of a long meander, thus directing the river to a shorter course and leaving the abandoned curve to form an oxbow lake. All stages of these changes may be seen on the flood-plain of the Mississippi.

Maturity.—With the advancing development of these various features, a river system gradually enters its maturity, and during this stage its activities are in fullest play. The initial work of first only imperfectly delivered to the river, having long distances to travel on the broad slopes of the unconsolidated surface, and often being delayed in lakes. It was never where these some well-prepared slopes, down which a perspective led to one of the numerous streams of the country the loss of evaporation is much reduced. The perfect dimension of the land surface by many valleys promises a feeding of water from the slopes at the fastest possible rate; the river arrangement of graded channels, subject at low waters and hence decreasing to the mouth, enables the streams to work most effectively as transporting agents. Following the development of subsequent branch streams, and the rearrangement of original lines of flow by tapping and diversion, have brought about a mature adjustment of means to structures, possible only as a result of the patient work and the best use of work by the denuding and transporting forces, of which the river is the more visible expression. The ideal bottoming that well-adjusted rivers give in face of the uniformity of geological processes deserves more attention than it has generally received.

It is during maturity that the three parts of a river system often referred to as if normally characterizing all rivers and all stages of development, are best represented. The head waters or torrent portion, where the volume is small where the slope is steep, where falls may still exist, and where the waste of the land is chiefly derived; the middle portion, of larger volume and strong, steady flow on a uniform grade, with a narrow flood-plain in a well-enclosed gorge; and the lower portion, where the valley is more widely opened, where there is a widespread flood-plain rising to a forward-growing delta, the river meandering slowly on the plain, and branching out to several mouths at the delta front. It is during and after maturity that rivers are most useful as navigable waterways.

Old Age.—After maturity the powers of the river gradually decay. The surface of the river basin is reduced to a condition of slight relief, the rainfall is less promptly dissipated, and more is lost by evaporation; even the upper reaches lose their activity, and the waste of the land is slowed away more and more slowly. As the land thus decays, the flood-plain that was built up during maturity is gradually attacked and worn down to fainter and fainter grades. At the same time the river and its branches wander more and more freely to one side or the other, being influenced by the fading valley slopes; and thus the well-defined and regular adjustment of streams to structures is somewhat lost. This stage is rather brief than actual, however, for the rivers enter so late a period without some disturbance interruptions in the course of their normal development, and are thus considered below.

Effects of Depression.—When the region drained by a river is broadly depressed, the lower part of the valley is submerged and converted into an estuary, bay, or flood (see above); at the same time all the branches which formerly

entered the trunk river below the head of the estuary now enter the sea independently, and must thereafter be regarded as separate rivers. Thus the Taunton, Hocktuck, and Pawtucket rivers now enter Narragansett Bay separately, and are properly described as independent rivers; but they are only the discovered branches of a trunk stream that once flowed down the valley which is now submerged. The Susquehanna, Potomac, James, and others are similarly the discovered branches of a former Chesapeake river. In the same manner it is probable that all the streams which now enter the Baltic Sea independently once joined a trunk river, which followed the axial line of the sea-trough.

Effects of Elevation.—When the region drained by a river system is evenly uplifted changes of two kinds are introduced. First, a new strip of land is added outside of the former coast-line, and the old trunk river is extended across this strip to a new mouth. By such extension it often happens that several formerly separate rivers are ingrafted on a single new trunk. Many branches of the lower Mississippi have thus been joined to the main river by the elevation of the coastal plain and the recession of the waters of the Gulf of Mexico. Second, inasmuch as the slope of the new coastal borderland is nearly always steeper than the grade passed by the extended river, the uplift allows the river to cut its valley to a greater depth than before; thus its powers are revived. This is particularly apparent in the case of a well-graded mature or old river, whose valley has become open; in consequence of uplift a narrow young valley will be cut along the bottom of the older and wider valley, and thus a composite topography—a topography developed with relation to two base-levels—will be introduced, of which many examples may be found. Most of the rivers of Pennsylvania and Virginia follow valleys of this composite nature. The action of the Colorado river is such in the bottom of a more open upper valley. The gorge of the middle Rhine is cut down in the bottom of a more open valley that traverses the highlands of the Schiefergebirge. The Ohio and the Missouri are both believed to be thus revived from a former old age, their narrow adolescent valleys of the present cycle of denudation being eroded beneath uplifted peninsulas of a former cycle of denudation. The Great Falls of the Missouri in Montana are a characteristic feature of the second youth of that river.

When a meandering old river is uplifted it cuts down a steep-sided meandering valley, and usually enlarges the radius of its curves in doing so, cutting steep valley walls on the outside of the curves and long slopes on the spurs of land that descend between the curves. The north branch of the Susquehanna in Pennsylvania, the Ogee in Missouri, the Seine in Northwestern France, and the Moselle in Western Germany—all exhibit these incised meanders. The meanders are sometimes so strong that the necks of the spurs are cut through, and the roundabout river course is abandoned. Such deserted incised meanders are known on the upper Ohio near Pittsburg, on the Moselle, and on the Neckar.

One of the most marked consequences of uplift is a revival of the processes of capture of such streams as deepen their courses slowly, by others (chiefly subsequent streams) whose channels are cut down more rapidly. The adjustment of streams to structures thus proceeds even further than in the previous cycle, for at the beginning of the first cycle there were no subsequent streams along weak structures, but at the beginning of the second cycle the subsequents are well formed, and they soon far outstrip the remaining consequents in their conquest for drainage area. It is believed that by such changes as these the Schuylkill has been greatly curtailed by the Susquehanna on the W. and the Lehigh and Delaware on the E.; in England the Trent has beheaded the Witham, and the Severn has probably beheaded the Thames, which seems once to have risen in Wales; the upper Meuse has lost branches on the W. to the Seine and on the E. to the Moselle.

Effects of Deformation.—Interruptions in the normal progress of river development are frequently caused by some uneven movement of the region, rather than by a simple uplift or depression. The region may be tilted by a slight angle, increasing or decreasing the slope toward the sea. A large part of the Atlantic coastal slope of North America was thus affected at a time when its rivers had reached old age, and the surface of the land had been reduced to a peneplain of moderate relief; then the tilting gave an increased slope to the rivers and an emphatic revival of their waning powers, and they are now in adoles-

cence or maturity of the cycle thus introduced. For example, the slanting upland of New England is dissected by the Connecticut, whose valley deepens inland in consequence of the greater elevation that the old lowland has received in Northern Massachusetts than at the coast. The valleys of the Hudson, Delaware, Susquehanna, Potomac, and others are similarly accounted for.

Inequality of slope in adjacent river systems introduced by gentle warping is an effective means of promoting the migration of divides, the steepened streams gaining area at the expense of those whose slope is decreased. Thus it is believed that the present northwest course of the Tennessee, near Chattanooga, is a diversion from a former southwest course, in consequence of slight deformation of the region.

More decided deformation is detected along the northern margin of the Alps, where the mountain-making forces seem to be invading the Piedmont districts and crushing them into incipient folds. When a land-surface is thus more or less warped the graded courses of its rivers are deformed; thus lakes may be formed where the river trough is depressed, and more active valley cutting may be induced where it is elevated, and in this way the marginal lakes of the Alps are explained, although glacial action has also undoubtedly contributed to their origin. The deformation of the Limmat, producing Lake Zurich, has been minutely studied.

Similar changes have progressed to a more advanced stage in the southern marginal ranges of the Himalaya; but while ephemeral lakes may have been formed on various outflowing rivers up-stream from the line of uplift, this stage is now past, and the rivers escape across the new ranges with unobstructed flow and essentially along their former courses; for the upturned strata of the foot-hills are the delta deposits of the earlier stage of river history. Rivers like these, of which the Sutlej may be taken as the type, maintained their flow in spite of uplifts across their course, and are called antecedent. The Green river of Wyoming, a chief head-stream of the Colorado, is by some regarded as antecedent, being thought to have kept its course through the great uplift of the Uinta Mountains; but the argument to this conclusion does not seem to be decisive.

Volcanic Accidents.—The lava-flows poured forth by volcanic or fissure eruptions run to the lowest ground that they can reach, and gradually congeal. In this way the rivers of the lava-buried areas are displaced and take new courses alongside of or across the lava surface. Thus the Snake river, gathering mature head waters among the mountains of Western Wyoming, crosses the lava-plains of Idaho in a young cañon; its upper and lower parts are as dissimilar as the upper and lower parts of an extended river that comes from older inland uplands to a newer coastal plain. If the region possessing displaced rivers of this kind is elevated the revived streams cut down new valleys to one side of their buried valleys, such being the relation of several older and newer rivers on the western slope of the Sierra Nevada in California, where the old river-gravels buried under the lava-flows are much sought for as a source of gold, while the new rivers flow in deep cañons.

Climatic Accidents.—Desiccation.—When the climate of a region turns from humid to arid the supply of a river system weakens, the head waters shorten, and the volume diminishes. In crossing lowlands the river is further lessened by evaporation, so that it may at last disappear, though its course to the sea remains open. Withered rivers of this kind may be found in the Argentine Republic, where they fail to reach the ocean, although the country slopes forward from their lower ends. Many withered rivers are found in the Great Basin of the U. S., where the side-streams, descending from the mountains, are unable to reach their former trunk stream, while the dwindling trunk stream fades away on the desert plains. During winter rains the withered system is somewhat invigorated; in summer droughts it is reduced to disvered remnants. In the Sahara the withering of the rivers is often complete; the valleys or wadies remain, but they lead no water, unless beneath the sands of their trough.

Climatic Accidents.—Glaciation.—The effects of glaciation (see GLACIERS) are among the most interesting accidents that can happen to rivers; and they are of great importance to civilized nations, inasmuch as they prevail over parts of Northeastern America and Northwestern Europe. During the occupation of a country by an ice-sheet there is a peculiar drainage system upon and under the ice, as is observed in Greenland and Alaska. Streams fed by rains and

surface-melting in summer flow for a time on the surface, and then disappear by plunging down crevasses; they emerge from tunnels at the ice margin, sometimes bursting out with much energy, and bearing a heavy load of coarse and fine detritus, which they spread out in their further course, often building up stony flood-plains in their valleys or deltas in the sea.

During the retreat of an ice-sheet it sometimes evacuates a district that slopes toward its front. A marginal lake then accumulates in the depression and overflows at the lowest point in the rim, scouring down a valley trench of considerable size; but when a still further retreat of the ice allows a lower discharge of the lake, this trench is abandoned except by such local drainage as it may receive from either side. In this way explanation is given of certain small rivers in broad valleys in the northern part of the U. S.; the upper Minnesota, the Desplaines by Chicago, Little river between the heads of the Maumee and the Wabash in Ohio, the Mohawk by Rome, N. Y., all being examples of this curious kind (*Popular Science Monthly*, Nov., 1894).

The most striking glacial accidents in river history are found after the retreat of the ice from the glaciated country, when the surface streams again take unconstrained possession of it. Supposing that the region had had a matured drainage system before the ice invasion, then the ice rounds off the peaks and ridges, deepens and widens the valleys, often eroding basins in their troughs, or clogging them with the drift that is left irregularly distributed over the country. The preglacial stream lines are therefore more or less obstructed, and hence the post-glacial streams often lose their way, being here detained in an eroded basin or in a hollow behind a drift barrier, and there turning across an old divide or spur along a new line of flow. Streams thus affected are as a rule characterized by frequent lakes and long reaches alternating with rapids or gorges along their new courses. (See LAKES, CATARACTS, and GORGE.) The delicacy of adjustment to structural lines that prevailed in the preglacial drainage system is confused or lost. There are little streams in large valleys; large streams in little valleys; falls in the lower portion of the river courses; and lakes everywhere. The rivers of Canada, Maine, Scandinavia, and other glaciated regions exhibit all these features in profusion. They are rapidly establishing better graded channels; filling lakes, which appear as meadows; pushing back falls and cutting down gorges (see NIAGARA FALLS); terracing valleys that were clogged with drift. The economic value of the rapids and falls thus produced is very great; nearly all the manufacturing cities of New England are located at water-powers of this accidental origin; Ottawa, Rochester, and Minneapolis are similarly determined.

Complicated History of Large Rivers.—While the several phases in the life and development of rivers here outlined are easily apprehended when considered separately, such is not the case with the development of actual rivers of large size, such as the Mississippi, Amazon, Rhine, or Danube. The successive uplifts by which the present drainage area has been constructed; the various cycles or partial cycles of denudation through which one part or another of the river has advanced; the accidents that its different branches have suffered—all combine to accumulate a history so complex that geographical study in its present state does not suffice to apprehend it clearly. Yet the real significance of each part is so closely dependent on its plan of development, and the relations of the various parts of a river system follow so distinctly from the history that they have been through, that nothing less than an analysis of their origin suffices to bring them clearly before the understanding. A full account of the Mississippi system would require an extended monograph. Its oldest parts are probably to be found in the upper branches of the Tennessee and New rivers, which descend from the mountains of Carolina and Virginia. Similar ancient head waters in Pennsylvania have been turned by diversion or deformation into the Atlantic rivers. Along the northern watershed the deposits of glacial drift are at many points sufficient to alter the direction of preglacial drainage; the so-called head of the Mississippi is certainly one of its youngest parts. The great western branches, the Missouri, Arkansas, and others, are young compared to the Ohio. The lower course of the trunk stream is a recent addition to the upper branches.

Economic Relations of Rivers.—In the economies of nature rivers are the great avenues of transportation along which the waste of the land, gathered by the creep of the soil and the wash of the wet-weather streams, is carried to

them. In the formation of such rivers appear in the well-known foldings. In regions where rivers are young, the banks are not yet prepared for incision, but are so marked that they are left over as waste or forested land; elsewhere are they generally on the uplands away from the streams, as is repeatedly illustrated on the dissected model plain of the U. S. and on the dissected plains of the Amazon, as those of Central Missouri. As the river life advances, and the valley widens in adolescence and later on, meanders are made more like stream and the more thoroughly dissected uplands are less populated. The early use of man, most frequently have been dwellers in open spaces of mature rivers, judging by the repeated accounts of a double traditional history. Villages from which most meanders have arisen have often been located by certain ancient great features, as river mouths, as New York at its head of water formed by an emerging river, as Providence at its head of water formed by an emerging river, as Albany and Troy at the mouth of river branches, as Pittsburgh at its mouth, as Lowell. Rivers whose volume is large, by reason of the fortunate growth of their basins, serve as most important means of internal communication, as the Amazon, but the modern development of the railway seriously limits the use of communication by river, as in the case of the Mississippi and its branches. The head waters of rivers are thus used as freshwater water supply for cities, while the trunk streams are employed in the disposal of sewage. Increasingly the diversion of streams in their upper courses into canals which are fed along the valleys and at separate grade than even reaching the divides between adjacent streams, whereas their water is easily distributed to the fields on the slopes. An opposite art is developed in the construction of dikes or levees near the river banks to prevent the overflow of the flood plain, as on the Mississippi. Farmers operations of this description are undertaken in nature a river from shifting its channels, as on the Mississippi, or to lead it into a more direct course than its natural stream, as has been done for the Rhine.

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Law on Rivers.—Under this title is comprehended not only riparian rights proper, or such as are peculiar to the ownership of land on the bank of a river, but also the rights of all persons, whether riparian proprietors or not, in water or flowing streams.

Flowing waters are by their nature, and so by law, incapable of private ownership. Whether the waters in question are those of a great river flowing in a bed as wide and free as the sea, or whether they make their way in a tiny stream through the lands of private owners, no one, situated as owner of the bed of the stream or not, can lay claim to the water as private property. He has, at the most, certain rights of use and enjoyment, exclusive or common, in the water of the stream. If he is a riparian proprietor he has certain peculiar and exclusive rights in the water, which give it out and constitute a part of his property in the soil through which it flows. If he is not a proprietor he may nevertheless share in the general or common right of the public to use the stream for navigation or other proper purpose. In the case of a public or so-called navigable stream, the riparian or private rights are inconsiderable, and the law concerns itself almost wholly with the rights of the public in the stream; in the case of private or non-navigable waters, as in other cases, the public rights are insignificant in comparison with the private rights of the riparian proprietors. The subject therefore naturally divides itself into two distinct regions, viz., the law of public and that of private waters.

Public Streams.—A public stream is one the bed of which is open to the sea. At common law no rivers have this public character except such as are navigable by great ships, and only those rivers are deemed to be navigable in which the tide ebbs and flows. Accordingly, the expression "navigable river" has come into general use to denote a public stream, though the common-law test of navigability—the presence or absence of tides—which in itself is always consistent with the physical fact, is usually inapplicable to the great inland waterways of the U. S. and has generally been abandoned. The principle is well established in the U. S. that all streams which are navigable in fact for vessels customarily used in the operations of commerce are navigable in law. Used in its natural sense, however, the term navigable is a very elastic one, and it is not uncommon for the public character of a stream, reasonable as a watercourse which will not admit

great ships may nevertheless support a considerable commerce carried on in small boats or barges. Accordingly, the question as to whether a certain stream is public or not is often a vexed question of fact, and streams which have no relation to the great waterways of commerce may nevertheless, by legislative or judicial determination, have the character of public waters imposed upon them.

As has been said above, the most important characteristic of a public river is that it is, like the seashore, subject to no private property rights. Riparian proprietors, as such, have in general no greater rights in the stream than are enjoyed by the public at large. The only exception to this rule at common law is the owner's right of access to his own land, and of mooring vessels in the river adjoining his land and keeping them there a reasonable time for the purpose of loading and unloading. His rights in these respects are precisely analogous to those of an owner of land upon a highway the fee of which is vested in the state. Indeed, it is as highways that public waters are chiefly regarded in law, and the most important of the public rights in them is that of navigation in essence of all kinds for purposes of commerce or pleasure. Navigable rivers are, moreover, some of the sea, and are, as such, subject to the common rights of fishing, of taking seaweed, and of cutting and taking ice, as well as to any other use of profit or convenience which may be enjoyed in common by all persons having occasion to resort thereto. The only restrictions upon these public or common rights is that they shall be exercised reasonably and with due regard to their mutual enjoyment, and that the less important rights (as fishing, for example) shall be exercised in due subordination to those that are more important (as navigation). It may be added that there is at common law no right in the public to use the bank of a river—the same being private property—even for purposes connected with the navigation of the river, as towing, mooring vessels, etc. The civil law, on the other hand, recognized easements of this nature in favor of the public over riparian lands, and the principle has survived in the modern codes which are based on the Roman system.

The law of the seashore, which makes high-water mark the line of division between the property of the littoral proprietor and that of the state, applies equally to tidal rivers. In the case of public waters which are not subject to the ebb and flow of the tide, the limit of riparian ownership is the ordinary watermark. Below that line—as below high-water mark on the seashore—lies the property of the crown, or state. This property right in the bed of a river (which the state may grant in a riparian proprietor or to any other individual or corporation, in fee simple or otherwise) is in the U. S. generally vested in the several States which have political jurisdiction over the waters in question, though the Federal Government, in the case of rivers flowing through or between several States, exercises a general jurisdiction in the interests of commerce.

Private Streams.—The law governing private streams concerns itself for the most part with the mutual rights and obligations of the riparian proprietors. An owner of land through which such a stream flows is deemed to be the owner of its bed. Opposite riparian owners are presumptively owners of the bed in the middle line of the stream respectively. (See FINEST AQUA.) As has been said above, however, this proprietorship of the bank and bed does not carry with it any exclusive property in the water of the stream. Every such proprietor has the right to use the running water so long as it is within his own territory, but he can not pollute or divert it, or appreciably diminish its volume, nor, in fact, make any use of it which is inconsistent with a similar use by every other riparian owner. He has the sole right of fishing, of cutting ice, of boating or skating in and upon such parts of the stream as flow over his land, and may grant any or all of these rights to others who are not riparian proprietors. But such a grant will not put the grantee in the position of a riparian owner as to give him a right of action against other riparian proprietors for an excessive or improper use of the stream on their part. Exclusive rights to use the water, to divert it permanently into artificial channels, to discharge it upon the land below, or to overflow the land above, may be gained by express grant from the proprietors whose lands are affected by such user, or by prescription. The soil of one riparian proprietor may be gradually increased or diminished by the action of the current, or by imperceptible changes in the course of the stream. The law recognizes this process of enlargement of one man's boundaries at the expense of his neighbor under

the name of "accretion," as a valid means of acquiring title to land. The legal consequences of accretion are the same whether it goes on in public or private streams or on the seashore; but if the process of change be a sudden or violent one, it will have no legal consequences whatever. Thus if a watercourse should suddenly desert its ancient bed and form for itself a new channel, the original boundary-line between the opposite owners, running through the middle of the old bed, will be preserved unchanged.

The rights of the public, so extensive and important in the case of public waters, are greatly narrowed in the case of private streams. There is in general no common right of navigation or fishing or any other user in such waters. Nevertheless, a stream which is strictly private so far as the title to its shores and bed is concerned, may become subject to a public easement of navigation or of floating logs. The public right in such cases is presumably acquired from the riparian owners, a grant or dedication by the latter being presumed from the long and general use of the stream for such purpose by the public. It is, however, highly probable that considerations of public policy will, in the newer parts of the U. S. at least, lead to a general recognition of common rights of navigation in suitable private streams, even where there has been no general use of the stream from which to infer a dedication.

For the distinction between riparian rights proper and such as pertain to waters percolating through the soil or flowing in undefined channels, see the article on **WATER-COURSES**. For other similar and related rights, see **LAKES**, **RIPARIAN RIGHTS**, **SEASHORE**, and authorities there cited.

GEORGE W. KIRCHWEY.

Rivers, RICHARD HENDERSON, D. D.: educator and minister of the Methodist Episcopal Church South; b. in Montgomery co., Tenn., Sept. 11, 1814; graduated at La Grange College, Alabama, in 1835; elected Assistant Professor of Languages, and in 1836 Professor of Languages, in that institution; was president of the conference school at Athens, Ala., in 1843; vice-president and Professor of Moral Science in Centenary College, Louisiana, in 1848, and president in 1849; was called to the presidency of La Grange College in 1854, and remained in that position after the removal of the institution to Florence, Ala., and the change of the name to Wesleyan University, until it was broken up by the civil war; was subsequently president of Somerville Female College, Tennessee, Centenary Institute, Summerfield, Ala., and Logan Female College, Kentucky; was president of Martin Female College, Pulaski, Tenn., 1874-78; was pastor in Auburn and Eufaula, Ala., 1878-83; took charge of Broadway church, Louisville, Ky., 1883-87; was a member of the Tennessee Conference; published *Mental Philosophy, Moral Philosophy, Our Young People* (1880); *The Life of Robert Paine* (1884); and *Arrows from Two Quivers* (1890). D. at Louisville, June 21, 1894. Revised by A. OSBORN.

Riverside: city (founded in 1870); capital of Riverside co. (created from the southwest part of San Bernardino County in 1893), Cal.; on the Santa Ana river, and the Southern Cal. Railway; 118 miles N. W. of San Diego (for location, see map of California, ref. 12-G). It was founded by colonists from New England, who constructed two irrigating canals, one of which cost \$50,000, and engaged extensively in the cultivation of oranges, lemons, figs, and grapes, the manufacture of pottery and cabinet furniture, and the production of raisins. There are several churches, public and private schools, high school, two libraries (Library Association, founded in 1879, and Public, founded in 1889), 2 national banks with combined capital of \$200,000, 3 State banks, a savings-bank, and 2 daily and 3 weekly newspapers. Pop. (1890) precinct, 1,358; (1890) city, 4,683.

Rives, AMÉLIE: See **CHANLER, AMÉLIE**.

Rives, WILLIAM CABELL: Senator; b. in Nelson co., Va., May 4, 1793; educated at Hampden-Sidney and William and Mary Colleges; studied law under Jefferson; served as a volunteer in the war with England 1812-15; became prominent in Virginia politics; was a member of Congress 1823-27; minister to France 1829-32, and again 1849-53; Senator from 1832 to 1845, with a brief interruption; a member of the peace conference of 1861, and of the Confederate Congress at Montgomery. D. near Charlottesville, Va., Apr. 26, 1868. He was the author of *The Life and Times of James Madison* (Boston, 3 vols., 1859-69) and other works.

Riviera, rîv-êr-â-raâ (i. e. the shore): name given to the coast of Liguria, Italy, from the French frontier to the Cape

of Porto Venere, near Spezia (see map of Italy, ref. 4-B). It is celebrated for its natural beauty and the salubrity of its climate. Its winter climate is one of the most mild and genial known, and this, with its ready accessibility, attracts to it each winter a very large number of invalids. It is customary to divide it into the Eastern Riviera (Riviera di Levante) and the Western (Riviera di Ponente), the two meeting at Genoa. See Black, *The Riviera, or the Coast from Marseilles to Leghorn* (1890); Murray, *A Handbook for Travellers on the Riviera* (1890); Macmillan, *The Riviera* (1892).

MARK W. HARRINGTON.

Riviere, rê-ê-vi-âr', BRITON: figure and animal painter; b. in London, Aug. 14, 1840; pupil of his father, William Riviere (1806-78); graduated at Oxford in 1867; Royal Academician 1881; medal, Centennial Exposition, Philadelphia, 1876; third-class medals, Paris Expositions, 1878 and 1889. Two of his most celebrated works are *Let Sleeping Dogs Lie* and *The Astrologer*. Studio in London. W. A. C.

Rivière du Loup (EN BAS), -dû-loo': post-village (called also FRASERVILLE); Temiscouata County, Quebec, Canada; on the southeastern shore of the river St. Lawrence, 125 miles below Quebec, and terminus of the Temiscouata Railway, at the mouth of the picturesque stream of the same name (see map of Quebec, ref. 8-E). It is the seat of Fraserville Institute, a convent, and an academy, and has a good trade. It is a place of summer resort. Pop. (1891) 4,175, nearly all French.

Rivière du Loup (EN HAUT), now Louiseville: post-village; capital of Maskinongé County, Quebec, Canada; on the north shore of Lake St. Peter, 68 miles below Montreal (see map of Quebec, ref. 4-B). It has a good trade and manufactures of leather. Pop. about 2,000.

Rix-dollar [from Swed. *riksdaler*; Germ. *reichsthaler*; *reich* (Swed. *rik*), kingdom, realm + *thaler* (Swed. *dalarn*, thaler, dollar): a silver coin formerly used in the Scandinavian countries and Germany. Its value varied in the different countries from a little less than 40 cents to a little more than a dollar.

Rizzio, rit'sê-ô, or Riccio, rit'chè-ô, DAVID: minister of Mary, Queen of Scots; b. at Turin, Italy, in 1540; the son of a dancing-master; was brought up in France; became an accomplished musician; obtained favor at the court of Savoy, where he was selected on account of his skill in languages to accompany an embassy sent to Scotland about 1563. Having attracted the attention of Mary, Queen of Scots, by his musical talent, she appointed him one of the pages of her chamber, and soon afterward (Dec., 1564) made him her secretary for foreign languages. He acquired great influence over her, and was accordingly hated by less fortunate courtiers; was an advocate of the marriage to Darnley, after which he was appointed keeper of the privy purse to the king and queen; was bitterly denounced by Knox and the Reformers on account of his Roman Catholicism; has even been regarded by some writers as a secret papal legate, and was regarded by many as the queen's paramour and father of Prince James. Several of the most powerful nobles, especially Morton, Ruthven, Lindsay, and Maitland, formed a conspiracy to assassinate him, and obtained the written concurrence of the weak Darnley by working upon his jealousy and by promising him the title of king. Introduced by Darnley into the queen's chamber, Ruthven and George Douglass struck down Rizzio in her presence, dragged him into the adjoining room, and killed him Mar. 9, 1566. It has been charged that Knox and other Reformers were privy to this murder. This is improbable, but Knox wrote of it in his *History of Scotland* as "a just act, and most worthy of all praise." F. M. COLBY.

Roach [M. Eng. *roche*, connected with O. Eng. *reohha*, Germ. *roche*, roach. The Eng. *ray*, name of same fish < Fr. *raie* < Lat. *râja*): a kind of fish, the *Rutilus rutilus*, of the family *Cyprinidae*. It is placed with its associates in a group distinguished by the pharyngeal teeth being in single series of five or six each, with crenate ridges and slightly hooked tips, the presence of twelve to fourteen anal rays, and the position of the dorsal fin opposite to the ventrals; the body is silvery, and the lower fins tinged with red, at least in the adult; the mouth is terminal. The roach generally attains a length of about 8 inches, and sometimes reaches as much as 10 or 12, and is under a pound in weight. It is distributed throughout Europe N. of the Alps, and, though insignificant as a game-fish, it is generally included in European works on angling. In the U. S.

the water is supplied by several related species of cyprinoids, such as *Leuciscus cephalus bullerianus*, and in some



The European trout.

pass to the northern *Leuciscus gibbosus*, and even to the common trout of Italy (*Salmo trutta*).

Revised by F. A. Lucas.

Trout: a kind of insect. See **CHRISTIANITY**.

Trout, Lake or Rule of the: primarily, the law governing the meeting or passing of travelers upon the highways; secondarily, the rules governing the steering, sailing, etc., of vessels meeting or passing upon navigable waters.

Law of the Road for Vehicles, etc.—This may be summed up as follows: (1) When two vehicles meet, each must bear to the right in the U. S., to the left in Great Britain. (2) In general, of vehicles following paths that cross, the one first to reach the point of crossing has the right of way. (3) In Great Britain, when one vehicle overtakes another, the foremost goes way to the left, and the other passes on at the right. These rules are not so peremptory that they must always be observed for drivers of vehicles, but their observance depends upon the general rule that all persons traversing a highway, whether walking, riding, or driving, must use reasonable care and diligence, under the circumstances, to avoid collisions, even though it should be necessary to turn in the opposite direction from that prescribed by the customary use of the road. (See **Anglo-American Highway**). For pedestrians, the rule on both sides of the Atlantic is to keep to the right.

Law, or Rule, of the Road at Sea.—The rules governing the meeting, crossing, etc., of vessels at sea, and the precautions required to avoid collisions, have now become a matter of international importance, and the tendency is toward the adoption of a uniform system by all maritime countries. On Dec. 22, 1889, a maritime conference met at Washington, D. C., with the sanction of the President of the U. S., issued in pursuance of a resolution of Congress to all maritime nations in diplomatic relations with the U. S. The object of the conference was to discuss, revise, and amend the rules, regulations, and proceedings concerning vessels at sea, and navigation generally. The conference rose on Dec. 31, 1889, with a report of its proceedings was published in three volumes. The rule of the road as recommended by the conference in most respects corresponds closely with that which custom dictated, and was in general adopted by Austria, Prussia, Germany, the Netherlands, Portugal, Sweden, Spain, and the U. S. It was to go into effect on Mar. 1, 1895, except steamshipmasters, pilots, etc., however, strenuously opposed the adoption, maintaining that in some important respects the rule with respect to fog-signals and the steering of vessels under the rule was impracticable, and materially increased the danger of collision instead of decreasing it. In response, therefore, to representations made by the British government the date at which the rule should go into effect was postponed. The following is a statement of the law that was enacted by the U. S. Congress to carry out the provisions of the recommendation of the conference, and to give effect by proclamation by the President.

International Sailing Rules.—(1) When two sailing vessels are approaching one another, so as to involve risk of collision, the vessel under way shall keep out of the way of a vessel which is close-hauled; (2) a vessel close-hauled on the red tack shall keep out of the way of a vessel close-hauled on the starboard tack; (3) when both are running free, with the wind on different sides, the vessel with the wind on the red tack keep out of the way of the other; (4) when both are running free, with the wind on the same side, the one to starboard shall keep out of the way of the other; (5) a vessel under way shall keep out of the way of the other; (6) if two steam-vessels are meeting and on, or nearly on, the same course, the one to starboard, so that each may see on the port side of the other. (7) When two steam-

vessels are crossing so as to involve risk of collision, the one which has the other on her starboard shall keep out of the way of the other. (8) When a steam-vessel and a sailing vessel are approaching so as to involve risk of collision, the steam-vessel shall keep out of the way of the other. (9) Every vessel overtaking another shall keep out of the way of the overtaken vessel. (10) In narrow channels every steam-vessel shall, when it is safe and practicable, keep to that side of fair-way or mid-channel which lies on the starboard side of such vessel. (11) Where by any rule one vessel shall keep out of the way of the other, the latter shall keep her course and speed, and the former, if the circumstances of the case admit, shall avoid crossing ahead of the other.

In obeying and constraining these rules due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from these rules necessary in order to avoid immediate danger.

Rules in regard to the Lights.—(1) The rules regarding lights shall be complied with in all weather from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited. (2) A steam-vessel shall carry forward in front of the forecastle, if there be one, and not less than 20 feet above the hull, a white light; on the starboard side a green light; on the port side a red light. The two side lights must be arranged with screens so that they can not be seen across the bow, nor more than two points abaft the beam. A steam-vessel when under way may carry an additional white light forward. (3) A steam-vessel towing another vessel shall in addition to her side lights carry two, if towing more than one vessel three, white lights. (4) A vessel not under command through accident shall carry two red lights in a vertical line not less than 6 feet apart aft of its white lights, or, in the day, two black shapes or balls 2 feet in diameter. (5) A sailing-vessel under way, and any vessel being towed, shall carry the same lights as are prescribed for a steam-vessel under way, with the exception of the white lights, which they shall never carry. (6) A vessel being overtaken by another shall show from her stern a white light or a flare-up light. (7) A vessel under 150 feet in length, when at anchor, shall carry forward, not more than 20 feet above the hull, a white light; a vessel 150 feet or more in length shall carry forward a white light, not less than 20 nor more than 40 feet above the hull, and aft another such light not less than 15 feet below the forward one.

Special rules are provided for steam-vessels of less than 40 tons, and vessels under oars or sails of less than 20 tons, which enable those vessels to carry a prescribed number and kinds of lights in a way more adapted to their size. Special rules are provided for pilot-boats, ferry-boats, etc.

Sound-signals in Fog, etc.—(1) All signals prescribed for vessels under way shall be given by steam-vessels on the whistle or siren; by sailing vessels and vessels towed, on the fog-bell. (2) A steam-vessel under way shall sound at intervals of not more than two minutes a prolonged blast. (3) A steam-vessel under way, but stopped and having no way upon her, shall sound at intervals of not more than two minutes two prolonged blasts with an interval of about one second between them. (4) A sailing vessel under way shall sound at intervals of not more than one minute when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession. (5) A vessel at anchor shall at intervals of not more than a minute ring the bell rapidly for about five seconds. (6) A vessel towing shall at intervals of not more than two minutes sound three blasts in succession, one long, followed by two short, and shall not give any other signal. (7) A steam-vessel wishing to indicate to another "The way is off my vessel, you may feel your way past me," may sound three blasts in succession, a short, long, and short.

Sound-signals for Vessels in sight of one another.—Steam-vessels must indicate their course by one short blast for "I am directing my course to starboard"; two short blasts, "I am directing my course to port"; three short blasts, "My engines are going full speed astern."

In all these rules every steam-vessel under sail and not under steam is considered a sailing vessel, and every vessel under steam, whether under sail or not, is considered a steam-vessel. "Steam-vessel" includes any vessel propelled by machinery. A vessel is "under way" when not at anchor or made fast to the shore or aground. F. SYNGER ALLEN.

Road-runner: See **COCKOO**.

Roads [O. Eng. *rad*, a riding, journey, road, deriv. of *ridan*, *ride*]: highways in the country and the streets in vil-

lages and small towns, often called common roads to distinguish them from paved city streets and from railways. The number of roads in a civilized community involves a large outlay for construction, and a heavy annual expenditure for repairs, so that the question of economy in road-making and maintenance is an important one. Good roads promote traffic and industry, while poor ones are a constant bar to the development of the towns which they connect. The location, construction, and maintenance of roads form a branch of civil engineering, and it is only the engineer who can conduct these operations so as to secure the greatest public convenience with the least expenditure.

The Romans built many roads extending to all parts of the empire, and portions of some of these are found at the present day in fair condition. Twenty-nine military roads centered at Rome, which with their numerous branches had, according to Antoninus, a total length of 52,964 Roman miles. The most important of these had a paved width of 16 feet, with curbs and unpaved sidewalks, but the prevailing width was 8 feet. There were also roads for single carriages, and for horsemen, of lesser width. The military roads were essentially pavements of dressed stone blocks, laid with very close joints on a foundation of concrete which rested on a sub-foundation of large flat stones, the entire thickness being about 3 feet. The road surface was quite smooth, and level transversely. Grade was usually disregarded, and the course of the road laid out in a straight line over hills and valleys. Milestones marked the distances from all parts of the empire to a gilt column in the Forum at Rome. In respect to durability, these roads were probably superior to any since constructed, but they were very expensive and the steep grades often rendered portions ill adapted to traffic. Macadam has said that their construction "was a kind of desperate remedy to which ignorance has had recourse," and from the point of view of engineering economy and the proper adaptation of means to ends Roman roads can not be recommended.

A number of Roman roads were built in England in the second and third centuries, and later some of these were widened and made public highways. The roads in England and throughout Europe were, however, in a deplorable condition during the Middle Ages, and indeed until the beginning of the nineteenth century no systematic method of construction and repair was known. About 1350 certain roads in England were given to private companies to repair, and toll was allowed to be collected. In 1553 the parishes were made responsible for the maintenance of the roads, but the burden proved to be too heavy, and the results were unsatisfactory.

The early explorers of Mexico and Peru found excellent roads between the principal towns. One of the military roads of Peru is said to have been nearly 2,000 miles long, with tunnels through mountains and bridges or ferries over streams; this was 20 feet wide and paved with flagstones covered with bitumen. In India and Persia there were also a few good roads in early times. In the latter country royal roads for the use of the ruler were built by the side of the common roads and kept in better condition, from which originated the phrase "There is no royal road to learning."

The earliest roads in the U. S. were mere Indian trails along watercourses and through gaps in mountain ranges. In New England the towns had control of roads, and there are records of some "eight and ten rods wide" which were authorized to be laid out, but only about one or two rods were devoted to traffic, the remainder being left uncleared. The prevailing method of construction and repair, when any method at all was used, was to plow two parallel furrows about 20 feet apart and scrape the loosened earth upon the space between them to form the road-bed.

Turnpikes were maintained in the U. S. during the eighteenth century by private companies which were allowed to collect toll, and the surface of these was often of gravel or broken stone. In 1796 an act of Congress authorized a national road from Baltimore westward, which was built for 650 miles through Pennsylvania, Ohio, and Illinois; its width is 80 feet, of which 30 feet is of broken stone, sometimes on a foundation of large stones. Although not properly kept up since the introduction of railways, it is still known as a good road.

The roads of Europe are in a far better condition than those of the U. S. This is due partly to the fact that they are older, but mainly to better and more effective methods of construction and maintenance. Gravel or broken stone is employed for a road surface, proper drainage is provided,

and systematic repairs are made at stated intervals. The dirt from the gutters is carted away instead of being spread on the road-bed, while this is kept in good condition by the frequent addition of broken stone properly compacted and rolled. Among the famous roads of Europe may be mentioned that from Geneva, over the Simplon Pass of the Alps, to Milan, which was built by Napoleon as a military route, and which cost the French Government about \$3,254,000, or nearly \$15,000 per mile; this is more than double the cost of construction of good roads under ordinary conditions.

About 1885 public opinion in the U. S. began to be aroused, mainly through the influence of bicycle riders and manufacturers, as to the deplorable condition of country roads and the great advantage of better methods of construction and repair. This movement has been productive of excellent results, yet very much remains to be done in order that these roads may be in a condition comparable to those of Europe. Methods of locating, building, and repairing roads are well known to civil engineers, and can be as easily carried out as those for the construction and maintenance of railways, but the public refuses or neglects to intrust the work to them. County commissioners, township supervisors, selectmen, and borough committees are the authorities who control the building and repair of roads, and these generally decide nearly all questions relating thereto, irrespective of the experience of other localities or of the rules of engineering. The method, so extensively prevailing, whereby farmers are allowed to work out their road-tax instead of paying it in money, is perhaps the greatest evil of the present system, and wherever it prevails good roads can never be secured. Under this method the mud of the gutters is annually loosened by the plow, transferred by the scraper to the middle of the street, and spread to a rounded surface without any attempt at compacting or rolling, so that the rains wash it quickly back again to the sides and the condition of the road during a large part of the year is very poor. It is safe to say that in the majority of cases the money spent in such repairs is entirely wasted.

The cost of road improvements in fifty counties of the State of New York during 1892 was \$2,716,000, and this does not include that spent in cities, towns, and villages. This annual sum, if expended in accordance with engineering principles, is sufficient to produce in a few years roads comparable in every respect with those of Europe.

It is one of the gratifying features of the road agitation that State Legislatures are urged to make such laws as will insure that the construction and maintenance of common roads shall be placed in the hands of civil engineers. Every effort spent in securing the passage of such laws tends to the improvement of roads. The building of a common road is easy compared to that of a railway; the principles and methods are given in great detail in engineering literature, and it is by the scientific application of these that the roads of Europe have been brought to such a high degree of perfection.

Location.—A road should be so laid out that its length between the points to be connected is as short as possible, the grades at the same time being such as to allow easy traction for vehicles and also thorough drainage. A slight grade will provide for drainage if proper ditches are constructed. The maximum grade for earth roads should be about 10 per cent.—that is, 10 feet of vertical rise to 100 feet of horizontal distance, while gravel roads may be limited to 7 per cent., and macadam roads to about 4 or 5 per cent. On these grades a horse exerts twice as much force in pulling up the load as on a level.

The width of roads in the U. S. has usually been too great. Sixteen feet is sufficient for the easy passage of two vehicles, and it is better that this width should be kept in good condition than that 30 or 40 feet should be maintained in poor order at greater cost. In the neighborhood of cities widths of 24 or 30 feet are sometimes required. To these widths are to be added those necessary for gutters or ditches, and for sidewalks when such are necessary.

The best transverse form is that of two planes of slight inclination connected by a short curved surface near the middle. It is a common error to make the section too rounding and the inclination of the sides too steep. Many good roads show to the eye but little elevation in the middle, and the harder and smoother the road-covering the less is the elevation required.

Construction.—In order to render the road free from dust and mud and the traction easy to animals some kind of road covering other than the natural soil is usually neces-

are. Gravel is often employed for this purpose, and when properly compacted or rolled into a good foundation it gives an excellent surface. This gravel should consist of angular stones in order that it may form a compact bed. The effect of frost on the road-bed is to be prevented by ditches which are deep enough to drain the subsoil; the longitudinal grain running away from the road.

The system of road-making devised by Macadam in the early part of the nineteenth century has been much used in Great Britain. The road bed is first excavated to a depth of 8 or 10 inches and compacted by rolling. Successive layers of broken stone are then laid and each layer thoroughly compacted. The top layer is generally composed of splintered or angular stones, and this is made thicker at the subsoil than at the surface so as to give the proper transverse form. The stone should be broken into fragments nearly round, and no stone should be used which will not pass through a ring 24 inches in diameter. Macadam's influence greatly improved the condition of roads in Scotland and England, and Parliament awarded him £2,000 in recognition of his services.

The system introduced by Telford is similar to that of Macadam, except that some blocks are set in contact to serve as a foundation for the broken stone. The term "macadam road" is, however, popularly applied to both systems of construction. Fig. 1 is a part of a cross-section of a road, show-



FIG. 1.



FIG. 2.

ing a layer of stone blocks about 6 inches in depth, a layer of broken stones 8 inches deep, and a top layer of binding material 1 or 2 inches thick. The stone blocks are set in close contact, with the widest ends down and rounded. The broken stone is applied in two or three thicknesses, each being thoroughly rolled while macadamized. In Fig. 2 an arrangement of the stone blocks more suitable for soft soils is shown, the upper figure being a section across the road and the lower one a plan. In very soft soils concrete may be used as a foundation.

Road coverings should be of tough and durable materials, and granite dust being the best. Some limestones make good roads, while others are entirely unsuitable, as they give out dust under the action of the traffic. It is important that the road bed should be thoroughly rolled, and for this purpose a steam roller is superior to any drawn machine. A 10 or 12 ton roller appears in general to produce the best results. Each layer should be rolled about four times in order to secure a first-class roadway.

Maintenance.—In Europe there are two methods for keeping road-surfaces in proper order: one of constant repairs by which the dust and mud are daily swept up and removed, while new material is supplied to fill ruts and depressions; and the other of partial repairs by which at short periods solutions of fresh material are made to the road-bed, while the daily work is confined to sweeping and clearing ruts by leveling off the surface. The former system is applicable to roads of light traffic, and the latter to those of heavy traffic. The high price of labor in the U. S. prohibits the system of constant daily repairs, except on city streets and park roads. In addition to renewal of the road surface, the ditches and drains are to be kept open and the refuse carried away. The cost of maintenance of a macadamized road is usually about the same as the interest on the cost of construction.

The cost of the construction of macadam road-surfaces ranges from 50 cents to \$1.50 per square yard of surface, or from \$5,000 to \$20,000 per mile, depending upon width of road, depth of the stone, and character of the foundation. Such roads are well adapted to streets of light traffic in cities and villages. In the article Pavements are given statistics of cities and towns in 1894; those some cities reported in 1893 were 1,483 miles of macadam and telford roads. The advantages and economy of these systems for common roads were shown last year as rapidly being built in the western part of the U. S. An order, however, that they may be kept

in the best order, very heavy loads should not be allowed to pass over them, unless on wide lines.

In 1891 a committee of the citizens of Philadelphia offered prizes for the best papers on the making and care of common roads. The prize papers were published under the auspices of the University of Pennsylvania, under the title *A Move for Better Roads*, and the adjudicators also expressed the following recommendations in relation to the subject: (1) That in the improvement of roads the macadam system, consisting of small angular fragments, in sizes not exceeding from 2 to 24 inches in their longest dimension, according to quality, should be used, whenever a stone surface is both practical and justifiable; (2) that the minimum width of the finished surface for a single track should be 34 feet, of such depth as the amount of traffic and character of the subsoil may require, to be determined by the engineer in charge; (3) that the bed to receive the stone must be so prepared that it can not be saturated with water, and to accomplish this great attention should be paid to the character and drainage of the subsoil; (4) that there should be legislative enactment regulating the width of the tires of wheels, and that the minimum width for all cart, dray-wagon, or other heavy-drawn vehicles should be 4 inches, to be increased, when the capacity of the vehicle exceeds half a ton per wheel, at the rate of 1 inch for each 400 lb.

References.—The literature of the subject is very extensive, particularly that in periodicals. Macadam's essays on road-making were published in London from 1826 to 1828, and then collected in a book which passed through many editions. Gillespie's *Manual of Road-making*, one of the earliest American books, was first issued in 1843, and revised in 1871. See also Gillespie's *Roads, Streets, and Pavements* (1876); Herbold and North's *Road-making and Maintenance* (1879); and Berra's *Highway Construction* (1892). Special reports from U. S. consuls concerning the roads of Europe will be found in a volume issued by the Department of State in 1891 under the title *Streets and Highways in Foreign Countries*. A monthly magazine of a popular character, called *Good Roads*, is published in New York. An organization called the National League for Good Roads has issued literature of a useful character, and in 1893 it exhibited several short pieces of road at the Columbian Exposition at Chicago, illustrating methods of construction. See also Pavements, MASONRY MONUMENTS.

Roanne, rô-an': town; in the department of Loire, France; 52 miles by rail N. W. of Lyons; on the Loire, which here becomes navigable and is crossed by a stone bridge (see map of France, ref. 6-G). It is a handsome town; has some manufactures of cotton, muslins, jewelry, and paper, and has considerable importance as an intermediate station of the traffic between Southern and Northern France. Pop. (1891) 31,980.

Roanoke: city (formerly the town of Big Lick, incorporated as a city in 1884); Roanoke co., Va.; on the Roanoke river, and the Norfolk and Western Railroad; 7 miles E. of Salem, the county-seat, 90 miles W. S. W. of Richmond (for location, see map of Virginia, ref. 6-E). It is in an agricultural and iron-mining region, at an elevation of 950 feet above sea-level, and is surrounded on all sides by mountains. The city has improved systems of water-works and sewerage, gas and electric light plants, and a street-railway system connecting it with Vinton on the E. and Salem on the W. There are 14 churches, 4 public-school buildings, public-school property valued at over \$300,000, 5 large and several small hotels, 8 national banks with combined capital of \$300,000, a State bank with capital of \$250,000, an incorporated bank with capital of \$200,000, a trust and deposit company with capital of \$50,000, 5 building and loan associations, and 3 daily and 5 weekly periodicals. The assessed valuations in 1894 aggregate \$10,987,741, and the net debt in 1894 was \$758,500. The industrial establishments include locomotive-works, railway-car shops, iron and steel works, bridge-works, foundries and machine-shops, hydraulic-engine works, ice, canning and preserving, and paper-lux factories, brick-works, and elevator-factory. Pop. (1880) Big Lick town, 669; (1890) city, 16,159.

Roanoke College: an institution at Salem, Va.; chartered by the Legislature in the year 1853. It is governed by a self-perpetuating board of trustees. It has enrolled about 2,000 students, and a majority of its graduates (among whom have been included several Choctaw Indians) become ministers and teachers. There were 170 students in attendance

from eighteen States and Territories and four foreign countries in 1894-95. The college offers a four years' course, with electives. The grounds embrace about 20 acres. There are four brick buildings for college purposes. One of these is set apart for the library, which contains 17,000 volumes. An annex to this building was erected in 1894 for a reference library and reading-room. The mineralogical and geological cabinets contain about 14,000 specimens, and there is also a valuable numismatic collection. Two literary societies and a Y. M. C. A. are maintained. **JULIUS D. DREHER.**

Roanoke River: a stream formed by the union of the Dan and Staunton rivers at Clarksville, Va. It flows 250 miles in an E. S. E. course into Albemarle Sound near Plymouth, N. C. It is a tidal stream to Halifax Falls, N. C., 75 miles from its mouth, and is navigable 75 miles farther to Weldon by steamboats, and throughout its course by bateaux. Its valley is picturesque and fertile.

Roaring: the noise made by some horses while drawing in the breath, especially while traveling fast. It is caused by a kind of wasting disease of the muscles of the larynx, and is incurable. Nevertheless, some of the best horses, like the great Eclipse, have been confirmed roarsers. In England tracheotomy and the continued use of the tracheotomy-tube have been successfully employed for its relief.

Roasting: See **COOKERY**; also **METALLURGY**.

Roatan: See **RUATAN**.

Robbery [from O. Fr. *roberie*, deriv. of *rober*, rob : Ital. *rubare*, from O. H. Germ. *raubōn* > Mod. Germ. *rauben*, plunder, rob]: larceny from the person of another by violence or putting him in fear. The force or fear must precede or accompany the larceny. Hence it is not robbery to snatch from the hand of another and carry away his purse, or stealthily to take it from his pocket and then frighten him from retaking it. On the other hand, if the article taken is so attached to the person that violence is necessary to detach it, as where a watch-cord is broken in taking a watch, or where an earring is torn from the ear, or if the owner surrenders the property because put in fear by the taker, robbery is committed. The fear need not be of injury to the body of the person robbed. Fear of injury to that which he has a right to defend by force, as his child or his property, will suffice. It has been held that a threat to injure another's character in order to induce him to surrender his property is a sufficient putting in fear. Other decisions hold that the threat of injury to character must consist in charging the victim with unnatural crime. *Britt vs. State*, 7 Humphrey (Tenn.) 45.

The courts have given to "the person" an extended meaning in the definition of robbery. Whenever the stolen property is so in the possession or under the control of an individual that violence or putting in fear is the means used by the thief to secure it, the taking is from the person. Accordingly, a thief commits robbery when he binds the owner in one room of his house and frightens him into telling where property is to be found in another part of the building. *State vs. Calhoun*, 72 Iowa 432.

Robbery was a capital felony at common law. It is punishable in Great Britain by penal servitude. In many of the U. S. it has been defined by statute and divided into degrees, punishable by imprisonment for periods of varying length. See **LARCENY**. **FRANCIS M. BURDICK.**

Robbia, LUCA, della: sculptor; b. in Florence, Italy, about 1399; at first a goldsmith, he soon devoted himself to larger work in bronze and marble. At the age of fifteen he went to Rimini, where he sculptured some fine bas-reliefs for the tomb of the wife of Sigismund Malatesta. Being recalled to Florence by an order to do work for Santa Maria del Fiore, he executed six compositions for the campanile. At the age of seventeen he was further commissioned to design the marble ornament of one of the organs of the cathedral, having Donatello in competition with him. Luca's design was considered the finer, although neither was executed; but the bronze door of the sacristy beneath this organ was intrusted to him, for which he modeled ten figures and many lovely heads and other ornaments. After these works he gave up bronze and modeled in clay, having discovered a glaze that protected his work from atmospheric injury. The first of his decorations in this medium are in Santa Maria del Fiore, in the arch over his own bronze door, as well as over the arch of the sacristy, as also a *Resurrection* of marvelous beauty, now in the Academy of Fine Arts in Florence. Luca afterward found out how to give color to his ware. His

first experiment in the colored glaze was in Or San Michele, and this reminds one of maiolica in its brilliancy. The fame of this new decorative work soon spread through Italy and over Europe, and his orders were innumerable—both for large panels for the inner decoration of churches as well as for outer walls above doorways, etc. His works abound in Tuscany. His brothers Ottaviano and Agostino, who were his pupils, helped him in the production of these works, and continued them after his death (in 1482). **ANDREA DELLA ROBBIA**, nephew of the famous Luca and son of his brother Mark, was born in Florence about 1436. He showed great artistic capabilities from an early age. After having shown his skill in the marble decorations of the chapel of Santa Maria delle Grazie, outside Arezzo, he devoted himself to producing colored reliefs in terra-cotta for Santa Maria delle Grazie, for the Cathedral of Arezzo, and for the loggia of the Hospital of the Innocents in Florence, besides much other work. He died in 1525.—His sons, GIOVANNI, LUCA, and GIROLAMO, also worked in their father's manner. Although the elder Luca, as the founder of the art, enjoys a special prestige among the Robbias, Andrea undoubtedly was the most talented. **W. J. STILLMAN.**

Robbins, CHANDLER, D. D.: clergyman; b. at Lynn, Mass., Feb. 14, 1810; graduated at Harvard 1829, and became pastor of the Second church (Unitarian) at Boston 1833, which position he long retained. He was the author of many addresses, sermons, and occasional publications; of a *History of the Second Church* (1852); of *Memoirs of Maria E. Clapp* (1858) and William Appleton (1863); and one of the editors of the *Proceedings of the Massachusetts Historical Society*, of which he was an active member. D. at Weston, Mass., Sept. 11, 1882. For biographical sketch, see Rev. O. B. Frothingham's *Boston Unitarianism* (1890).

Revised by J. W. CHADWICK.

Robert I. (King of Scotland): See **BRUCE, ROBERT**.

Robert II.: King of Scotland; founder of the Stuart dynasty; b. in Scotland, Mar. 2, 1316; son of Lord Walter Stewart, by Marjory, daughter of Robert Bruce; fought at the battle of Halidon Hill (1333); became joint regent with the Earl of Murray 1334, and sole regent 1338-41, during the minority and absence in France of his uncle, King David II.; was again regent with the Earl of March from the capture of the king at the battle of Nevill's Cross Oct., 1346-57; opposed a successful resistance to the project of imposing Lionel, Duke of Clarence, upon Scotland as king, and renewed his oath of fealty to David II. 1363; was imprisoned 1363-69; declared king after the death of David Feb., 1371; was crowned at Scone Mar. 26, 1371; conducted two wars with Richard II. of England, in the second of which the successful forays of Richard II. and the Duke of Lancaster into Scotland took place. These were avenged in 1388 by a successful invasion of England by two armies, one of which, commanded by James, Earl of Douglas, fought and won the celebrated battle of Otterburn (or Chevy Chase) July 21, 1388, but lost its leader. The kingdom suffered much from the border wars and from the disorders of the turbulent barons. D. at Dundonald Castle, May 13, 1390.

Revised by F. M. COLBY.

Robert III.: King of Scotland; son of Robert II. by his first wife, Elizabeth Mure of Rowallan; b. in Scotland about 1340; was first known as John Stuart, Earl of Carrick; succeeded to the throne in 1390; renewed the war with England 1399; was an imbecile ruler and left the administration in the hands of his ambitious and unscrupulous brother, Robert Stuart, Earl of Menteith, by whom the heir to the throne, David, Duke of Rothesay, was imprisoned and starved to death in Falkland Castle 1402. In 1400 occurred the invasion of Scotland by Henry IV. of England and the retaliatory expedition of the Scots resulted in their terrible defeat at Homildon Hill 1402. Robert sent his surviving son, Prince James, to France for safety against the designs of Menteith, and became the victim of incurable melancholy on learning the imprisonment of his son by the English, May, 1405. D. at Rothesay, Bute, in 1406.

Robert II., surnamed **THE DEVIL**: Duke of Normandy; son of Richard the Good; succeeded his brother Richard in 1028. He humiliated his vassals and kept order in his realm; conquered districts from his neighbors and regulated his frontiers; supported Count Baldwin IV. of Flanders against his sons, King Henry I. of France against his mother, and his nephews, Alfred and Edward of England, against Canute of Denmark; made Normandy the most powerful state in

France; and was the very image of mediæval energy, activity, unscrupulousness and cruelty. From the height of its career its leadership fell into melancholy. Its repaired walls with a magnificent retainer; thence he went next out to Constantinople with a more modest train; and from Constantinople he journeyed on first to Jerusalem. At the Sea of Galilee he found consolation, but on his return to Antioch, at Sidon, July 3, 1883. His only child, born to him by a mistress, was William the Conqueror, who succeeded him. The text of the famous opera by Meyerbeer, *Robert le Diable*, is based on a romance of 1480, and has very little to do with history.

Robert, of Basel, JAMES LIEBOWITZ, painter; b. in the village of Neuchâtel, Switzerland, May 14, 1794. He studied in Paris with Charles Gérard, a Swiss painter, and partly with J. C. David, and gained a prize for engraving when barely twenty years of age. In 1818 he was able, with the help of a friend, to visit Italy, where he worked and studied for some time, and spent much of his life thereafter. His peculiar gift to nature was graceful composition, grouping of figures, together with a picturesque eye, and he found among the scenery of Central Italy and the brigands who had been captured by the authorities the material which he used. He executed many pictures from 1827 to 1836, many of them made popular by engraving; and his reputation was very high in France under Louis Philippe. His work is not very important in the purely artistic sense, as his color is cold and his painting not skillful, but will always be popular. He by his own hand in consequence of disappointment in love, at Venice, Mar. 29, 1835. At the Louvre his pictures *Robbers of the Piramides* and *the Madonna in Egypt*, *St. Romanus*, *Descent from the Cross*, and the well-known *Robbers of the Desert* were exhibited in 1834 and the colors of the *Adoration* in 1836, those marking the beginning and the end of his brief and brilliant career.

ROBERT, ROBERTS.

Robert College, an institution of learning at Constantinople, Turkey, founded by James H. and William H. Briggs, sons of Rev. Harrison G. O. Briggs, a veteran missionary in Turkey, and opened in 1863, under the control of Rev. Dr. Robert, a wealthy philanthropist of New York who made arrangements with his friend Rev. Cyrus Smith, D. D., of Constantinople, to take charge of the college as its first president. Mr. Robert supported the college until his death in 1879, when he bequeathed to it one-fifth of his estate. His total benefactions to it were about \$450,000. The institution was opened in a rented building. In 1864 it was incorporated in the State of New York as one of the colleges of the University of New York. Under presidency of the college, granted in 1869, the two main buildings were erected in 1871 and 1880 respectively, on a fine site in the Bosphorus. After fourteen years of service Dr. Robert resigned in 1877, and was succeeded by Rev. George K. Burgess, D. D. The curriculum corresponds generally to that of a New England college, though special attention is paid to the languages, no fewer than thirteen being taught. Its chief language of instruction is the English. There is a preparatory course of two years, and a collegiate four-year course of five years, both including instruction in the languages of the students. From 1863 to 1880, inclusive, the total number of students by years was 5,149; of alumni students, 1,710; of graduates, 574. The college has already attained a most honorable standing, and has become a national, if not of international, importance.

WILLIAM B. DWIGHT.

Robert Fleury, *etbasé*, JOSEPH NICOLAS, historian and genre painter; b. at Cologne, of French parents, Dec. 8, 1797; pupil of Oudet, Baron Gros, and Horace Vernet; second-class medal, Salon, 1824, first-class 1834, and Salon, Paris Exposition, 1855 and 1867; commander Legion of Honor 1867; member of the Institute 1850; director of the French Academy in Rome 1864. In 1834 he exhibited in Paris his *Museum of St. Bartholomew*, which has since gained him a high reputation. His *Conference at Compiegne* (1840), *Jane Shore* (1850), and *Sack of a New House* (1856) are in the Luxembourg Gallery, Paris. Some works are in the museums at Versailles, Nantes, Rouen, and Antwerp. D. in Paris in 1890.

WILLIAM A. COFFIN.

Robert Fleury, TOKI, historical genre, and portrait painter; b. in Paris, France, Sept. 10, 1858; son of Joseph Louis Fleury; pupil of Paul Delacroix and Léon

Cogniet; medals, Salons, 1884 and 1887; medal of honor, Salon, 1879; first-class medals, Paris Exposition, 1875 and 1889; officer Legion of Honor 1884. His *Last Day of Carthage* (1877) is in the Luxembourg Gallery, Paris. Studio in Paris. W. A. C.

Robert Gilsard: See GILSGARD, ROBERT.

Robert of Gloucester: a chronicle of English annals, of whose life nothing is known except that he was living at the time of the battle of Evesham (1066). His metrical chronicle of England from the time of the fabulous first to his own times was chiefly based upon Geoffrey of Monmouth's work. It extends to 10,000 lines, and is valuable as one of the earliest specimens of the English language. It was printed by Thomas Hoare (1724), and reprinted 1810.

Roberts, RICHARD TITUS, A. M.: general superintendent Free Methodist Church; b. at Leno, Cataraugus co., N. Y., in 1831; graduated at Wesleyan University in 1846; was a member of General Conference, Methodist Episcopal Church, 1849-58; general superintendent of Free Methodist Church 1860-63; founder (1865) and president (1869-70) of A. M. Chebrough Seminary, North Chili, N. Y.; published *Prayers of Men* (1878); *Why Another Sect?* (1879); *First Lessons on Money* (1886); *Ordaining Women* (1891). Founder (1890) and editor (1890-99) of *The Earnest Christian* (monthly), and editor of *The Free Methodist* (weekly) 1898-99. D. Feb. 27, 1899. A. Osmun.

Roberts, DAVID, B. A.: painter; b. at Stockbridge, Scotland, Oct. 24, 1796. He was educated as a decorative painter, and became a theatrical scene-painter; but was much attracted by the picturesque in architecture, and, after studying English buildings of the Middle Ages, went to France in 1824. In 1826 he exhibited his *Roman Cathedral*, which was the beginning of his career as a painter of romantic landscape. In 1831 he was engaged in the founding of the Society of British Artists, and became its first president. In 1832 he visited Spain, and made many drawings afterward published in lithography. About 1836 he went to Palestine, and thence to Egypt; his pictures painted at this time, either in the East or after his return, and from studies made in the East, are the best of his work. In 1841 he was elected a Royal Academician. In 1851 he visited Italy, and his pictures for several years thereafter were of Italian subjects. In his old age he took the London water-side as his field of study, and painted picturesque views of the town as seen from the Thames. His work never attained any special value as landscape in the artistic sense, and lost less by rendering in lithography than most drawing or painting from nature would lose. Spirited and popular treatment of ruined buildings, Gothic cathedrals, men in unfamiliar costume, and the like, were his favorite themes. D. in London, Nov. 25, 1864. He published *Picturesque Sketches in Spain* (1837); *The Holy Land and Syria* (finished in 1840, 4 large vols.); *Italy: Classical, Historical, and Picturesque* (1859). Of his pictures, those of his middle life and strongest period are *Church of the Holy Nativity at Bethlehem*, the *Statue of Memnon at Sunrise*, the *Ruins of Philæ*, the *Gateway of the Temple at Jerusalem*. In the National Gallery in London are his *Church of St. Paul, Antwerp*, and the *Cathedral of Burgos*. Recent Subjects.

Roberts, ELIAS BECKY, LL. D.: journalist; b. at Utica, N. Y., Sept. 30, 1827; learned the printing trade; graduated at Yale College 1850; became in 1851 editor and proprietor of the *Utica Morning Herald*, an influential newspaper of Whig and subsequently of Republican principles; was a member of the presidential conventions of 1864 and 1868, of the State Legislature 1867, and of Congress 1871-75; was assistant treasurer U. S. at New York 1889-94; is president of Franklin National Bank, New York. He published *Government Revenue* (Boston, 1894) and *The Planting and Growth of the Empire State*, American Commonwealth Series (2 vols., Boston, 1897).

Roberts, ROBERT HENRICH, D. D.: bishop of the Methodist Episcopal Church; b. in Frederick co., Md., Aug. 2, 1776; emigrated with his father's family in 1783 to Logansport Valley, Western Pennsylvania, then the frontier of that State, where he was found "in the woods" by the earliest Methodist itinerants, "a stalwart youth in hunting-shirt of tow linen, buckskin breeches, and moccasin shoes." They supplied him with Methodist books, licensed him to exhort in 1800, and to preach in 1802. In the latter year he joined the Baltimore Conference, which then stretched over the Alleghenies. After itinerating in West Virginia and Penn-

sylvania, he was appointed to important churches in Baltimore, Philadelphia, etc., and in 1816 was elected bishop. He immediately returned to Western Pennsylvania and thence removed to Indiana, then the far West. He did much for Western missions, and the Indians called him "the grandfather of all the missionaries." D. in Lawrence co., Ind., Mar. 26, 1843. Revised by A. OSBORN.

Roberts, Sir WILLIAM, M. D., F. R. S.: clinician; b. in Anglesea, Wales, Mar. 18, 1830; graduated M. D. London University 1854; was physician to the Manchester Royal Infirmary 1855 to 1886, and Professor of Clinical Medicine at the Victoria University from 1876 to 1886. He practiced his profession in Manchester from 1885 to 1889, removing to London in the latter year. His more important publications are *A Practical Treatise on Urinary and Renal Diseases* (London, 1865; 4th ed. 1885); *Lectures on Dietetics and Dyspepsia* (London, 1885; 2d ed. 1886); *On the Chemistry and Therapeutics of Uric Acid, Gravel, and Gout* (London, 1892). S. T. ARMSTRONG.

Roberts, WILLIAM CHARLES, D. D., LL. D.: minister, educator, and secretary; b. at Galltmai, Cardiganshire, South Wales, Sept. 23, 1832; educated at Princeton College and Theological Seminary; was pastor of the First Presbyterian church, Wilmington, Del., 1858-61; of the First Presbyterian church, Columbus, O., 1861-64; copastor in the Second church, Elizabeth, N. J., 1864-66; pastor of the Westminster church, organized from the Second church under his leadership, 1868-80; corresponding secretary of the board of home missions 1880-86; president of Lake Forest University 1886-92; and was reappointed corresponding secretary of the board of home missions in 1892. Dr. Roberts was chairman of the committee that established Wooster University, Ohio; member of the first Pan-Presbyterian council, Edinburgh, 1877, and of the third, Belfast, 1884, where he read a paper on American colleges; moderator of the General Assembly, New York, 1889, and a member of the committee for the revision of the Confession of Faith. He is the author of a series of letters on the great preachers of Wales, the translator of the *Shorter Catechism* into Welsh, and has published occasional sermons. C. K. HOYT.

Roberts, WILLIAM HENRY, D. D., LL. D.: minister and professor; b. at Holyhead, Wales, Jan. 3, 1844; was educated at the College of the City of New York and Princeton Theological Seminary; statistical clerk in the U. S. Treasury Department 1863-65; assistant librarian of Congress 1866-72; pastor at Cranford, N. J., 1873-77; librarian of Princeton Theological Seminary 1877-86; Professor of Practical Theology in Lane Seminary 1886-93; permanent clerk of the General Assembly 1880-84, and since 1884 has been stated clerk of the same body. Dr. Roberts was elected American secretary of the Pan-Presbyterian council, London, 1888. He helped prepare the general catalogue of Princeton Theological Seminary 1881, and the catalogue of the library in the same institution 1886. He has published *Inaugural Address*, Lane Seminary (1886); *History of the Presbyterian Church in the United States of America* (1888); *Ecclesiastical Status of Theological Seminaries* (1892); sermons and magazine articles. C. K. HOYT.

Roberts of Kandahar, FREDERICK SLEIGH ROBERTS, Baron: British general; b. in Cawnpur, India, Sept. 30, 1832; educated at Eton, Sandhurst, and Addiscombe; entered the Bengal artillery 1851; promoted through various grades to that of lieutenant-general 1883; served with great distinction in the Indian mutiny campaign, the Abyssinian campaign, and the Afghan campaigns; commander-in-chief in India 1885-93. His most noted exploit is the relief of Kandahar in the summer of 1880. He was created a baronet in 1881, and Baron Roberts of Kandahar, Jan., 1892. The soldiers nicknamed him Bobs Bahadur, the latter word meaning hero or champion. C. H. T.

Robertson, FREDERICK WILLIAM: clergyman; b. in London, England, Feb. 3, 1816; abandoned the plan he had formed of entering the army; entered Brasenose College, Oxford, 1837, and graduated 1840; was settled in Winchester 1840-42, in Cheltenham 1842-47, in Oxford 1847, going that year to Brighton, where he died Aug. 15, 1853. Of his works, there have been published *Sermons preached at Trinity Chapel, Brighton* (five series, London, 1855-64); *Lectures and Addresses on Literary and Social Topics* (1858); *Expository Lectures on St. Paul's Epistles to the Corinthians* (1859); and *Notes on Genesis* (1877). His fame was posthumous, but it is permanent. His writings and biography were reprinted in the U. S. and widely read. He was one of

the greatest and most inspiring of modern preachers, and has exerted great influence in liberalizing religious thought. He was, however, more a preacher than a theologian, and he left little in systematic form. He is usually, although perhaps erroneously, classed with Maurice and Stanley as a founder of the modern Broad Church party in the Church of England. See his *Life and Letters*, edited by Stopford A. Brooke (2 vols., 1865).

Robertson, GEORGE CROOM: educator and metaphysician; b. at Aberdeen, Scotland, Mar. 10, 1842; educated at Aberdeen, Berlin, and Göttingen Universities; became Assistant Professor in Greek at Aberdeen in 1864; Professor of Philosophy in University College, London, 1866-92; was editor of *Mind* 1876-91. D. in London, Sept. 21, 1892. His principal writings are *Hobbes*, in Blackwood's *Philosophical Classics* (1886), and several articles in *Encyclopædia Britannica* (9th ed.) and in the *Dictionary of National Biography*. He aided Alexander Bain in editing Grote's posthumous work on *Aristotle* (1872). See *Philosophical Remains of George Croom Robertson*, with a brief memoir, edited by Alexander Bain. J. MARK BALDWIN.

Robertson, JAMES: royal governor of New York; b. in Fifeshire, Scotland, about 1710; served as deputy quartermaster-general in the campaigns against Louisbourg and Ticonderoga 1758-59; was appointed lieutenant-colonel of the Fifty-fifth Regiment; exchanged into the Sixteenth; was stationed at New York as barrack-master 1763-75; became notorious for his extortions and speculations; was appointed colonel 1772; went to Boston July, 1775; was appointed major-general Jan. 1, 1776; commanded a brigade in the battle of Long Island; went to England 1777; was appointed royal governor of New York 1779; took the oath of office Mar. 23, 1780; exerted himself with Gen. Greene to procure the exchange of Maj. André; became lieutenant-general Nov. 20, 1782; d. in England Mar. 4, 1788.

Robertson, JAMES, D. D.: minister and professor; b. at Alyth, Perthshire, Scotland, Mar. 2, 1840; educated at the Universities of Aberdeen and St. Andrews; missionary in Hasskeni, Constantinople, 1862-64; in Beyrout, Syria, 1864-75; minister of Mayfield church, Edinburgh, 1876-77; since 1877 Professor of Oriental Languages in the University of Glasgow. Dr. Robertson has published many articles on Eastern topics in various magazines; translated and edited *Müller's Outline of Hebrew Syntax* (Glasgow, 1882; three subsequent editions); published *Introduction to the Pentateuch* in *Virtue's New Illustrated Bible*, republished in *Book by Book* (London, 1892); *The Early Religion of Israel*, Baird lectures, 1889 (Edinburgh, 1892; three later editions); *The Old Testament and its Contents*, in *Guild and Bible Class Text-books* (Edinburgh, 1893); and *The Psalms: their Place in the History and Religion of Israel*, Croall lectures, 1894 (Edinburgh, 1895). C. K. HOYT.

Robertson, THOMAS WILLIAM: actor and dramatist; b. in England, Jan. 9, 1829; became an actor in a traveling company of which his father was manager; produced a play, *A Night's Adventure*, in 1851; settled at London and devoted himself to literature 1860, and wrote several very successful dramas, including *David Garrick* (1864); *Society* (1865); *Ours* (1866); *Caste and Play* (1868); *School* (1869); *M. P.* (1870); and *Dreams* (1869). D. in London, Feb. 3, 1871. See his *Principal Dramatic Works* (2 vols., London, 1889).

Robertson, WILLIAM, D. D.: historian; b. at Borthwick, near Edinburgh, Scotland, Sept. 19, 1721; graduated at the University of Edinburgh 1741; became a minister of the Scottish Church at Gladsmuir 1743; joint minister of Greyfriars church, Edinburgh, 1759; principal of the University of Edinburgh 1762, and was appointed historiographer of Scotland 1764. D. at Grange House, near Edinburgh, June 11, 1793. Author of a *History of Scotland during the Reigns of Mary and James VI.* (3 vols., 1758-59); *History of the Reign of the Emperor Charles V.* (3 vols., 1769); a *History of America* (2 vols., 1777); and an *Historical Disquisition concerning the Knowledge which the Ancients had of India* (1791). During his lifetime and long afterward his name was ranked with those of Gibbon and Hume, and his complete *Works* have been often reprinted, but are now little read. His *Life* was written by Dugald Stewart (1801) and by Lord Brougham, who was a family connection.

Robespierre, rō'bes-pi-ār', MAXIMILIEN MARIE ISIDORE: revolutionist; b. at Arras, France, May 6, 1758. Losing his

born at an early age, he was brought up by his maternal grandfather. He showed unusual promise, and took high honours at school, and at the Collège Louis le Grand in Paris, where he studied with George Danton. Admitted to the bar in 1791, he was soon advanced to the rank of criminal justice, but resigned on account of his reluctance to prosecute criminals of death. He was a devoted student of Rousseau, whose sentimentalism made a great impression upon him. He drew on the subject for the guild of soldiers in France, and was sent as a delegate of the first class to the Constituent Assembly in 1790. His earnestness soon commanded attention, and enabled him to exert a powerful influence not only in the Assembly but in the Jacobin Club. Early in 1791 he urged and carried a motion to prevent any member of the Constituent Assembly from being eligible for the next year to prevent any deputy from taking office for the next four years. During this session the Government in consequence, the very centre directed by Mirabeau, his own name had been put. He was appointed public secretary, but on the night of the king to Versailles he was overpowered and sent back to the house of a carpenter. The next day a demand was made to defend his life, and finally, at the end of the Constituent Assembly, Sept. 30, 1791, responded to the repeated appeals by saying his home in Gironde. He was the embodiment of sentimentality, his feelings compelling him alternately to peace and war. When the members in the Legislative Assembly advocated war, Robespierre offered the most strenuous opposition in the Jacobin Club. His orations were passionate and inflamed in tone, but they exerted not a little influence. In Apr., 1792, he resigned his office as public prosecutor, and in August he had been nominated the Legislative Assembly for a revolutionary festival and a new national convention. For his services he was elected the first deputy to the new Convention, which opened Sept. 21. The Jacobins were bitterly attacked by the Girondins but Robespierre and Danton rose together and succeeded in gaining the ascendancy. The execution of the king Jan. 20, 1793, still further strengthened the Jacobins, whose triumph became complete Aug. 2. The Committee of Public Safety then took absolute control of affairs. Robespierre was elected member of this committee July 27. His popularity with the mob in Paris, his natural respectability, and his fluent oratory gave him great influence. Standing in the committee midway between the extreme and unprincipled radicals on the one hand and the conservative element on the other, he strengthened his own position by pitting them against one another, and thus contributing to the general destruction that followed. The desperate intrigues of Mar and Apr., 1794, and Barras, Desmoulins, and Danton, as well as their followers, to the scaffold, and left Robespierre in absolute power. He placed his friends in all the prominent Government positions, assumed complete control of the revolutionary tribunals, and ordered that the jury need not listen to a defence if it was otherwise convinced. This infamous provision, sweeping away as it did all guarantees of justice, was perhaps the most characteristic act of the Reign of Terror. The executions from this time till the fall of Robespierre amounted upon thirty a day. The number of his enemies increased with his power. He surrounded himself with a court of the most fantastic trappings of which excited ridicule, and he was all Paris laughing at him by his method of sitting up a new religion. He was to have thirty-six annual festivals, and the first of these he celebrated by walking at the head of a procession, and after a windy harangue setting the people dancing of Vice, Atheism, Selfishness, Annihilation, and Crime. All Paris suddenly awakened to a consciousness that they were ruled by a maniac, as ridiculous as he was cruel. Signs of insubordination showed themselves immediately. Robespierre fought off inevitable danger with desperation. In the Assembly he was assailed by the most violent epithets, and his voice was drowned in the tumult. He broke away from the Convention to appeal to the mob, whenupon the Convention declared him an outlaw. In the midst that crowded his jaw was broken by the shot of a guillotine, and the following day, July 28, 1794, Robespierre, with Saint-Just and twenty others, was carted to the guillotine and the rest of the populace.

Works.—*Author*, *Le Société des Jacobins* (4 vols., 1791); *Travail*, *Parole Robespierre* (3 vols., 1805-67); Hamel, *Robespierre*; *Journal*, *History of the Girondins*; and the *History of the French Revolution* by Thiers, Michelet, Louis Blanc, von Bülow, Stephens, Carlyle, and Taine.

C. K. ADAMS.

Robin (shortened from *Robinson Crusoe* from O. W. Robin, Hindu, of Robert, Robert); the name applied in Great Britain to several well-known stinging-beds of the family *Erythronium*, and improperly given in the U. S. to a species of thistle, the *Potentilla virginiana*. There are fifteen genera of robins in Europe, Western Asia, and Northern Africa, most of them widely spread, resembling each other in their chief characteristics—the short tapering bill, curved at the extremity and partly covered with bristles. They all feed on worms, insects, and fruits, generally live on cultivated grounds, and have but slight fear of man. The best-known species is *Erythronium rubecula*, the robin-redbreast whose song is familiar to every British country household.

Robin, 18140, CHARLES PIERRE; biologist and pathologist; b. at Jasseron, department of Ain, France, June 4, 1821; graduated M. D. in Paris in 1846; devoted himself to the study of normal and pathological anatomy; in 1847 was made Associate Professor of Natural Sciences in the medical faculty; in 1852 was elected to the Academy of Medicine, and in 1856 to the Academy of Sciences; in 1862 he was appointed to the newly established chair of Histology. In 1865 he edited Nysten's *Encyclopédie Médicale de Médecine*, for which he wrote a number of monographs. In 1864 he established the *Journal de l'Anatomie et de la physiologie normales*, which he edited until 1883. In 1878 he was elected senator from Ain and was re-elected in 1894. The progress made in France in histology is entirely due to his teaching. Among his numerous works are *Traité de microscopie* (Paris, 1871); *Anatomie et physiologie cellulaires* (Paris, 1876); *Nouveaux dictionnaires de l'anatomie* (Paris, 1886). D., Oct. 6, 1885. S. T. AMMONSON.

Robin Goodfellow: a famous personage in English folklore; reputed to be a son of Olden, king of the fairies, by a mortal mother; noted for his mischievous tricks, his fondness for disturbing the peace of families, and his power of assuming various shapes, the "shrewd and knavish spirit" whose characteristics are fully given by Shakespeare in a well-known passage of *A Midsummer Night's Dream*. Shakespeare identifies him with the Puck or Hobgoblin, a domestic spirit who answers to the Knecht Ruprecht of Germany and the brownie of Scotch superstition. He is the "ribbier fiend" of Milton's *L'Allegro*, who pinches sluttish maids, but rewards the clean-swept floor and the "cream-bow" dolly set for him, by threshing corn, grinding meal, breaking flax, etc., and sometimes leaves a silver shilling in the good housewife's shoe. (See Keightley's *Fairy Mythology*.) A popular volume entitled *The Mad Pranks and Merry Jests of Robin Goodfellow* appeared in 1628, and was reprinted by the Percy Society 1841. Revised by H. A. BEER.

Robin Hood: See HOOD, ROBIN.

Robins, BENJAMIN; mathematician; b. at Bath, England, in 1707; devoted himself to mathematics, which he taught in London; invented the ballistic pendulum; made experiments on the resisting force of the air to projectiles, and studied fortification in Flanders; became engineer-in-chief to the East India Company 1749; fortified Madras, where he died of fever July 20, 1751. He prepared for the press in the name of Rev. Richard Walter, chaplain of the Centurion, the narrative of Anson's *Voyage around the World* (1748), and was author of *New Principles of Gunnery* (1742), besides other scientific writings.

Robin Snipe: See SNOW.

Robinson: city; capital of Crawford co., Ill.; on the Clero, Cin., Chi. and St. L., and the Ind. and Ill. S. railroads; 25 miles N. N. W. of Vincennes, and 44 miles S. of Paris (for location, see map of Illinois, ref. 8-6). It is in a fruit, corn, and wheat growing region, and has large wood interests, a private bank and three weekly newspapers. Pop. (1880) 1,880; (1890) 1,387.

Robinson, BEVERLY; soldier; b. in Virginia in 1723; was a major under Wolfe at Quebec 1759; married a daughter of Frederick Phillips, thereby coming into possession of immense tracts of land on the Hudson; was opposed to the measures of the British ministry, but was loyal to the Government; removed into New York at the outbreak of the Revolution; recruited and commanded the Loyal American Regiment, of which he was colonel; was concerned in the negotiations preliminary to the treason of Arnold (who at that time occupied Robinson's country-seat); lost his property by confiscation; at the conclusion of the war went to New Brunswick, and then to England; and died at Thornbury in 1792.

Robinson, CHARLES SEYMOUR, D. D., LL. D.: clergyman and hymnologist; b. at Bennington, Vt., Mar. 31, 1829; educated at Williams College and Union and Princeton Seminaries; pastor of the Presbyterian churches—Park, in Troy, N. Y., 1855–60; First, in Brooklyn, 1860–68; of the American chapel in Paris 1868–70; Madison Avenue Presbyterian church, New York, 1870–87; Thirteenth Street 1890–92; since 1892 of the New York Presbyterian church, New York. Dr. Robinson has published *Songs of the Church* (New York, 1862); *Songs of the Sanctuary* (1865); *Songs for Christian Worship* (1866); *Short Studies for Sunday-school Teachers* (1868); *Chapel Songs* (1872); *Bethel and Penuel* (1873); *Church Work* (1878); *Calvary Songs for Sunday-schools* (1875); *Psalms and Hymns* (1875); *Spiritual Songs* (1878); *Studies in the New Testament* (1880); *Spiritual Songs for Social Worship* (1881); *Spiritual Songs for Sunday-schools* (1881); *Studies of Neglected Texts* (1883); *Laudes Domini* (1884); *Sermons in Songs* (1885); *Sabbath Evening Sermons* (1886); *Simon Peter: Early Life and Times* (1887); *The Pharaohs of the Bondage and Exodus* (1887); *Studies in Mark's Gospel* (1888); *Laudes Domini for the Sunday-school* (1888); *Laudes Domini for the Prayer Meeting* (1889); *From Samuel to Solomon* (1889); *Studies in Luke's Gospel* (2 vols., 1889); *New Laudes Domini* (1892); *Annotations upon Popular Hymns* (1893); *Simon Peter: Later Life and Labors* (1894). C. K. HOYT.

Robinson, EDWARD, D. D., LL. D.: biblical scholar; b. at Southington, Conn., Apr. 10, 1794; graduated at Hamilton College 1816; was tutor there 1817–18; remained in Clinton, engaged in classical studies, till the autumn of 1821, when he went to Andover, Mass., to publish an edition of eleven books of the *Iliad* (the first nine, the 18th, and the 22d); was instructor in Hebrew in Andover Seminary 1823–26, under Prof. Stuart, whom he assisted in preparing the second edition (1823) of his *Hebrew Grammar*, publishing meanwhile (1825) his translation of Wahl's *Clavis Philologica Novi Testamenti*; studied in Europe, mostly at Halle and Berlin, 1826–30; in 1828 married, as his second wife, Therese Albertine Luise von Jakob, daughter of a distinguished professor at Halle (see ROBINSON, THERESE); returned to the U. S., and was professor extraordinary at Andover 1830–33; broke down in health, and resided in Boston 1833–37; was professor in Union Theological Seminary, New York, from 1837 till his death Jan. 27, 1863. In 1838, and again in 1852, he traveled in Palestine with Rev. Eli Smith, the learned missionary. Besides the works already mentioned, he published Taylor's *Calmet* (1832); *A Dictionary of the Bible for the use of Schools and Young Persons* (1833); Buttman's *Greek Grammar* (1833; 2d ed. 1839; 3d ed. 1851); Gesenius's *Hebrew Lexicon* (1836; 5th ed. 1854); *Greek and English Lexicon of the New Testament* (1836; 2d ed. 1847); *Greek Harmony of the Gospels* (1845; 2d ed. 1851); *English Harmony of the Gospels* (1846); *Memoir of the Rev. William Robinson* (1859). In 1831 he founded *The Biblical Repository*, which he edited for four years, and in 1843 the *Bibliotheca Sacra*, for which he continued to write till 1855. His greatest work was *Biblical Researches* (1841, 8 vols.; compressed into two, and a third added 1856), for which, in 1842, he received the gold medal of the Royal Geographical Society. He also received the degree of D. D., previously (1831) conferred by Dartmouth College, from the University of Halle in 1842, and that of LL. D. from Yale College in 1844. His *Physical Geography of the Holy Land* was edited by Mrs. Robinson in 1864, and published in 1865. See *The Life, Writings, and Character of Edward Robinson*, by R. D. Hitchcock (New York, 1863).

Robinson, Sir FREDERICK PHILLIPSE: soldier; son of Col. Beverley Robinson; b. on the Phillipse Manor, New York, in Sept., 1763; became an ensign in his father's Loyal American Regiment Feb., 1777; was wounded and taken prisoner at Stony Point; served in the West Indies, and with great distinction under Wellington in the Peninsular war, rising to be general; was commander-in-chief of the British forces in Canada 1812; participated in the campaign on Lake Champlain Sept., 1814; was knighted 1815; was governor of Upper Canada 1815–16; removed to the West Indies, where he commanded the forces; became full general 1841. D. at Brighton, England, Jan. 1, 1852.

Robinson, HENRY CRABB: lawyer and man of letters; b. at Bury St. Edmunds, England, May 13, 1775; was articled to a lawyer at Colchester, and afterward in London; studied several years (1800–05) at Jena and other German universities, where he acquired a very thorough knowledge of mod-

ern German literature and philosophy; enjoyed the intimate friendship of Goethe, Wieland, Schiller, the Schlegels, and other eminent people; furnished data to Madame de Staël for her work on Germany; was correspondent of *The Times* in Spain at the beginning of the Peninsular war 1808–09; was engaged on his return to London as a regular writer for that journal; was called to the bar at the Middle Temple 1813; became a highly successful and prosperous lawyer on the Norfolk circuit, from which he retired with a fortune in 1828, and for the remainder of his life devoted himself to society and literary leisure, being prominently known as the intimate friend of Wordsworth, Blake, Clarkson, Flaxman, Lamb, Coleridge, Southey, and their compeers. He was one of the first members of the Athenæum Club, one of the founders of University College, London, and of the Flaxman Gallery, to which latter institution he left liberal bequests. D. in London, Feb. 5, 1867. He published little, but left a copious *Diary and Correspondence*, from which interesting selections were published in 1869. Revised by H. A. BEERS.

Robinson, JOHN: clergyman; b. in England, probably in Lincolnshire, 1575; entered Cambridge University 1592; pursued his studies in Corpus Christi College, and there became attached to Puritan doctrines; took preliminary orders in the Church of England; obtained a benefice near Great Yarmouth, Norfolk; was suspended by the bishop for non-conformity in ecclesiastical ceremonies 1602; gathered an Independent congregation at Norwich; formally separated from the Church of England 1604; resigned his fellowship at Cambridge; became assistant, and soon after sole, pastor of a Dissenting congregation (1604) gathered at Scrooby, Nottinghamshire (near the borders of Yorkshire and Lincolnshire), where the Brewsters, Bradfords, and Mortons were among his flock; suffered a persecution which led many of his congregation to emigrate with him to Amsterdam, Holland, 1608; removed to Leyden 1609; gathered there a numerous church, constantly re-enforced by arrivals from England; attended lectures at the university, of which he afterward became a member; held a public discussion with the Dutch professor Episcopius, the successor of Arminius, upon the Calvinistic doctrine of predestination, 1613; entered into the plans for colonization in New England about 1617; was active in promoting the negotiations, through Cushman, Carver, and Brewster, with the Plymouth Company of capitalists; dismissed a portion of his congregation with a memorable sermon on their embarkation for America July 22, 1620, intending to follow them the next year; but before the negotiations were completed he died at Leyden about Mar. 1, 1625. He was buried in St. Peter's church, the members of the university and the ministers of the city attending his funeral. Among his numerous controversial publications were *A Justification of Separation* (1610); *Of Religious Communion* (1614); *Apologia Justa et Necessaria* (1619); *A Defense of the Doctrine propounded by the Synod of Dort* (1624); *Essays or Observations, Divine or Moral* (1628); *A Treatise of the Lawfulness of Hearing of the Ministers in the Church of England* (1634); and *An Apology for Certain Christians no less conterminously than commonly called Brownists or Barrowists*. His complete Works, with a memoir, appeared in London and Boston in 3 vols., 1851. In 1891 a bronze tablet to his memory, placed on an outer wall of St. Peter's, was dedicated by representatives of the National Council of the Congregational Churches of the U. S. Revised by G. P. FISHER.

Robinson, JOHN CLEVELAND: soldier; b. at Binghamton, N. Y., Apr. 10, 1817; entered the U. S. Military Academy 1835, but without graduating began the study of law in 1838. In 1839, however, he accepted a second lieutenancy in the Fifth Infantry, and served in the war with Mexico and in Florida against the Indians. In Sept., 1861, he was appointed colonel of the First Michigan Volunteers, and in Apr., 1862, brigadier-general of volunteers, serving in command of a brigade with the Army of the Potomac in the Virginia peninsular campaign of 1862, at the second battle of Bull Run, Chantilly, and Fredericksburg. At Gettysburg and in the Richmond campaign of 1864 he commanded a division with great bravery, losing a leg on the fourth day of fighting in the latter campaign, near Spottsylvania Courthouse, while leading the advance of the army; was appointed brevet brigadier-general and major-general for gallantry. In 1866 he attained the colonelcy of the Forty-third Infantry, and in 1869 was retired from active service on the full rank of major-general. In 1872 he was elected Lieutenant-Governor of the State of New York, and in 1894

received from the Secretary of War a medal of honor for distinguished gallantry in action near Spottsylvania Court House.

Robinson, Charles, D. D., Governor of New York, b. at Westham, Conn., Dec. 4, 1810; educated at the academy at Andover, studied law, and was admitted to practice in 1832; appointed master in chancery in 1842, and reappointed in 1845; joined the Republican party on its formation; elected to Legislature in 1858, and appointed member of the state in 1861, and again in 1863; nominated for the Governor in 1863 to the same office, but was defeated; was a member of constitutional commission 1871-72; elected comptroller of the state on the Democratic ticket in 1873, and Governor in 1876; nominated for Governor of New York by the Democrats in 1879, but was not elected, b. at, *Illustr. N. Y.*, Nov. 20, 1891.

Robinson, Robert, preacher, b. at Swaffham, Norfolk, England, Oct. 1723; studied in the grammar school at Swaffham; was appointed in his fifteenth year to a London (Lancashire) Independent preaching at a Calvinistic Methodist (Unitarian) house; became a Baptist and formed a congregation at Swaffham, where he had small success by selling grain and wool; applied himself to the study of languages; acquired a deservedly high reputation for eloquence, wit, goodness, and liberality; during the twenty-fourth of the third, and a translation of *Scott's Sermons* (5 vols., 1776-84); published a *Plan for the University of our Lord Jesus Christ* (1780), popular hymns and tracts, and left a *History of Swaffham* (1790), posthumously published. D. in Swaffham, June 8, 1793. He was said to have become a Methodist (i. e., Unitarian) in his later years. His *Life*, by George Prier (1796), is a valuable work.

Revised by W. H. Whitney.

Robinson, Therese Alexandrine Louise (née Jakob), author; daughter of Prof. Ludwig H. van Jakob; b. at Halle, Prussia, Jan. 20, 1807; translated *Scott's Old Mortality* and *David Copperfield* (1825); published *Psyche, Original Fables* (1834), under the pseudonym of *Taty* (the female of her animal), and *German Songs* (2 vols., 1825-26); married Prof. Edward Robinson 1825 (see Robinson, Edward); contributed largely to *The Biblical Repository*, edited by her husband; published in Germany *Characteristics of the Popular Songs of the German Nations* (1840) and a volume on *The Authenticity of the Poems of Ossian* (1840). In 1840 appeared her chief work (in English), *An Historical View of the Languages and Literature of the Slavic Nations* (New York and London). D. in Hamburg, Apr. 25, 1860. A posthumous work appeared under the title *Three Years, a Picture from the Last Century* (New York, 1870).

Robinson, Cyrus. See **ENGLISH LITERATURE (Debut)**.

Robitaille, Adolphe, Frenchman; senator; b. at Varennes, Jura, Dec. 20, 1834; graduated M. D. at McGill College in 1858. He represented Bonapartists in the Canadian Assembly 1861-67; the same constituency in the Parliament of the Dominion 1867-71; and was recorder-general from Jan. 22, 1872, until Nov. 5, same year, when he resigned with the other members of the cabinet, on the Pacific Railway matter. He was Lieutenant-Governor of Québec 1877-84, and was called to the Senate Jan. 22, 1885.

N. M.

Rob Roy, the popular name of a Scotch outlaw (*Rob* = *robber*, meaning "red" in Gaelic, whose true name was Robert MacGregor; b. in Scotland about 1690; changed his name to Campbell on the outlawry of the clan MacGregor 1715; became a partisan of the Pretender in 1716, and for many years thereafter continued to make depredations, chiefly on the retainers of the Duke of Montrose. D. near Aberdeen, Dec. 28, 1734. His exploits, long traditional in Scotland, formed the basis of a novel by Sir Walter Scott. See also *James MacGregor* (1618; new ed., 1861) and Miller (1859).

Robson, Robert, actor; b. at Annapolis, Md., Mar. 4, 1802. He made his first appearance in Baltimore Jan. 5, 1822, in *Uncle Tom's Cabin as H. H.* In June, 1853, he played small parts at the Washington Varieties. He was afterwards engaged as second low comedian at the Troy Museum. On Sept. 16, 1860, he made his first appearance in the York at Laura Keane's theater as Bob in *Old Heads and Young Hearts*. He became popular and added to his list of his engagements at the Arch Street theater in Philadelphia. From 1868 to 1870 he played in Boston; in December of 1870-71 he made his most pronounced metropolitan hit at Boston in *Lord Astor* at the Union Square

theater, New York. He did not, however, repeat his success in London, where he went with Ellen Boucicault at the end of 1874. In 1877 he entered into partnership with W. H. Crane and successfully produced *Our Inquiring House* at the Park theater, New York, Jan. 20, 1877. *Our Bachelor* and *Shakespeare and Plato* also proved successful. Robson and Crane's conspicuous success in *The Hermit* ended after two years, Robson playing alone in the piece and making it the principal one in his repertory. B. R. Yarnall.

Robusti, Giovanni, called *Tintoretto*, painter; b. at Venice in 1518 or 1519. He was the son of a dyer (*tintore*, hence *il tintoretto*, the younger or little dyer). He is said to have been a pupil of Titian for a very short time only, and no other teacher is named, except that he had Andrea Schiavone as a fellow worker, who, however, was younger than he. He lived poor and unknown for several years, expressing his surprising natural gift for painting, studying also the art of modeling in wax and clay and arranging groups and compositions of figures as made. Among his earlier pictures are two, now in the Academy of Fine Arts at Venice, but painted for the ancient Scuola (charitable society) della Trinità; these are the *Fall of Man* and *The Death of Abel*, noble pictures. The *Abel* in particular is a beautiful piece of warm color, and in character quite different from the work of Titian or of any other Venetian. Cole, who made on the spot a wonderful wood-engraving from this picture, speaks of it as "a Venetian Rembrandt" in its depth and softness. In this and in the *Fall of Man* appears a tendency toward the annual in composition; the main lines are strongly diagonal in one and twisted or involved in loops in the other. The one is the scene of violent action, the other of repose, but in each the unusual power of drawing the human body in movement is very visible. A very remarkable love of landscape is also evident in these pictures. All these gifts and peculiarities are marked throughout the artist's career. The *Isaac and Jacob* of his later life is very similar in composition to the *Fall of Man*, and something of the same thought is in the *Three Graces with Mercury*. About 1546 he seems to have undertaken the two very large pictures in Santa Maria dell' Orto, the *Last Judgment* and *Moses on Mt. Sinai*, or the *Golden Calf* as it is sometimes called, and from that time he was always busy, and generally upon large and important pictures. Strange stories are told of his eagerness to work on the largest scale, indoors or on house-fronts, at the lowest prices or for nothing. He is said to have painted a large picture during the few days allowed for making sketches in competition for the Scuola di San Rocco, and in this way to have secured the employment he desired, though at a very low rate of payment, at least at first. The largest picture in Europe is Tintoretto's *Last Judgment*, in the hall of the Greater Council in the ducal palace, given as 75 feet long. It is only at very favorable times that any clear view of this picture can be had; it is faded and smoked, and has been repainted in many places, and opinions of competent persons differ widely as to the value of what is left. Another very large painting is *The Crucifixion*, in the Scuola di San Rocco, which must be 45 feet long, as it fills all the upper wall of the Sala dell' Albergo. This picture is famous; it has been engraved on a large scale by Agostino Carracci, and it is called Tintoretto's masterpiece. In color and in the highest artistic qualities it is not his best work, but it shows, as well as any, some of his excellences as a designer and as an executant. Thus the event of the Crucifixion is taken before it is complete, and it is evident that the whole series of acts making up the public execution of three persons by the cross has been seen with the eye of imagination. In full harmony with this power of perception and interpretation is the artist's power of drawing the human form in vigorous action. All in the picture is movement and stir, and every figure in the enormous panoramic scene is busied in some special way, but nowhere does the skill and knowledge of the draughtsman fail him for a moment. It is evident that this is not at all the way in which the events of the New Testament history were generally represented by the great Italians; this is the modern way of proceeding, the story is told as the event might actually have taken place. Now it is probable that the very highest artistic qualities, as beauty of composition in line and mass and beauty of color, are incompatible with such vigorous narrative; but if Tintoretto's large paintings had not suffered so cruelly from fading and from candle-smoke and from repainting

we should know more than we do of what graphic art is capable. The best and best-preserved specimen of his historical or descriptive work is the *Miracle of St. Mark*, in the Academy at Venice, which is splendid and deeply satisfying in color, while full of strenuous action; and if its composition in line and mass is not altogether of the highest order, it only misses this excellence by a little. Still, for many art lovers, such smaller and more simple pictures, as the *Death of Abel*, mentioned above, or the *Bacchus and Ariadne*, or the *Pallas defending Peace and Abundance*, in the Anticollegio of the ducal palace, or even the not uncommon portraits of robed senators, are more precious than the large pictures of action.

Little is known of the details of this artist's life, for it was filled with hard work in Venice, which city he seldom left. The work in the Scuola di San Rocco was begun in 1560, and soon after this time his first paintings in the ducal palace were undertaken. After the fire which destroyed half the palace in 1577 he undertook other works there, and the San Rocco work was also continued during all those years. The great *Paradise* was painted about 1586. D. at Venice, May 31, 1594.

Of his numerous pictures the following may be mentioned: In the Scuola di San Rocco, eight large pictures on the walls of the lower hall, thirteen on the walls of the upper hall, and thirteen on the ceiling of the same, all of biblical subject except two or three, which deal with the legend of St. Roch (S. Rocco); also, in the Albergo, *The Crucifixion* and another large picture. In the ducal palace, ten historical pictures, besides the great *Paradise*, on the wall of the Greater Council, and, in the smaller halls of the upper story, fifteen large pictures, mostly of Venetian historical and emblematic subject with several mythological subject and two of the Bible history, besides many portraits. In the Academy of Fine Arts, besides the three already named, there are a *Crucifixion with the Three Marys*, a *Descent from the Cross*, a *Virgin and Child*, each of these having portraits of Venetian nobles introduced, an *Assumption of the Virgin and Mary*, and portraits of extraordinary value. In the Church of Madonna del Salute is *The Marriage of Cana*, a noble work. In the Madonna dell' Orto are the pictures described above and three others, of which the *Last Judgment* has been much described and commented on. In the Carmini, or Church of the Carmelite friars, is a *Presentation in the Temple*. In S. Giorgio Maggiore are the *Last Supper*, *The Israelites gathering the Manna*, and several other important pictures. Perhaps a dozen other churches in Venice have works which should be studied. Pictures of his hang in the galleries of the Uffizi and the Pitti Palace at Florence, in the British Museum, in the Old Pinakothek at Munich, in the Louvre, and in the National Gallery of London.

Little has been published about Robusti except the notices in biographical dictionaries and guide-books, probably because the interest of his career lies in his art alone. A biography by W. R. Osler in the Great Artist Series was published in 1879. See Janitschek, *Kunst und Künstler*.

RUSSELL STURGIS.

Roby, HENRY JOHN: educator; b. at Tamworth, England, Aug. 12, 1830; graduated at Cambridge 1853; became fellow of St. John's College 1854; was assistant tutor 1855-56, and reappointed 1860; was university examiner in law, classics, and moral sciences 1859-61; member of, and secretary to, the local examination syndicate 1858-59; took a prominent part in urging university reform; was assistant master of Dulwich College 1861-65; Professor of Jurisprudence at University College, London, 1866-68; was appointed by the crown secretary to the schools inquiry commission Dec., 1864, to the endowed schools commission Aug., 1869, and was a member of that body 1872-75. He was elected member of Parliament for Eccles Oct., 1890. He edited the *Report of the school commissioners* and the numerous volumes of documents thereto appended (Mar., 1868); author of an *Elementary Latin Grammar* (1862; 2d ed. 1882); and a valuable *Grammar of the Latin Language, from Plautus to Suetonius* (3 vols., 1871-74; 5th ed. 1887); *Introduction to Study of Justinian's Digest* (1884).

Revised by BENJ. IDE WHEELER.

Roca, JULIO A.: general and statesman; b. at Tucuman, Argentine Republic, July, 1843. He studied in the military school at Paraná, joined the army, and became general in 1874. He was Minister of War under President Avellaneda 1878-80, and in this capacity headed the expedition by which

the Indians of Patagonia were finally reduced to subjection. Succeeding Avellaneda, he was president Oct. 12, 1880, to Oct. 12, 1886. Specie payments were suspended in 1885, marking the beginning of the great Argentine crisis which soon after convulsed the financial world. H. H. S.

Rocafuerte, rō-kā-fwār'tā, VICENTE: statesman; b. at Guayaquil, Ecuador, May 3, 1783. He was educated in France and England, where he derived republican ideas from Miranda, Bolivar, and their associates. In 1812 he was elected deputy for Guayaquil to the Spanish Cortes. After his country became a part of Colombia he held diplomatic positions in North America and Europe, and he resided several years in Mexico, where he was a prominent journalist. Returning to Guayaquil in 1833 he was elected to congress, but his liberal opinions caused him to be exiled. The same year the liberals revolted at Guayaquil and proclaimed him supreme chief, but he was defeated and captured by Flores. The latter magnanimously offered to co-operate with him in the reorganization of the republic, and under this arrangement Rocafuerte was president from 1835 to 1839. This period was the most prosperous in the history of Ecuador, and the president won universal respect. Subsequently he held various civil and diplomatic positions. He published many works on political subjects. Rocafuerte was unquestionably the greatest statesman of Ecuador. D. at Lima, Peru, May 16, 1847. HERBERT H. SMITH.

Roe'ambolē [= Fr., from Germ. *rockenbolle*, rocambole, liter., rye-bulb; so called because it grows among rye]: the *Allium scorodoprasum*, a plant of the garlic family, much resembling garlic, but larger and milder. It is cultivated in European kitchen-gardens, and is a native of northern regions.

Rochambeau, rō'shān'bō', JEAN BAPTISTE DONATIEN DE VIMEUR, Count de: marshal of France; b. at Vendôme, France, July 1, 1725; entered the army 1742; was distinguished in the campaigns of the Seven Years' war; was made lieutenant-general Mar. 1, 1780; commanded the French forces in the U. S. during the war of independence 1780-82; took a prominent part in the campaign of Yorktown 1781; became governor of Picardy 1783; was made marshal 1791; commanded the Army of the North from Mar. to June, 1792; was imprisoned during the Reign of Terror, and escaped the guillotine only through the death of Robespierre; was appointed by Napoleon, when First Consul, grand officer of the Legion of Honor (1804). D. at Thoré, May 10, 1807. His *Mémoires* were published in 1809, and translated into English in 1838.

Rocha Pitta, SEBASTIÃO, da: author; b. at Bahia, Brazil, May 3, 1660; educated at Bahia and at Coimbra, in Portugal, he married early and settled on his property, living a life of studious leisure. He wrote there some mediocre verse and a now forgotten romance. Late in life he determined to write a history of Brazil, and undertook the most extensive preparations for the task. He even went to Lisbon in search of documents. In 1728 he completed the work, calling it *Historia da America portugueza desde o seu descobrimento até o anno 1724* (Lisbon, 1730). His success was great, and brought him many honors. His last years were spent in retirement on his estates near Cachoeira, Brazil. D. Nov. 3, 1738. His book was the first real history of Brazil, and though he was often over-credulous in his use of documents, he gathered a vast mass of material for his successors. A. R. MARSH.

Rochdale: town; in Lancashire, England; on both sides of the Roch; 11 miles N. by E. of Manchester (see map of England, ref. 7-G). St. Chad's parish church (twelfth century, restored 1885) is a Perpendicular building, approached by a flight of 122 steps. The town-hall (1866-71) is a fine example of the Gothic style. Rochdale has large manufactures of woolen goods, such as baize, flannels, blankets, and kerseys, cotton goods, especially calicoes, and iron and steel ware. It is distinguished as having made the first successful attempt at Co-OPERATION (q. v.). It returns one member to parliament. Pop. of parliamentary borough (1891) 71,401.

Rochefort, rōsh'fōr', or Rochefort-sur-Mer, -sūr-mār' (anc. *Rupifortium*): town; in the department of Charente-Inférieure, France; on the right bank of the Charente, 9 miles from its mouth. It has a port and a naval arsenal, is surrounded by walls and ramparts planted with trees, and is defended by forts at the entrance into the river (see map of France, ref. 6-D). Outside is a roadstead protected by the

mouth of the Chiron, and A.C. Its two harbors are spacious and safe, and to accommodate the largest ships of war, and such vessels as frigates, corvettes, gunboats, torpedo-boats, etc. It has a large naval hospital and schools of navigation. It was founded as a naval station by Colbert in 1664, and fortified by Vauban. Pop. (1891) 23,294.

Rochefort, Victor Henri, Marquis de Rochefort-Langey, comarant, b. in Paris, France, Jan. 30, 1820; educated at the college of St. Louis; became one of the writers of *Pique*, and was removed from that position because of his satires on the imperial government. In Jan., 1848, he founded the *Laborateur*, in which he so bitterly attacked the empire that on August of the same year the journal was suppressed and the writer condemned to one year's imprisonment and a fine of 10,000 francs. He fled to Belgium, and there resumed the publication of *Le Laborateur*, which was likewise suppressed in France. In 1869 he was elected a member of the Corps Législatif. Later in the same year he founded a radical journal, *Le Républicain*, and in Jan., 1870, was sentenced to six months' imprisonment and fined 100,000 francs for violent language. He remained in prison until the fall of the empire at Sedan, Sept. 4, 1870. In that month he became a member of the government of national defense and member of the committee on barricades. In 1871 he founded another journal, *Le Mot d'Ordre*, and was named a senator of the National Assembly, from which he resigned after voting against the proposed treaty of peace. He declared he was a member of the Communists, but violently opposed the Government. On the entrance of the national troops into Paris he fled toward Belgium, but was arrested, and for complicity in the acts of the Communists sentenced to imprisonment for life in a fortress and sent to the penal settlement of New Caledonia, whence he and several of his associates escaped in the spring of 1874, and returned to Europe by way of the U. S. He resided at Geneva until December of 1874, then allowed him to return to Paris, where he founded a new radical paper, *L'Internationale*. He was elected to the Chamber in 1897, but resigned a few months later, and devoted himself to his paper, which became notorious for the violence of its language in attacks on the existing politicians of the time. He was an ardent supporter of anarchism in 1883, and was condemned by the high court of justice in the following year, but he escaped and continued to flee to London. Profiting by a amnesty in 1894 he returned to Paris. In his long and turbulent career he has been involved in many lawsuits and trials. He is the author of a number of farces, vaudevilles, comic operettas, etc.

Revised by F. M. COLBY.

Rochefoucauld. See LA ROCHEFOUCAULD.

Rochefoucauld Liembourg, Duc de la: See LA ROCHEFOUCAULD Liembourg.

Rochefort-les-Bains: See LA ROCHEFORT-LES-BAINS.

Rochelle, city, Charente-Maritime, on the Gar. Route and N. W. railways; 27 miles S. of Bordeaux, 75 miles W. of Orléans (for location, see map of France, ref. 12-K). It is the geographical and trade center of a large agricultural and stock-raising region, and contains a national bank with a capital of \$50,000, a private bank, and two weekly newspapers. Pop. (1890) 1,690; (1890) 1,783.

Rochelle Salt named from La Rochelle in France, where it was first prepared in 1672; the double tartrate of sodium and potassium, an efficient cathartic, considered more valuable than most preparations of the kind. It is much used in preparing scillitis powders.

Rochester, city, in Kent, England; on the Medway; 29 miles S. E. of London (see map of England, ref. 12-K). It is continuous with Chatham, and connected with Street by a swinging bridge. Near the bridge is a castle founded in 1100; the wall overlooking the river is a fine specimen of Norman architecture of an earlier date. The bishopric was founded in 694 and the foundations of the cathedral were built in 1000. This has been rebuilt and restored numerous times. Features of interest are the Early English tower of the Norman nave. Rochester has some trade in wool and paper. Pop. (1891) 25,179.

Rochester, town, capital of Fulton co., Ind.; on the line of Lake, Madison, and the Erie and the Lake Erie and West. railways; 24 miles N. by E. of Logansport, 90 miles S. of Indianapolis (for location, see map of Indiana, ref. 12-K). It has large water-power from the lake, and runs several flour and grain mills and other manufactures,

a State bank with capital of \$50,000, 2 private banks, a high school, and a daily and a weekly newspaper. It ships large quantities of flour, grain, and produce. Pop. (1890) 1,390; (1890) 2,467; (1894) 4,829.

Editor of "REPUBLICAN."

Rochester, city, capital of Olmsted co., Minn.; on the Zumbro river, and the Chicago and N. W. Railway; 40 miles N. of Red Wing, 60 miles S. by E. of St. Paul (for location, see map of Minnesota, ref. 11-G). It is the center of a great grain-growing region, and has large dairying and horse-breeding interests. Excellent water-power is derived from the river and utilized in manufacturing. There are several flour and grain mills, elevators, foundries, and machine-shops, a high school, the Second Minnesota Hospital for the Insane, 4 libraries (the Public, High School, Insane Hospital, and German) containing over 7,000 volumes, the Notre Dame de Lourdes Academy (Roman Catholic, opened 1877), 3 national banks with combined capital of \$200,000, and a monthly, a daily, and a weekly periodicals. Pop. (1890) 3,163; (1890) 5,321.

Rochester, city (settled in 1728, incorporated as a township in 1787, chartered as a city in 1891); Stafford co., N. H.; on Salmon Falls, the Carleton river, and the Boston and Maine and the Portland and Rochester railways; 10 miles N. N. W. of Dover, and 30 miles E. by N. of Concord (for location, see map of New Hampshire, ref. 8-G). It has exceptional water-power, manufactures of shoes and woollen goods, 6 churches, a national bank with capital of \$100,000, 2 savings-banks, a library (founded in 1799), and a weekly newspaper. Pop. (1890) 4,099; (1890) 7,590; (1894) estimated, 10,000.

Editor of "COURIER."

Rochester, city, port of entry, and capital of Monroe co., N. Y.; 229 miles W. of Albany; lat. 41° 0' 28" N., lon. 77° 36' 51" W. (for location, see map of New York, ref. 4-D). The site is upon a level plain on both banks of the Genesee river, 7 miles from and 283 feet above Lake Ontario. Within the city limits there are three falls of 96 feet, 30 feet, and 83 feet respectively, below the last of which the stream becomes navigable for lake vessels. From the upper fall, near the center of the city, N. nearly to the lake, the river banks are of precipitous rock, varying in height from 100 to 310 feet. The fine bridges spanning this gorge afford a view that is especially attractive to visitors. On the banks of the river, both to the N. and S., beautiful parks, embracing 475 acres, have been laid out, and the lake shore, where there are numerous and attractive summer resorts, is accessible by spacious boulevards and by both steam and electric cars on either side of the river. The main line of the New York Central and Hudson River Railroad crosses the city at the upper fall upon elevated tracks, and there are three branches of the road entering here—one to Syracuse via Auburn, one to Niagara Falls, and one to the mouth of the Genesee. Other railways having terminal here are the Rochester Division of the Erie, the Northern Central, running to Baltimore, the Buffalo, Rochester and Pittsburgh, the Western N. Y. and Penn., the Lehigh Valley, the Rome, Watertown and Ogdensburg, the West Shore, and a belt line connecting all the other lines with one another and with the port of Genesee. The Erie Canal crosses the river by a fine stone aqueduct, 948 feet long, on seven arches. The city has an average length of 5 miles, by about the same breadth. It is laid out in broad streets, generally well paved and lighted, and abounding in fine shade trees. The dwellings are, in a much greater degree than is usual in cities of its size, detached and surrounded by lawns and shrubbery. The business portion contains an unusually large number of fine buildings, including Powers' block, which contains a valuable collection of paintings.

Public Buildings.—The court-house, city-hall, and Free Academy form a striking architectural group in the center of the city. Other notable edifices are the Government building and the State arsenal, with the Soldiers' Monument in front of it. The Lyceum theater, the Genesee Valley Club-house and the Eureka Club-house compare favorably with similar structures in other cities. The Y. M. C. A. has a fine building, and there are ninety-seven churches, of which several have new and very attractive houses of worship. The Presbyterians report 7,021 communicants; the Lutherans, 5,823; the Baptists, 4,367; the Episcopalians, 3,690; the Methodists, 3,657. Rochester is a cathedral city and the Catholics are numerically very strong.

Schools and Colleges.—In the matter of education Rochester has for many years been prominent. The university

(see ROCHESTER, UNIVERSITY OF) has taken high rank among the colleges of the U. S. There is also a flourishing Baptist Theological Seminary which maintains a German as well as an English department. The Western New York Institute for Deaf Mutes has achieved a worldwide reputation by its improved methods of instruction; and the Mechanics' Institute is placing technical instruction and familiarity with the homelier arts of life within reach of the masses. There is a young but vigorous Historical Society, and an Academy of Science. There are 38 public schools, 7 schools connected with orphan asylums but supported and supervised by the city, and a Free Academy, in all of which 19,250 pupils are instructed by 631 teachers, at an expense of \$29.63 per annum for each pupil. It is estimated that 8,000 pupils attend the parochial and other private schools. In the Free Academy building there is a public library of 22,000 volumes; in the court-house there is a valuable law library of 15,000 volumes; the Reynolds Free Library contains 30,000 volumes, and is especially complete in books of reference; the library of the university contains 28,000 volumes, and that of the Theological Seminary 28,000 volumes.

Public Institutions.—There are four hospitals (City, St. Mary's, Homoeopathic, and Hahnemannian) with spacious buildings, capable of providing for 700 patients. The State Industrial School is situated in the northern part of the city, and occupies an inclosure of 42 acres, on which there are nine large buildings. Juvenile offenders are received from all parts of the state except New York and Kings County, and the school numbers about 650 boys and 150 girls. The Monroe County penitentiary, almshouse, and asylum for the insane are situated just S. of the city. Mt. Hope Cemetery, one of the oldest of its kind in the U. S., was established 1838, has a naturally beautiful site, and has been laid out with much care and taste. The Catholic Cemetery of the Holy Sepulchre, established 1872, is located on a fine site of 140 acres upon the river bank N. of the city. A gas and electric company, with a capital of \$4,300,000 and 200 miles of mains, supplies the city with light. The Rochester Street-railway Company, with a capital of \$5,000,000, maintains 12 lines of electric cars, with a trackage of 85 miles. A magnificent system of water-works was constructed in 1874, with two sources of supply—one from the river, the water being forced through 10 miles of mains in the business center by the Holly patent, and used for suppressing fires and running light machinery; the other from Hemlock Lake, 29 miles S. and 400 feet above the city. The water from this source is distributed through 252 miles of mains, which can furnish 22,000,000 gal. daily. The total cost of the system to 1895 was \$7,000,000.

Business Interests.—There are in Rochester 10 banks of discount, with a capital and surplus of \$4,500,000 and deposits of over \$15,000,000; 4 savings-banks and 2 trust companies, with deposits of over \$30,000,000 and a surplus of over \$3,500,000. Owing to the surpassing fertility of the Genesee valley and its fine water-power, flour was formerly the chief product of Rochester. There are still 17 flouring-mills in operation, with an aggregate capacity of 5,000 barrels a day. The nursery business has, however, become of far more importance, and in this line Rochester outranks every other city. In the manufacture of clothing Rochester ranks third among the cities of the U. S., with an annual output of \$13,000,000. In the manufacture of shoes it ranks fourth. Thirteen breweries send out 700,000 barrels of beer per annum. A single tobacco-factory employs 450 hands, and the value of the city's output in that line of business is \$4,500,000. The largest carriage-factory in the U. S., employing 800 hands, is situated here. The kodak camera business originated here, and there is \$5,000,000 invested in it. Several large establishments are engaged in the manufacture of perfumery. Rochester locks, microscopes, and vacuum oil-products have a worldwide celebrity, and contribute much to the prosperity of the city. According to the U. S. census of 1890 Rochester had 1,892 manufactories, employing 37,720 persons, and yielding products valued at \$65,091,156. From its proximity to the coal-fields of Pennsylvania, it has become a great distributing center for coal, which is loaded from railways on the banks of the river into vessels that convey it to all points on the lakes. In 1890 Rochester ranked sixth in exports and fourth in imports of the lake ports of the U. S.

History, etc.—The first house was erected in 1812, and the place was incorporated as the village of Rochesterville in 1817 and as a city in 1834. From the first there has been a steady growth in wealth and population, which lately,

through the influence of an energetic chamber of commerce, have increased with phenomenal rapidity. There are 36,000 dwellings within the twenty wards of the city. The assessed valuation is \$100,000,000. From the "Rochester rappings" (1848-49) the city may be regarded as the birthplace of modern Spiritualism; it was also the center of the anti-Masonic excitement (1827-29).

Pop. (1820) 1,500; (1880) 89,366; (1890) 133,896; (1892) 144,834. J. H. GILMORE.

Rochester: borough; Beaver co., Pa.; at the confluence of the Ohio and Beaver rivers, and on the Pitts., Ft. Wayne and Chi. and the Cleve. and Pitts. railways; 26 miles N. W. of Pittsburg (for location, see map of Pennsylvania, ref. 4-A). It is in a fire-clay, coal, oil, and building-stone region, and is connected by electric street-railway with New Brighton, Beaver, and Beaver Falls, and by a bridge across the Beaver river with Bridgewater. There are 11 churches, 2 graded public schools, 2 hotels, 22 societies and lodges, Masonic temple, a national bank with capital of \$50,000, a private bank, and a weekly newspaper. The manufactures include tumblers, bottles, stoves, brick, flour, and lumber. Pop. (1880) 2,552; (1890) 3,649; (1894) estimated, 4,000.

EDITOR OF BEAVER "ARGUS AND RADICAL."

Rochester, JOHN WILMOT, Earl of: b. at Ditchley, Oxfordshire, England, Apr. 10, 1648; succeeded to the title 1659. He became a favorite at the court of Charles II.; wrote poems in accordance with the prevailing taste; was famous for his wit and infamous for his vices. He had Dryden beaten by a gang of hired bullies in 1679 in revenge for a passage lampooning Rochester in Dryden's alleged *Essay on Satire*. His death-bed repentance was described by Bishop Burnet in a pamphlet which had an extraordinary sale. D. July 26, 1680. His *Poems and Familiar Letters* were posthumously published. See his *Life*, by Dr. Johnson. Revised by H. A. BEERS.

Rochester, University of: a college established at Rochester, N. Y., in 1850. At that time the whole of Western New York was without any important institution of this kind. The founders were principally Baptists, although the charter contains no denominational restriction. The university has had two presidents, Martin B. Anderson, LL. D., L. H. D., who served from 1853 to 1888, and David J. Hill, LL. D., who was elected in 1888. Among the local benefactors have been Hiram Sibley, who gave \$100,000 for the erection of Sibley Hall, a fire-proof building containing the library and museum; Mortimer F. Reynolds, who built a chemical laboratory; and Don Alonzo Watson, who established a professorship in history and political science with an endowment of \$50,000. The original campus, afterward enlarged to 24 acres, was the gift of the Hon. Azariah Boody. The assets of the university in 1894 were \$1,203,077.44, of which \$689,842.84 was invested in productive funds yielding an annual income of \$35,179.37, and the remainder, \$513,234.60, in buildings, books, and appliances. In 1894 the faculty was composed of 17 professors and instructors, and the students numbered 212. There are four courses of study leading to a degree, embracing 100 courses of instruction. The library contains nearly 30,000 bound volumes, and several thousand pamphlets. The reputation of the institution has rested chiefly upon the character of its work as a classical college, but within recent years the natural sciences have occupied a larger place in the curriculum, and laboratories have been opened in chemistry, biology, physics, and geology. The geological museum is one of the finest in the U. S., being the original Ward collection amplified.

DAVID J. HILL.

Rochet, rō'shā', Louis: sculptor; b. in Paris, Aug. 24, 1818; studied under Pierre Jean David, called David d'Angers, and began to exhibit in 1835, his first statue being a *Boy extracting a Thorn from his Foot*. Among his most prominent works are the *Statue of Marshal Drouet*, at the Versailles Museum; *William the Conqueror*, a statue at Palais in Normandy; a life-size statue of *Napoleon*, and another *Napoleon as a Scholar at Brienne* (1853); *Madame de Sévigné*, at Grignan (1857); a colossal equestrian statue of Pedro I., at Rio de Janeiro (1861); and a similar statue of Charlemagne (1867). D. in Paris, Jan. 21, 1878.

Rock-butter: See BUTTER.

Rock-crystal: See QUARTZ.

Rocker: an instrument used in mezzotint engraving. See ENGRAVING (*Mezzotint*).

Rocket: See DYERS' WEED.

Ann, known as Pigeon Cove, is a popular summer resort. The town has a public high school, public library, national bank with capital of \$100,000, a savings-bank, a weekly newspaper, and manufactories of cotton goods, isinglass, shoes, and organs. The new post-office in Boston was built of Rockport granite. Pop. (1880) 3,912; (1890) 4,087.

Rockport: town; capital of Aransas co., Tex.; on Live Oak Point peninsula in Aransas Bay, Gulf of Mexico, and on the San Ant. and Aran. Pass Railway; 10 miles N. E. of Aransas Pass (for location, see map of Texas, ref. 7-D). It is in an agricultural, fruit-growing, and stock-raising region; has considerable oyster, fish, and turtle interests, exports large quantities of cattle and hides, and is a popular summer and winter health resort. There are several large hotels, a national bank with capital of \$60,000, and two weekly newspapers. The vicinity abounds in wild game of many varieties. Pop. (1880) not separately returned; (1890) 1,069; (1893) estimated, 1,500.

Rock Rapids: town (founded in 1872); capital of Lyon co., Ia.; on the Rock river, and the Chi., St. P., Minn. and Omaha, the Burl., Cedar Rap. and N., and the Ill. Cent. railways; 22 miles W. of Sibley, 60 miles N. of Sioux City (for location, see map of Iowa, ref. 2-C). It is in an agricultural and stock-raising region, has good water-power for manufacturing, and contains 5 churches, several graded public schools, a national bank with capital of \$50,000, a private bank, and 2 weekly newspapers. Pop. (1890) 1,394; (1894) estimated, 2,500.

Rock-roses: See *Cistus*.

Rocks [M. Eng. *rokke*, prob. blending O. Fr. *roke* (> Fr. *roche*, rock) and O. Eng. **rocc* in *stōn-rocc*, stone-rock]; natural masses of solid mineral matter. The term is used in various ways. Popularly and in general literature a rock is characterized as hard and unyielding, and is placed in antithesis to sand, clay, or mud, and in almost all instances where it is used in a figurative sense this is the prominent idea. Modern geological usage extends the term so as to embrace any natural mass of solid mineral matter, whether compact or incoherent. Thus granite, limestone, sandstone, chalk, and deposits of sand, clay, and soil are all considered under the general head of rocks. A third usage arises from the closer discriminations of petrography, which has in effect defined a rock as any natural mass of solid mineral matter that possesses nearly uniform structure, texture, and composition. Thus masses which may have like composition but different structure and texture are called different rocks, viz., granite, gneiss, porphyry, rhyolite, etc.; and rocks with similar textures but with different compositions are different rocks, as granite, diorite, gabbro. A fourth usage springs from the petrological idea of the individuality of a rock-mass as a geological body which has been brought into place by one act, as a continuous lava-stream, or which is the result of the continued action of any set of forces upon a given kind of material, as a continuous bed of sand and gravel. One rock-body may consist of several kinds of rocks, as a stratum whose basal portion is conglomerate and upper portion sandstone; a lava-stream which is partly rhyolite, obsidian, and pumice. The language has not yet discriminated between these ideas, hence the uses of the term rocks are confusing.

Formation of Rocks.—Conclusions regarding the formation of rocks are partly a matter of observation, partly a matter of inference. 1. Lavas flow out from craters and crevices in the earth in a highly liquid condition and, upon cooling, solidify into rocks. Similar material is thrown into the air in dust-like particles and larger fragments, and accumulates upon the surface in more or less compacted masses, as tuffs, breccias, etc.; or the lavas may remain within fissures and openings in the earth's crust where their solidification can not be observed. Similarity in composition and analogies in texture and in mineralogical characteristics between surface lavas and intratellural rock-bodies, as well as their disposition toward surrounding rocks, permit logical inferences to be drawn regarding the original nature of intratellural bodies as molten lavas or magmas. All such rocks are classed as *igneous* or *eruptive*. 2. Sand, silt, and soil are washed down slopes by water and carried along by streams, or as sand and dust are blown about by winds to be deposited when the force of the current lessens. They accumulate in layers or beds, horizontal or inclined, and by drying or cementation may become more or less coherent masses. Mineral springs deposit layers of calcium-carbonate, silica, etc., sometimes acquiring great thickness. These observed proc-

esses result in the formation of rocks similar in composition, texture, and structure to others whose formation may be inferred to have been occasioned by similar agencies. All such deposits are known as *sedimentary* rocks. 3. Alterations in rocks of the two first categories may affect their composition, texture, or structure. Changes that cause the rock to disintegrate are classed as weathering or decomposition. Changes that convert it into a mass still possessing great durability are classed as metamorphism. Such metamorphism may be occasioned by heat, by solutions, or by dynamic forces, and the results may be recrystallization, the production of new minerals, fracturing, and rearrangement of the fragments. All rocks resulting from the metamorphism of igneous or sedimentary rocks, and those resembling them whose original nature may not be determinable, are called *metamorphic* rocks. See **METAMORPHISM**.

IGNEOUS or eruptive rocks which solidified on or near the surface of the earth are called *volcanic*, if considerably below the surface *plutonic* or *abyssal*. If lavas reached the surface they are *extrusive* or *surface lavas*, if not they are *intrusive*. The latter often metamorphose adjacent rocks by heating or by impregnation with hot solutions and vapors, and in turn often exhibit modifications in structure, texture, and composition resulting from cooling produced by surrounding rocks. Intrusive igneous rocks form dikes, sheets, laccolites, batholites, stocks, or necks. Extrusive rocks form lava streams and sheets, domes, breccias, agglomerates, and tuffs. The last may be stratified and bedded, and if deposited in water are not distinct from sedimentary rocks.

Chemical and Physical Characters.—All igneous rocks consist of oxygen, silicon, aluminium, with sodium and potassium, or calcium, magnesium, and iron in variable proportions. Usually all eight are present. Besides these elements are small amounts of titanium, phosphorus, hydrogen, and often traces of manganese, nickel, cobalt, lithium, barium, strontium, chlorine, sulphur. These are usually expressed in analyses as oxides, but are mostly combined in silicate minerals, together with some that are oxides. The molten magmas must be considered as solutions of compounds of these elements at high temperatures, their exact molecular character being unknown. Those with more than 65 per cent. silica are called acid magmas; those between 65 and 55 per cent. silica, intermediate; and those with less than 55 per cent. silica, basic. The extreme limits are about 80 and 85 per cent. silica. Molten magmas are often very liquid at the time of eruption, especially those with less than 60 per cent. silica. The more siliceous ones are more viscous at like temperatures. As the temperature falls the magmas become more viscous, and crystallization usually sets in. If cooling is very sudden, the magma forms an amorphous mass (glass) without crystals. With slower cooling crystals form more or less perfectly, their shape and chemical composition depending upon the physical as well as the chemical condition of the magma, molecular shifting and arrangement being more easily accomplished in more liquid magmas, which, however, must be below the fusion-point of the minerals crystallizing. Slowest cooling permits most perfect molecular adjustment, resulting in fewer but larger crystals. Other agencies affecting crystallization are absorbed vapors, and possibly pressure. The size and arrangement of the crystals control the texture of the rock, which may be glassy or *vitreous*, stony or *lithoidal* and *crystalline*. When the grains are visible to the naked eye the texture is *phanerocrystalline*; if not, then *aphanitic*. Rocks are *porphyritic* when they consist of a groundmass of any texture bearing larger, prominent crystals (*phenocrysts*). Particular textures have special names, as *granitic*, *poikilitic*, *ophitic*, *trachytic*, *rhyolitic*, etc. Structures due to the physical continuity of the mass are *compact*, *porous*, *vesicular*, *pumiceous*, *jointed*, *columnar*, *laminated*, etc. The commonest minerals that crystallize from molten magmas (pyrogenetic) are quartz, potash-feldspar or orthoclase, lime-soda-feldspars, the feldspathic minerals (nepheline, leucolite, leucite, and sodalite), and certain ferromagnesian minerals (amphiboles, pyroxenes, micas, and olivines) among others are titanite, magnetite, ilmenite, apatite, zircon, and less often garnet, tourmaline, allanite, and spinel. Minerals prominent in the most acid rocks (granites) are quartz, alkali (potash, soda) feldspars; less abundant lime-soda-feldspars, with muscovite, biotite, and hornblende. As we pass to less acid rocks quartz diminishes; feldspars increase to a certain point, and then diminish and disappear in the most basic rocks (peridotites). Alkali-feldspars increase

is characterized by syenite and by diorite-syenite, and are accompanied by leucite and sodalite. Limestone-feldspar rocks occur in lines from acid to basic rocks, and produce such a diversity as oligoclase and anorthite and in gabbro, pyroxenite and anorthite. The range of the ferromagnesian minerals is from biotite through hornblende, augite, clinopyroxene, to olivine, the first being most prominent in one rock, the last in most basaltic rocks. This rock body may vary in chemical and mineral composition in different parts, and may exhibit various structures and textures.

Some rocks occupy space between igneous rocks of one group or show one corner of reaction. They appear in various and unusual characters common to such a group of rocks, which distinguish them from rocks of some other group. Regions or districts are called *polygenetic provinces*. These characterizing together with other all sorts, prove that variation of igneous rocks in one area originates from a parent matter magma by chemical differentiation, lime-iron-magnesian-silicates tending to separate from sodium-alkali-silicates and true silicates, hence may be expected at any stage of differentiation, and igneous rocks have no fixed chemical composition, and the variations attached to the definitions of various kind of rocks may be arbitrarily chosen, there being no actual lines of demarcation between them. The consequence, in this respect, of igneous rocks about any eruptive center is one of their most essential characteristics.

Classification of igneous rocks may be accomplished in various ways owing to the number of their variable features. Two methods proposed have developed inherent weakness. The one first adopted classes together all rocks with same chemical composition and then subdivides them on a basis of texture, and further on one of mineral composition, whereas others group-grained granular rocks as the elements for the chemical groups. These are granite, diorite, gabbro, pyroxenite, syenite, and diorite-syenite, whose chemical characters may be learned under their separate headings. Under each of these groups are chemically similar rocks having fine-grained and usually porphyritic texture, commonly called porphyry, besides folioid to glassy forms, the last being variously named, and under a general term of *dyke* and *vein*.

The rocks of coarse class belong granite, granite-porphyr, quartz-porphyr, quartz-karatophyr, rhyolite, rhyolite-obsidian, pumice and pumice, quartz-pentelherite, dacite and trachyte forms. Granite are subdivided on a basis of the siliceous ferromagnesian minerals—muscovite, biotite, hornblende, augite, etc. The fine-grained and aphanitic, and some varieties are subdivided on a mineralogical basis, as when the feldspars are included as of chief importance, feldspar predominating in quartz-porphyr, quartz-pumice, quartz-feldspar, quartz-karatophyr and quartz-pentelherite, and lime-soda feldspar oligoclase, syenite or diorite. Other subdivisions are based on the character of the groundmass and the relative abundance of minerals.

The rocks of fine class belong diorite, diorite-porphyr, anorthite-porphyr, pyroxenite, anorthite and anorthite glass. These rocks are subdivided on a mineralogical basis, the minerals involved being quartz, anorthite, hornblende, hypersthene and augite. These names are placed as prefixes to the names in designate varieties.

The rocks of coarse class belong gabbro, gabbro-syenite, pyroxenite, anorthite, diorite, basalt, trachyte (basaltic glass), and the crystalline mineralogically.

The rocks of fine class belong peridotite, pikrite (peridotite-porphyr, basaltic). This class is distinguished by the absence of feldspar, or its presence in very small amounts, and is subdivided mineralogically according to the presence of pyroxenite, anorthite, diorite, etc.

The rocks of coarse class belong syenite, syenite (orthoclase), pyroxenite, pyroxenite, basalt, trachyte (basaltic glass), and the crystalline mineralogically. They are subdivided according to the presence of quartz, anorthite, diorite, basalt, and the ferromagnesian minerals.

The rocks of coarse class belong diorite-syenite and its derivatives and glassy; mineralogical and chemical according to the presence of nepheline, leucite, and certain ferromagnesian minerals.

Some classes of rocks not represented by coarse-grained rocks are the porphyritic (muscovite and hornblende), the fine-grained (and nepheline-basalt), and the highly siliceous (nepheline and nepheline). These are basalt, and some of the best seen in alkalies.

Sedimentary rocks, as already said, may be composed of particles of other rocks when they are fragmental or clastic, or they may consist of fragments of organic remains, both animal and vegetable. They may be precipitations from aqueous solutions—*crystalline*. The composition and character of clastic rocks depend on the mineral character of the rocks from which they were derived, and on the transporting currents which deposited them. The mechanical effect of the stream is to assist the material according to its gravity and surface resistance, the heaviest fragments settling nearest. The process is one of separation, leading to differentiation of the particles according to their mineral character, the ultimate extremes having the simplest composition, and the more soluble portions going into solution. Such rocks may approximate closely to the composition of igneous ones, or they may differ as widely from them as to consist of but one of their constituent minerals, as quartz. The texture of fragmental rocks may be due to the aggregation of the mineral particles, or of grains varying in size up to that of gravel and boulders. The fragments are usually rounded, and the resulting mass, if sandy, is fine sand, gravel, or sludge, and when indurated or cemented by interstitial material, is sandstone or conglomerate. These rocks are largely quartz. If other minerals, as feldspar, and various rock-fragments accompany quartz, the rock is graywacke. When the fragments are angular it is breccia. Rocks consisting of extremely minute particles have been derived largely from the more easily decomposable minerals, feldspar, mica, etc. These are largely shales, and are more or less impure clays, indurated to different degrees—clays, clay-slate, and shale. Fragmental material derived directly from volcanic explosions, and deposited by currents of air or water has already been alluded to. The finest-grained aggregates are tuffs.

Fragmental rocks of organic origin are chiefly calcareous, as calcareous ooze (foraminifera), shells, shell-sand and mud, coral-rock and limestone; siliceous, as diatomaceous earth, and siliceous ooze (radiolaria); phosphatic, as guano, phosphatic limestone and marl, and deposits of bone phosphates; carbonaceous, including coals and their natural distillation products. It is questionable whether this last group does not properly belong to the series of metamorphic rocks.

Sedimentary rocks formed by precipitation or crystallization from solutions may be from large bodies of water, as many limestones and dolomites; or from smaller bodies, as certain iron ores, salt, etc.; or from springs, as travertine (calcareous) and calcareous mays, silica, sinter (siliceous), or geyserite; and in subterranean cavities, as various vein-stones, quartz, etc. Vein-stones, with their associated metallic minerals, are generally treated apart from other rocks on account of their special economic importance, and are known as metallic veins or ore-deposits. Ice as geological bodies, glaciers, etc., is a sedimentary rock formed by precipitation or crystallization.

Metamorphic rocks are of three categories: those demonstrably produced by the alteration of igneous rocks; those proved to be metamorphosed sedimentary rocks; and all rocks resembling these two groups, whose original character can not be determined. Since the petrographical features of the rocks of the third category are so nearly identical with those of the first two groups, it is probable that they also were either igneous or sedimentary originally. When stages of metamorphism can be traced from slightly altered to extremely altered forms, it is found that the final products of metamorphism, both of igneous and of sedimentary rocks, may in some cases be identical, so that highly metamorphosed rocks may possess no petrographical characteristics suggestive of the original nature of the rock. Thus the structure, texture, and mineralogical composition of highly metamorphosed rocks may shed no light on the nature of the original rock. It is customary to name and classify metamorphic rocks according to the most prominent petrographical features, regardless of the origin of the rock, or of the processes by which metamorphism has been brought about. Most metamorphic rocks exhibit a foliation, either in the ability of the mass to separate in thin plates, or in the arrangement of the minerals in parallel planes. This foliate or schistose structure is so universally present in all series of these rocks that they are commonly called the *Crystalline Series* (q. v.). However, it does not occur throughout all basins of metamorphic rock, some of which are massive, but these are related to the schistose rocks so intimately in geological position, being usually intercalated

between layers of schist, and have so nearly identical mineralogical composition and characters that they are generally considered together, and the whole series is classified on a basis of mineral composition—that is, rocks having similar mineral constituents are grouped together with little or no regard to the relative proportions of these minerals. At present this seems justifiable because of the lack of constancy in the composition of any considerable body of metamorphic rock, and because of the abrupt and frequent changes in the proportions in which the minerals occur together. The principal kinds of metamorphic rocks are—

I. *Feldspar-quartz Rocks* are those rocks whose predominant minerals are feldspar and quartz. They include:

Gneiss, a crystalline rock composed of potash-soda-feldspar and lime-soda-feldspar with quartz, and one or more minerals of the mica, amphibole, pyroxene groups, besides other minerals, and having a banded or laminated structure, produced by the parallel arrangement of some of the mineral constituents. It varies from quite massive forms to finely schistose ones. It bears a close analogy to granite in texture and composition, in some cases being scarcely distinguishable from it. When lime-soda-feldspars predominate over alkali-feldspars, the rock corresponds closely to quartz-diorite. According to the ferro-magnesian mineral prevalent, gneisses are subdivided into mica-gneiss (biotite, muscovite, or both), hornblende gneiss, augite gneiss, sericite-gneiss, etc.

Granulite, schistose rock consisting of feldspar, quartz, and garnet, with other minerals subordinate, according to which the rock is subdivided into cyanite-granulite, tourmaline-granulite, etc.

Häfeintia and *Adinole*, dense, aphanitic or felsitic rocks, composed of minute particles of feldspar and quartz, and sometimes mica.

II. *Mica-rocks, chlorite-rocks, or talc-rocks* are:

Mica schist, laminated rock consisting of mica and quartz in variable proportions. According to the kind of mica, or of the other prominent constituents, they are muscovite-schist, biotite-schist, sericite-schist, paragonite-schist, and numerous other mica-schists depending on the accessory mineral, as staurolite, andalusite, epidote, etc. With increase of quartz it passes into micaceous quartzite; with more feldspar, into gneiss; with calcite, into micaceous limestone.

Chlorite-schist, laminated rock composed of chlorite and quartz, with other minerals subordinate.

Phyllite, Argillaceous Schist, Argillite, micaceous, argillaceous, schistose or slaty rock intermediate between clay-slate and mica-schist. Subdivisions are chiastolite-slate, staurolite-slate, ottrelite-slate, sericite-phyllite, etc.

Talc-schist, laminated rock composed of talc, with quartz or feldspar and other minerals.

III. *Amphibole-rocks*.—Rocks whose predominant mineral is amphibole, either schistose or massive; the former is *amphibole-schist*, the latter *amphibolite*. With amphibole may be associated feldspar, quartz, garnet, etc. According to the variety of amphibole present the rock is hornblende-schist, or hornblende, actinolite-schist, glaucophane-schist. Nephrite, a variety of jade, is a compact microfibrinous variety. Subdivisions are also established upon the character of the accessory mineral, as epidote-amphibolite, etc. When lime-soda-feldspar becomes prominent, the rock grades into diorite-schist; by increase of quartz and feldspar, into gneiss.

IV. *Pyroxene-rocks* are augite-schist, when laminated; augite, when massive; enstatite-rock, jadite (jade). As lime-soda-feldspar increases, and the augite becomes more like diallage, the rock passes into schistose gabbro.

V. *Other rocks* are eclogite, crystalline massive rock, seldom schistose, composed of omphacite (light-green pyroxene), and garnet, with other minerals subordinate. Olivine-rocks are essentially olivine, with pyroxenes, hornblende, or mica in varying amounts, corresponding closely in mineral composition to the peridotites.

Epidote-schist and tourmaline-schist are schists in which epidote and tourmaline are prominent minerals, in combination with others less characteristic. Greenstone-schists are schistose and green, and generally very fine-grained. The color is due to fibrous amphibolite (actinolite), chlorite, or serpentine with epidote, combined with other minerals.

Quartz-rocks are chiefly composed of quartz, quartzite when massive, quartz-schist when schistose, usually with mica.

Calcite-rocks are crystalline limestone and *MARBLE* (q. v.).

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Rock-salt: See SALT.

Rock-snake: See BONGAR.

Rock Springs: town; Sweetwater co., Wyo.; on the Bitter creek, and the Union Pac. Railway; 258 miles W. of Laramie (for location, see map of Wyoming, ref. 12-G). It is in an extensive coal-mining region, and has 2 national banks with combined capital of \$110,000, and 2 weekly newspapers. Pop. (1880) 763; (1890) 3,406.

Rockville: city (set off from the town of Vernon and chartered as a city in 1889); Tolland co., Conn.; on the Hockanum river, and the N. Y. and N. Eng. Railroad; 10 miles E. N. E. of Hartford (for location, see map of Connecticut, ref. 7-I). The river, which is the outlet of Lake Sillis, has here a series of falls aggregating 280 feet, and affords abundant power for manufacturing. The principal industry is the manufacture of envelopes; other important articles made here are woolen goods, silk goods, satinet, gingham, and warps. There are 8 churches, a public library, 2 national banks with combined capital of \$500,000, 2 savings banks with aggregate deposits of over \$1,750,000, and 1 weekly newspapers. Pop. (1880) 5,902; (1890) 7,772.

Rockweeds: the popular name of the brown seaweeds of the genera *Fucus* and *Ascophyllum*, common on rocks between tide-marks along the U. S. coasts. See FUCOID.

Rockwood: town; Roane co., Tenn.; on the Queen and Cresc. Route and the Rockw. and Tenn. Rivers railways; 6 miles N. of the Tennessee river, 45 miles W. S. W. of Knoxville (for location, see map of Tennessee, ref. 6-II). It is in a coal and iron mining region, and contains several blast furnaces, a national bank with capital of \$50,000, and two weekly newspapers. Pop. (1880) 1,011; (1890) 2,429.

Rocky Mountain Goat [so called on account of its goat-like appearance]: a species of antelope (*Mazama montana*



Rocky Mountain goat.

with short legs, round, black, decurved horns, long, white woolly hair, and a short beard on the chin. It is very much

and than this deposit in gold. It is found from Northern California to Colorado. In the higher parts of the Coast and New-Castle Mountains. It extends northward to the mountains and the Klamath district of British Columbia. In the lower valleys in some places down to the coast, the forest and fields are used industrially by the Indians of the coast of British Columbia.

P. A. L.

Rocky Mountains. All the mountains of North America between the Great Plains and the Pacific Ocean. The term *Rocky Mountains* was originally applied, but was finally rejected by the name *Rocky Mountains*.

The term is not entirely consistent in the application of this name. To some extent, both by geographers and popular usage it is restricted in its application to parts only of the western mountain system. Some apply it only to the range of Montana, Wyoming, and Colorado; others include in addition the ranges of Idaho, Utah, and New Mexico, whereas others would add the desert ranges of Oregon, California, Nevada, Utah, New Mexico, and Arizona comprising from it only the Cascades, the Sierra Nevada, and the Coast Ranges, but its application to all the mountains of North America W. of the Great Plains is the most usual and definite one. The name *Cordillera* of North America has been proposed as a substitute for *Rocky Mountains* as comprising the entire mountain system, but has not secured general acceptance.

The name *Rocky Mountains* is very appropriate. On the mountainous plateau of the greater part of the region naked rockiness is an extreme rarely known elsewhere on the continent. Chief among the reasons of this are extreme aridity and great elevation, the lack of moisture preventing the growth of vegetation, and great elevation promoting rapid denudation of the rock-material disintegrated at the surface. The mountains are composed of crags and peaks of naked rock, and the mountain streams run at the foot of towering cliffs in deep gorges lined with rocks. The hills, unprotected by vegetation, are swept clean of mud and soil by the winds. The valleys are rarely have broad plains, and the steep sides of the valleys are strewn with fragments of rock. In the desert region the streams run in deep valleys, where they rise hundreds or thousands of feet above the waters, and in channels below are choked with rocks which tumble from the cliffs. By reason of unequal erosion of the general surface, much of the structure under conditions of great aridity long lines of cliffs or towering escarpments of rock extend across the plateau.

In very late geological time the whole region has been the seat of intense volcanic activity. Extinct volcanoes are found on high plateaus and on the flanks of great mountain ranges. Broad basins are covered with sheets of lava; great cones have been filled with extruded matter, and areas of solid rock are scattered over the land. Some of this extrusion is so recent that the angular blocks are yet present in all their forms of stream and wave, and these and rocks often appear without soil, and without even moss and lichens. Extreme aridity is not a characteristic of the entire country. These ranges near the Pacific coast and the 42d parallel of N. lat. are abundantly supplied with snow, and here the indicated beds are greatly masked by the forests and deep snowplacement.

The great mountain system extends through the U. S. to the southern border, through British America and down to the Arctic Ocean, or from the 30th. to the 70th parallel N. lat. Its greatest development in longitude is between the 100th and 120th degrees of N. lat.; here the system is a breadth of about 1,000 miles. Its highest peak is in Oregon, at 9,940 feet and 10,140 feet, which rise to an altitude of 15,000 feet above sea-level, as determined by the U. S. and Canadian Survey. In the same system are found the mountains of Mexico and Central America, where the name *Rocky Mountains* has rarely been applied. The mountains of Central America are composed of limestone and volcanoes, the geological characteristics of which are little known. The system is connected with the rest of North America by the narrow Isthmus of Panama, where the elevation does not exceed a few hundred feet, whereas it passes to the Pacific waters, being in general not more than 150 feet above the level of the sea. The mountains of Mexico are usually termed *Cordillera* or the Mexican Cordillera, but locally the term *Sierra* is applied only to certain ranges; the other great mountain ranges, whether their origin is by extrusion or glacial and degradation, have their special names.

They consist of many ranges trending in general parallelism with the coast, and of numerous volcanic peaks, a few of which are active. Among the celebrated mountains of this country are Orizaba, altitude 15,000 feet; Popocatepetl, altitude 17,947 feet; and Ixtaccihuatl, altitude 17,345 feet.

Passing from Mexico to the U. S. the Rocky Mountains proper are reached; and here the geography and geology of the region have been studied to such an extent as to warrant a partial classification of the system into minor groups or systems. The mountain system in the U. S. is extremely broad and complex, composed of hundreds of ranges and ridges, and covering a vast extent of country.

The general plateau or upland on which the ranges stand in Mexico extends across the U. S. from N. to S., widening westward nearly to the Pacific coast. Its maximum elevation is in Colorado, where it reaches an extreme altitude of 10,000 feet; thence northward its summit descends, valuing Canada at an elevation of perhaps 4,000 feet. It descends also westward into the basin of the Colorado river, but rises again in Nevada, where it reaches an altitude of about 6,000 feet, descending thence westward to the foot of the Sierra Nevada in California. On the E. it descends to the low country traversed by the Mississippi river, by a long, undulating, treeless slope, known as the Great Plains. In the U. S. are the following systems: The Desert Ranges, the Park Ranges, the Plateaus, the Sierra Nevada, the Coast Ranges, the Cascade Mountains, and provisionally the Geyser Ranges.

The Desert Ranges occupy Southern Oregon and Idaho, Western Utah, all of Nevada, Southwestern California, Southern Arizona, and Southwestern New Mexico, extending northward into old Mexico. This region is linked on the E. by the plateau region drained by the Colorado river, and on the W. by the Sierra Nevada and Cascade Range. The northern and greater part is known as the Great Basin, since it has no outlet to the ocean. Though known collectively as the Great Basin, it is in fact a group of many large and small basins. Owing to the fact that this region has a very slight rainfall, nowhere exceeding 20 inches and in some parts not greater than 2 or 3 inches, its drainage system is in an extremely undeveloped condition. The rains which fall upon these mountain ranges and flow down their gorges are absorbed by the thirsty soil of the valleys or by the equally thirsty atmosphere. The detritus carried down the mountain-sides by these (and the amount is not inconsiderable when they are in flood) collects in the valleys as the streams disappear, thus filling them to a great depth with the ruins of the mountains.

The greater of the basins composing the Great Basin are (1) that of the Great Salt Lake, upon the eastern side of the basin in Utah, receiving drainage from the Wasatch Range, which limits this region on the E.; (2) the Humboldt-Carson Basin upon the W. in the shadow of the Sierra Nevada. Into this basin flow and sink the streams from the Sierra Nevada and from the ranges of the basin. Other basins are those of the Malheur and Harney Lakes in Oregon, Owens Lake in California, and Sevier Lake, Utah.

The ranges of this region are narrow and simple in structure. They are separated by broad level desert valleys filled with detritus from their sides. The trend is commonly N. to N. W. So far as their geological structure is known, they are of one type—i. e. a monoclinical ridge of displacement, or a displacement due to a fault on one side and a flexure on the other, which may otherwise be described as the half of an anticlinal fold. The typical ridge is composed of strata dipping one way, the front or face of the range being the escarpment edges of the strata, and the back of the ridge conforming to some extent with the dip of the strata. Very few of the ranges are as simple as the type described, as they are complicated by secondary faults and flexures, transverse, oblique, and sometimes even longitudinal with the principal structure. Simple anticlinals are rarely found. The ridges described are composed of granites, schists, and Paleozoic sandstones and limestones; but these rocks and the monoclinical structures are often masked by extruded beds found on the flanks or sometimes partly burying the ranges, and many of the mountains are chiefly of eruptive origin. It is probable that this region has been above the level of the sea since Jurassic time, and some portions of it longer, but the great orographic displacement which produced the present ranges is of very late date, and it is probable is yet in progress. One of the characteristics of these ranges is that they usually rise abruptly from the desert plain without intervening foot-hills, and rarely do

the ranges coalesce. Of the age of the dry land there is no certain knowledge, but the mountain forms due to upheaval and atmospheric degradation, and also the mountain forms due to extravasation, are of very late geological origin.

There are about 100 ranges in this group. The highest, broadest, and most massive is the Wasatch. In this are found the principal geological formations of the other ranges of the system, and also some of the sedimentary beds of the Plateau System. The escarpment faces the W., and the highest peak, Mt. Nebo, is found at the southern extremity. The streams which are used to fertilize the Great Salt Lake and Utah valleys have their sources in these lofty mountains.

PRINCIPAL SUMMITS OF THE DESERT RANGE SYSTEM.

NAME.	Range or group.	Feet.
Authority, King.		
Clayton Peak	Wasatch	11,899
Twin Peaks	"	11,560
Lone Peak	"	11,295
Lewiston Peak	Oquirrh	10,923
Tooele Peak	"	10,595
Mt. Bonneville	Aqui.	11,050
Pilot Peak	Ourbe	10,900
Goslute Peak	Egan	10,491
Spruce Mountain	Pecquap.	10,411
Tenabo Peak	Cortez	9,240
Dalton Peak	"	9,232
Shoshoni Peak	Shoshoni	9,780
Mt. Poston	Toyabe	12,143
Bunker Hill	"	11,735
Globe Peak	"	11,237
Mt. Moses	Fish Creek	8,725
Signal Peak	Havallah	9,887
Mt. Bonpland	East Humboldt	11,321
Star Peak	West Humboldt	9,925
Peavine Mountain	"	8,217
Authority, Thompson.		
Mt. Nebo	Wasatch	11,680
Beaver Dam Mountains	Virgin	8,100
Virgin Peak	"	8,000
Mt. Bangs	"	7,950
Pine Valley Mountain	Pine Valley	10,250
Craggy Head	"	9,750
Mt. Delano	Tushar	12,240
Mt. Belknap	"	12,300
Midget Crest	"	11,414
Mt. Katherine	Pavant	10,000

The Park System extends from Southern Wyoming through Central Colorado into New Mexico; bounded on the N. by the Laramie Plains, on the E. by the Great Plains, and on the W. by the plateaus; the southern limits can not yet be defined. There are a great number of ranges in New Mexico, on either side of the Rio Grande del Norte, having a N. and S. trend, the general structure and geological relations of which are unknown. They may constitute a system or sub-system by themselves, or they may be considered as a part of the Park System, probably the latter. The general trend of the Park Ranges is a few degrees W. of N., but there are exceptions. These mountains are drained by the Platte and Arkansas, which flow into the Mississippi; by the Rio Grande del Norte, which flows into the Gulf of Mexico; and by the Colorado river of the West, which flows into the Gulf of California. The axial ridges of the system—i. e. those which separate the Atlantic from the Pacific drainage—constitute a part of the continental divide. The system is composed of ranges and irregular groups which stand as walls about the great parks. In North Park heads the North Platte; in Middle Park heads the Grand, a tributary of the Colorado; in South Park heads the South Platte; and the Rio Grande del Norte drains the San Luis Park. These parks are elevated valleys, nearly or completely surrounded by mountains. Besides the larger parks mentioned, there are many of smaller extent—mountain-valleys of great beauty in midsummer, but mantled with snow during many months of the year. Most of the ranges are known to be of the Uinta type—i. e. broad, plateau-like masses carved from blocks upheaved in part as integers and in part as bodies of many parts—a structure more fully described below. Many of the park-spaces are zones of diverse displacement. These mountains are composed of granites, schists, Paleozoic, Mesozoic, and Tertiary sediments, and the sedimentary groups are separated by many and well-defined unconformities, giving evidence of alternating periods of dry-land condition and oceanic sway; but the last great orographic movement which upheaved the great masses from which the mountains have been carved began in Tertiary time. These ranges are arranged *en echelon*, the eastern mountain-front running N. and S., while the ranges trend somewhat

E. of S. Hence, proceeding southward, one finds the front range dropping down and disappearing, while its place is taken by that behind, which in turn comes to the front. The following are the principal ranges and groups of this system in succession from E. to W.: Rising from the plains in full view of Denver is the Front Range, which on the N. is nearly continuous with the Medicine Bow Range, the latter being the eastern wall of North Park. To the S. it becomes broken and spreads out into a mass of short ranges and hills, through which the South Platte makes its way to the plains. Just N. of Pueblo, on the Arkansas, it gathers itself and rises suddenly into the great mass of Pike's Peak, and then drops down to the level of the plains. Between North and Middle Parks is the Park View Mountain, an eruptive mass which, with its spurs and outliers, separates the two parks. Next in order to the westward is the Park Range, which extends from Buffalo Peaks northward nearly to the junction of the Sweetwater with the North Platte river. This range forms the western wall of South, Middle, and North Parks. The South and Middle Parks are separated by a series of eruptive mountains, among them Silverheels and Mt. Guyot. From the north end of this range, W. of North Park and the north end of Middle Park, long spurs and irregular mountains extend westward to the plateaus. W. of the south end of the Park Range is the valley of the Arkansas, and W. of the valley is the Sawatch Range, with the Mount of the Holy Cross at its northern extremity. This range trends 30° W. of N. Still farther W. is the Elk Mountain Group, which consists of a series of short, parallel ranges closely massed, trending in the same direction as the Sawatch Range.

Returning to the border of the plains, the first range S. of the Arkansas is the Wet Mountain, a short range, fronting the plains for a few miles only. Its trend is the same as the last. To the W., and parallel with this range, is the Sangre de Cristo, called in one portion of its course the Sierra Blanca. This is a long, high range, fronting the plains for hundreds of miles, and breaks up near Santa Fe. To the W. of it lies San Luis Park, and beyond the park is the enormous irregular rugged mass known as the San Juan Mountains, and beyond are the plateaus.

PRINCIPAL MOUNTAINS OF THE PARK RANGE SYSTEM.

Authority, Gannett, U. S. G. G. S.

NAME.	Range or group.	Feet.
Gray's Peak	Front Range	14,341
Torrey Peak	"	14,346
Mt. Evans	"	14,330
Long Peak	"	14,271
Mt. Guyot	"	13,565
Cheyenne Mountain	"	9,948
Platte Mountain	"	9,343
Park View Mountain	"	12,433
Mt. Lincoln	Park Range	14,297
Buffalo Peak	"	13,541
Mt. Powell	"	13,548
Pike's Peak	Pike's Peak Group	14,147
Mt. Harvard	Sawatch Range	14,375
Mt. Elbert	"	14,351
La Plata Mountain	"	14,311
Massive Mountain	"	14,298
Mt. Antero	"	14,245
Mt. Princeton	"	14,196
Mt. Yale	"	14,187
Holy Cross Mountain	"	14,176
Mt. Shavano	"	14,093
Mt. Ouray	"	14,043
Grizzly Peak	"	13,956
Castle Peak	Elk Mountain Range	14,115
Maroon Mountain	"	14,003
Capitol Mountain	"	13,997
Snowmass Mountain	"	13,970
Pyramid Peak	"	13,885
White Rock Mountain	"	13,857
Italian Peak	"	13,850
Treasury Mountain	"	13,840
Mt. Day	"	13,193
Lopus Peak	"	12,823
Gothic Mountain	"	12,570
Crested Butte	"	12,052
Greenhorn Mountain	Wet Mountain	12,290
Blanca Peak	Sangre de Cristo	14,464
Garland Peak	"	14,500
Crestone	"	14,253
Mt. Rito Alto	"	12,980
Hunt Peak	"	12,723
Mt. Wilson	San Juan Mountains	12,250
Uncompahgre	"	14,225
Mt. Sneffels	"	14,178
Mt. Folus	"	14,054
Handle Peak	"	13,997
Rio Grande Pyramid	"	13,773
Mt. Osa	"	13,640

viding them into two sub-systems, the Northern and Southern Coast Ranges. To the N., beyond the head-waters of the Sacramento, the Coast Ranges topographically coalesce with the Cascade Mountains, and to the S., beyond the head-waters of the San Joaquin, with the Sierra Nevada; but here the geological separation is plain, as shown by Whitney. The general trend of these ranges is 30° W. of N. The Coast Ranges are composed of more or less closely oppressed folds of strata degraded by rains and rivers—i. e. they have the Appalachian structure, but complicated and more or less masked by extravasated matter. The summits or axial planes are in general tipped westward or toward the Pacific. The Appalachian type is not known to occur elsewhere in the Rocky Mountain region. The upheaval of these mountains began in the late Tertiary times, and may yet be in progress.

PRINCIPAL MOUNTAINS OF THE COAST RANGE SYSTEM.

NAME.	Feet.	Authority.
San Carlos Peak.....	4,977	Whitney.
Mt. Hamilton.....	4,440	"
Mt. Diablo.....	3,856	"
Mariposa Peak.....	3,700	"

The Cascade Mountains stretch from Southern Oregon northward far into British America. On the E. they are bounded by the great valley of the Columbia river, and on the W. by the Pacific Ocean. The Columbia river, where it bursts through this zone of mountains, plunges to the level of the sea in a series of great cascades, and from these the mountains take their name. They consist of an irregular volcanic plateau, upon which stand many volcanic peaks. They can not be separated topographically, nor is there yet sufficient data to separate them geologically from the northern extremity of the Coast Ranges and Sierra Nevada. Little is known of their general topography and geology, except that the group is characterized by many lofty volcanoes now extinct. The trend of this zone of mountains is a little W. of N.

PRINCIPAL MOUNTAINS OF THE CASCADE SYSTEM.

NAME.	Height.	Authority.
Mt. St. Elias.....	18,101	Coast Survey.
Mt. Rainier.....	14,444	" "
Mt. Adams.....	13,258	Vansant.
Mt. Hood.....	11,225	Williamson.

In Northern California and Southern Oregon the Coast and Cascade Ranges are united by a mass of mountains having little apparent system, in which heads the Klamath river, and from which the group receives its name. These form apparently no part either of the Coast or Cascade System, but are too little known to enable one to speak definitely concerning their relationship.

N. of the Front and Park Ranges there is a break in the mountain system in Central Wyoming. The Union Pacific Railway traverses this region, a great stretch of barren, elevated plateaus. On the N. the mountains rise again in a complex system which extends into Canada. These ranges will be called provisionally the Geyser Ranges. The easternmost of them, known as the Bighorn Range, separates the head-waters of Tongue river from those of Bighorn river, both being tributaries of the Yellowstone. W. of this is a broad, high range, known as the Wind River Range, in which heads Wind river, the upper waters of the Big Horn, and Green river, one of the two forks of the Colorado. The northward extension of this range, known as the Absaroka, separates the head-waters of the Yellowstone from its main affluent, Bighorn river. W. of this range follows a succession of short, broken ranges, the Tetons, the Gallatin, Madison, Ruby, and others.

In Northern Montana the Front Range, which faces the plains, bears the continental divide, separating the waters of the Missouri from those of the Columbia. This range terminates in latitude 46°, where the divide swings to the westward, following a succession of low passes until it reaches the Bitter Root Range. So far as the limited geographical knowledge concerning this range informs us, this is a long, continuous range forming most of the western boundary of Montana, and bearing for a long distance the continental divide upon its crest, separating the head-waters of the Missouri from those of the Salmon river, a tributary of the Columbia. W. of this range in Central Idaho is a

section of ranges separating branches of the Salmon river, a region which is probably as little known as any part of the U. S.

An outlying range to the E., known as the Black Hills of Dakota, is of the Uinta structure, as shown by Newton.

PRINCIPAL MOUNTAINS OF THE GEYSER SYSTEM.

Authority, Hayden Survey.

NAME.	Location.	Feet.
Arrow Peak.....	Montana.....	7,420
Mt. Blackmore.....	".....	10,134
Bridger Peak.....	".....	9,106
Mt. Cowan.....	".....	10,351
Crazy Peak.....	".....	11,178
Mt. Delano.....	".....	10,200
Electric Peak.....	".....	11,155
Mt. Ellis.....	".....	8,419
Emigrant Peak.....	".....	11,034
Liberty Peak.....	".....	9,163
Ward Peak.....	".....	10,371
Mt. Chauvenet.....	Wyoming.....	13,000
Mt. Chittenden.....	Yellowstone National Park..	10,190
Mt. Dome.....	".....	10,713
Dunraven Peak.....	".....	9,968
Fremont Peak.....	Wyoming.....	13,790
Gros Ventre Peak.....	".....	11,570
Mt. Hayden.....	".....	13,691
Mt. Holmes.....	Yellowstone National Park..	10,529
Index Peak.....	Wyoming.....	11,702
Mt. Leidy.....	".....	11,177
Mt. Sheridan.....	Yellowstone National Park..	10,385
Mt. Washburn.....	".....	10,346

In Canada the Rocky Mountain System is much narrower than in the U. S., and the platform upon which the ranges stand is much lower. From the boundary as far N. as Peace river three members are distinguished: a front range, comparatively simple, known to Canadian geographers as the Rocky Mountains proper, and bearing the continental divide; a broken volcanic plateau; and, bordering the Pacific coast, a northward extension of the Cascade Range, also of volcanic origin and capped with enormous extinct volcanoes.

Still farther northward the Rocky Mountains continue their northwesterly trend, greatly diminishing in importance as they near the Arctic Circle, and finally disappearing between the Mackenzie and Yukon rivers. The Cascade Range continues through British Columbia and Southeast Alaska, following the coast closely and rising in the latter territory until in the neighborhood of Mt. St. Elias it attains a great altitude, having many peaks exceeding 14,000 feet in height and culminating in the great mass of Mt. Logan, 19,500 feet above the sea. The valleys and gorges among these mountains are filled with numerous glaciers which extend very nearly to sea-level. Thence westward, following the coast-line, this range diminishes in altitude, and finally drops into the sea, appearing above its surface in the chain of the Aleutian islands.

In the U. S. the Rocky Mountains, with the Great Plains that stretch eastward, constitute the great arid region where irrigation is necessary to agriculture. In Northern California and Western Oregon and Washington the precipitation of moisture from the Pacific currents is very great, and hence this region is not embraced in the arid district. The arid region is about two-fifths of the area embraced in the U. S., excluding Alaska. From surveys and careful comparative estimates it is shown that it will not be possible to redeem 4 per cent. of the entire region by irrigation when every brook, creek, and river is utilized. Less than 10 per cent. of the region is forest-clad. These forests are on the sides of the high mountains, and extend over the more elevated plateaus. This does not include large districts of country covered with a scant growth of dwarf cedars and pines which can be used for fuel, but are of no value in mechanical industries. Some portions of this forest region are capable of being cultivated without irrigation, but only such crops can be raised as will mature in the short summers of a sub-arctic climate. Of the remaining lands, a large portion is covered with grasses and other plants which may be utilized to some extent for pasturage. The land most suitable for cultivation lies along the streams, and is confined principally to the little valleys nesting among the mountains. The mountains, hills, and plains can furnish nutritious but scant pasturage for herds and flocks, but altogether the agricultural resources of the region are limited. Gold, silver, iron, copper, lead, salt, coal, and many other minerals are found in abundance, and the region is chiefly valuable for its mines. J. W. POWELL.

Rodman, THOMAS JEFFERSON: soldier; b. at Salem, Ind., July 30, 1815; graduated at the U. S. Military Academy and commissioned brevet second lieutenant of ordnance July, 1841; promoted through consecutive grades up to lieutenant-colonel Mar., 1865. His whole life was devoted to the interests of his profession. To him is due the honor of inventing the method of hollow casting and, from the results of his experiments upon metal for cannon and cannon powder, the design and construction of the 15 and 20 inch cast-iron cannon, with their projectiles and suitable powder. The principles involved in giving to the gun its correct exterior form, the proper distribution of strains in the metal, and the regulation of the interior pressure by the progressive burning of the powder were developed by him largely through the use of his pressure-gauge. The path he marked out has been followed by other investigators, and has resulted in the development of modern guns. He was the author of a valuable *Report of Experiments on Metals for Cannon and Cannon Powder* (1861). D. at Rock Island, Ill., June 7, 1871. Revised by JAMES MERCUR.

Rodney, CÆSAR: signer of the Declaration of Independence; b. at Dover, Del., Oct. 7, 1728; inherited a large landed property; was sheriff of Kent County 1755-58; member of the Legislature many years, and its Speaker 1769-73; delegate to the Stamp Act congress at New York 1765; was chairman of the Delaware popular convention 1774; elected to the Continental Congress Mar., 1775; was soon afterward elected brigadier-general; signed the Declaration of Independence; served under Washington in the New Jersey campaign 1776-77; appointed judge of the Supreme Court, but refused the office; defended Delaware from British invasion; was made major-general of Delaware militia; was president or executive officer of Delaware 1778-82, and was again elected to Congress, but did not take a seat in that body. D. at Dover, June 29, 1784.

Rodney, CÆSAR AUGUSTUS: jurist; nephew of Cæsar Rodney; b. at Dover, Del., Jan. 4, 1772; graduated at the University of Pennsylvania; studied law; was a prominent member of Congress 1803-07; Attorney-General of the U. S. 1807-11; commanded an artillery company 1813; went to South America 1817 as member of a commission to report upon the insurrection against Spain; was member of Congress 1821-22, U. S. Senator 1822-23, and in the latter year became first minister to the Argentine provinces. Author, with J. Graham, of *Reports on the Present State of the United Provinces of South America* (London, 1819). D. in Buenos Ayres, June 10, 1824.

Rodney, GEORGE BRYDGES RODNEY, Lord: admiral; b. at Walton-upon-Thames, Surrey, England, Feb. 19, 1718; entered the British navy in his twelfth year; was governor of Newfoundland 1748; re-entered the navy 1752, rear-admiral 1759; in 1762 he captured Martinique, St. Lucia, and Grenada; vice-admiral 1762, baronet 1764, master of Greenwich Hospital 1765, commander-in-chief in Jamaica 1771, admiral and commander-in-chief at Barbados in Dec., 1779, when he sailed from England with a fleet of 30 vessels; defeated a Spanish squadron off Cape St. Vincent Jan. 16, 1780, and broke through the French fleet near Martinique Apr. 17, 1780, for which achievement he received the thanks of both houses of Parliament and a pension of £2,000. In the war against Holland (1781) he captured Dutch Guiana; as commander-in-chief of the West India squadron engaged the French fleet under Count de Grasse Apr. 9, and again Apr. 12, 1782, capturing seven ships of the line and two frigates; was thanked and pensioned by Parliament, and created Baron Rodney of Rodney Stoke, Somersetshire, 1782. D. in London, May 23, 1792. See Hannay's *Rodney* (Men of Action Series, 1801).

Rodos'to (anc. *Rhodesstus*, Turk. *Tekirdagh*): town of European Turkey; in the vilayet of Adrianople, on the Sea of Marmora; 77 miles from Constantinople (see map of Turkey, ref. 4-D). Rising upon hills and surrounded by thriving gardens and orchards, it presents an enchanting spectacle as seen from the water. It exports grain, cotton, silk cocoons, wool, skins, and wine, and largely supplies the capital with vegetables, fruit, and fish. Pop. estimated at 25,000, of whom 14,000 are Ottomans, 5,500 Armenians, 4,000 Greeks, and 1,000 Jews. E. A. GROSVENOR.

Rodriguez Lobo, FRANCISCO: See LOBO, FRANCISCO RODRIGUES.

Rodriguez, rō-dree'jes: an island in the Indian Ocean; the easternmost of the Mascarene group and of the African

islands, lat. 19° 41' S., lon. 63° 23' E.; 365 miles E. N. E. of Mauritius, of which it is administratively a dependency. Area, 42.5 sq. miles. It is of volcanic origin, and consists of a mountain ridge running E. and W., with considerable plains N. and S. The highest point (Le Piton) is 1,160 feet high. It is surrounded by a coral reef through which there are only two passages, each leading to one of the two ports. It is relatively arid, with a maritime tropical climate, and is subject to hurricanes during the northwest, or winter, monsoons. It is devoted to agriculture and fishing. The turtle which once formed an important article of export have disappeared. Rodriguez was not permanently inhabited until 1691, when it was occupied by a Protestant refugee. In time it had a considerable population, mostly slaves, but, on their emancipation, they emigrated, leaving in 1843 a population of only 250. In 1893 it was 2,068, mostly blacks or of mixed Negro blood. The island is of strategic importance and belongs to Great Britain. The language is French.

MARK W. HARRINGTON.

Roe, EDWARD PAYSON: novelist; b. at Moodna, Orange co., N. Y., Mar. 7, 1838. He studied at Williams College, and one year at Auburn and part of a year in Union Theological Seminary; in 1862 became chaplain of Second New York Volunteers; was subsequently a hospital chaplain at Fortress Monroe; at the close of the civil war became pastor of a Presbyterian church at Highland Falls, N. Y.; in 1874 removed to Cornwall, N. Y., and began the cultivation of small fruits, publishing *Success with Small Fruits* (1880). He was widely known as the author of many successful novels, including *Barriers Burned Away* (1872); *Opening of a Chestnut Burr* (1874); *A Knight of the Nineteenth Century*, (1877); and *Miss Lou* (1888). D. at Cornwall, July 20, 1888.

Revised by H. A. BEERS.

Roe, Sir THOMAS: diplomat, traveler, and author; b. at Low Leyton, Essex, England, about 1568; educated at Magdalen College, Oxford; was knighted 1604; explored the river Amazon in Brazil 1609; was sent as envoy to the Great Mogul, Jahangir, and penetrated to Delhi 1614-18; was ambassador to Constantinople 1621-28, to Poland and Sweden, charged with negotiating a peace between those kingdoms, 1629; sat in Parliament for Oxford University 1640; was sent to the Diet of Ratisbon 1641. He brought from Constantinople a valuable collection of Oriental MSS., which he presented to the Bodleian Library, and procured the Alexandrian MS. of the Greek Bible, now in the British Museum. D. in England, Nov., 1644.

Roebliŋg, rō'bliŋg, JOHN AUGUSTUS: civil engineer; b. at Mulhausen, Prussia, June 12, 1806; graduated at the Royal Polytechnic School in Berlin, the subject of his thesis being suspension bridges. In 1831 he emigrated to the U. S., locating near Pittsburg, Pa., and began the practice of his profession on the slack-water improvement of the Beaver river, and later made surveys for a railroad route across the Allegheny Mountains from Harrisburg to Pittsburg. Having begun the manufacture of wire rope at Pittsburg, he obtained the contract for replacing the wooden aqueduct of the Pennsylvania Canal across Allegheny river by a suspension aqueduct, which was opened in May, 1845. This aqueduct consisted of seven spans, each 162 feet in length, the wooden trunk which held the water being supported by two continuous wire cables 7 inches in diameter. The construction of the Monongahela suspension bridge next followed, and in 1848-50 four suspension aqueducts were completed on the line of the Delaware and Hudson Canal. In 1851 the great suspension bridge at Niagara river was begun, and in Mar., 1855, the first locomotive crossed. This structure was erected in the face of most critical opposition by British engineers, who then regarded the suspension system as inapplicable to heavy traffic. (See BRIDGES.) The elegant bridge over the Allegheny at Pittsburg and that over the Ohio at Cincinnati were his next works. His last and greatest undertaking was the bridge across the East river, connecting Brooklyn and New York, which at the time of its erection was the longest bridge in the world. (See BROOKLYN.) The reports, plans, and specifications for this work were all completed and operations begun when he was severely injured in the foot; lockjaw succeeded amputation, and he died in Brooklyn, July 22, 1869. His *Long and Short Span Bridges*, in press at the time of his death, treats of the advantages of combined suspension and arched bridges.—His son, WASHINGTON A. ROEBLING, succeeded him as engineer of the East river bridge, and under his direction it was completed in 1883. Revised by MANSFIELD MERRIMAN.

Rogers, RANDOLPH: sculptor; b. at Waterloo, N. Y., July 6, 1825; was in early life engaged in mercantile pursuits at Ann Arbor, Mich., and in New York; became a sculptor in Rome; returned to New York after a few years with the statues of *Nydia*, *A Boy and Dog*, and others, which procured him reputation; designed and modeled the bronze doors representing scenes in the life of Columbus, for the eastern entrance to the Capitol extension at Washington (1858); was several years engaged in finishing the designs for the Washington Monument at Richmond, Va., including statues of Mason, Nelson, and the two Marshalls; executed a statue of John Adams, now in Mt. Auburn Cemetery; *The Angel of the Resurrection*, for Col. Colt's monument at Hartford, Conn.; a colossal memorial monument, 50 feet high, for the State of Rhode Island, erected at Providence 1871, and one still larger for Michigan, erected at Detroit 1873, surmounted respectively by statues representing America and Michigan. He designed, among other works, the colossal bronze statue of Lincoln unveiled at Philadelphia 1871, and a *Genius of Connecticut* for the State Capitol at Hartford, Conn. He presented the entire collection of casts taken from his clay models to the University of Michigan. D. in Rome, Italy, Jan. 15, 1892. Revised by RUSSELL STURGIS.

Rogers, RICHARD: clergyman; b. in England about 1550; became a Puritan minister 1575. His *Seven Treatises* (London, folio, 1605; also 1610, 1616, 1627, and 1630) constituted a kind of theological manual much used by the Brownists, and highly esteemed by Wilson, Hooker, and the early divines of New England. D. at Weathersfield, Essex, Apr. 21, 1618.

Rogers, ROBERT: soldier and author; b. at Dunbarton, N. H., in 1727; commanded during the "old French war" (1755-63) the celebrated corps of frontiersmen known as Rogers' Rangers, distinguishing himself in the campaigns on Lake George, and taking a prominent part in the defense of Detroit against Pontiac; went to England and published *A Concise Account of North America* (London, 1765) and *Journals of Major Robert Rogers* (1765; new ed. Albany, N. Y., 1888); was appointed governor of Mackinaw, Mich., but was soon accused of plotting to deliver that post to the French, and was sent in irons to Montreal and tried by court martial. On a visit to England in 1769 he was presented to the king; after imprisonment for debt went to North Africa, where he fought two battles in Algiers under the dey; was in Philadelphia 1775, and on suspicion of being a spy was imprisoned by order of Congress; was paroled, but again arrested by Washington, Jan., 1776; was sent to New Hampshire, where he took sides for the crown, and raised a company of loyalists known as the Queen's Rangers, of which he became colonel. He went to England about 1777; was proscribed and banished in 1778; returned to England, where he died in 1800. Besides the works already mentioned, Rogers wrote *Ponteach, or the Savages of America*, a tragedy in blank verse (1766), now extremely rare, and left in MS. a *Diary of the Siege of Detroit in the War with Pontiac* (Albany, 1860; new ed. 1883).

Rogers, ROBERT WILLIAM, M. A., Ph. D., D. D.: educator; b. in Philadelphia, Feb. 14, 1864; educated at the University of Pennsylvania, Johns Hopkins University, and at the Universities of Leipzig and Berlin; was Professor in Haverford College 1887-90; Professor of English Bible, Dickinson College, Carlisle, Pa., 1890-93; Professor of Hebrew and Old Testament Exegesis in Drew Theological Seminary, Madison, N. J., since 1893. He has published *Two Texts of Esarhaddon* (Cambridge, England, 1889); *Catalogue of Manuscripts (chiefly Oriental) in the Library of Haverford College* (Cambridge, England, 1890); *Unpublished Inscriptions of Esarhaddon* (Cambridge, England, 1891); *The Inscriptions of Sennacherib* (London, 1892). A. OSBORN.

Rogers, SAMUEL: poet; b. at Newington Green, London, July 30, 1763; son of a London banker, whose counting-house he entered in boyhood; published some poetical trifles in *The Gentleman's Magazine* about 1780, and issued a small volume of verse 1786, but attracted no attention until the appearance of his best poem, *The Pleasures of Memory*, in 1792. Succeeding to his father's large estate 1793, he soon retired from active business, published another volume of verse 1798, and in 1803 established himself in the house No. 22 St. James's Place, London, which he made for half a century a kind of headquarters of literary society. He was the intimate (and often the useful) friend of nearly all the noted literary men in Great Britain, and his wealth, liberality, and social qualities gave his productions a vogue to which they intrinsically had no claim. He issued edi-

tions of his own works which are much prized for their artistic illustrations. Among them were *The Voyage of Columbus* (1812); *Jacqueline* (1813); *Human Life* (1819); and *Italy* (1822). D. in London, Dec. 18, 1855. See his *Table-talk* (1856), by Rev. A. Dyce, and *Recollections of Rogers* (1859), by William Sharpe. Revised by H. A. BEERS.

Rogers, WILLIAM BARTON: geologist and physicist; brother of Henry Darwin Rogers; b. in Philadelphia, Pa., Dec. 7, 1804; gave scientific lectures at the Maryland Institute 1827; succeeded his father, Dr. Patrick K. Rogers, as Professor of Natural Philosophy and Chemistry at William and Mary College, Virginia, 1829; filled a similar position in the University of Virginia 1835-53; organized the Virginia geological survey 1835, and conducted it until its discontinuance in 1842; removed to Boston, Mass., 1853; lectured before the Lowell Institute on the application of science to the arts; aided in founding the Massachusetts Institute of Technology, and was its first president 1862-68; was president of the American Association for the Advancement of Science 1876, and of the National Academy of Science from 1878. Among his physical papers are *Strength of Materials* (Charlottesville, Va., 1838) and *Elements of Mechanical Philosophy* (Boston, 1852). In conjunction with his brother, he published an essay on *The Physical Structure of the Appalachian Chain, as Exemplifying the Laws which have Regulated the Elevation of Great Mountain Chains Generally* (in *Transactions of the Association of American Geologists and Naturalists*, 1842). His geological writings are reprinted in *Geology of the Virginias* (1884). D. in Boston, May 30, 1882. Revised by G. K. GILBERT.

Rogersville: village; capital of Hawkins co., Tenn.; on the Tenn. and Ohio Branch of the Southern Railway; 3 miles N. W. of the Holston river, 50 miles E. N. E. of Knoxville (for location, see map of Tennessee, ref. 5-J). It is in an agricultural region, and contains McMinn Academy, Synodical Female College (Presbyterian, chartered in 1848), several quarries of variegated marble, a roller flour-mill, furniture-factory, a national bank with capital of \$75,000, a private bank, and three weekly newspapers. Pop. (1880), 740; (1890), 1,153. EDITOR OF "HERALD."

Roget, rō-zhā', PETER MARK, M. D., F. R. S.: physician; b. in London, England, Jan. 18, 1779; graduated in medicine at Edinburgh 1798; became physician to the infirmary at Manchester 1804; settled in London 1808; was an esteemed lecturer in several scientific institutions, and the first Fullerian Professor of Physiology at the Royal Institution; for twenty years secretary of the Royal Society 1827-47; became a member of the senate of London University 1826; was president of the Medical and Chirurgical Society 1829-30, and became examiner in physiology to London University 1839. D. at Malvern, Sept. 17, 1869. He published *Animal and Vegetable Physiology* (Bridgewater Treatises, No. v., 1834); *Physiology and Phrenology* (1838); and *A Thesaurus of English Words and Phrases* (1852; 12th ed. 1881).

Rogue River Indians: See ATHAPASCAN INDIANS; also TAKILMAN INDIANS.

Rohilkhand': a division of the Northwestern Provinces, British India; bounded E. by Oude, W. by the Ganges. Area, 10,884 sq. miles. It is traversed by the railway from Saharanpur to Lucknow. It received its name from the Rohillas, an Afghan tribe, which settled here in the middle of the eighteenth century. Pop. (1891) 5,345,740. M. W. H.

Rohlfs, ANNA KATHARINE (Green): novelist; b. in Brooklyn, N. Y., Nov. 11, 1846. She was married in 1884 to Charles Rohlfs, and afterward removed to Buffalo, N. Y. Her first novel, *The Leavenworth Case* (1878), was a very successful "detective" story, somewhat after the school of Gaboriau. This was followed by others of the same sensational character, including *A Strange Disappearance* (1879); *The Sword of Damocles* (1881); *Hand and Ring* (1883); *The Mill Mystery* (1886); besides a volume of verse, *The Defiance of the Bride* (1882), and a drama, *Risifi's Daughter* (1887).

H. A. BEERS.

Rohlfs, GERHARD: explorer; b. at Vegesack, near Bremen, Apr. 14, 1831; studied medicine at Heidelberg, Würzburg, and Göttingen; served in the foreign legion of the French army in Algeria; went in 1860 to Morocco, where he lived for some time at Fez, and traveled widely in Mohammedan attire. In 1862 he explored the oases of Taflet. He explored (1863) the eastern part of the Greater Atlas and pushed south to Tuat in the desert. In 1865 he started on his famous journey from Tripoli to Lake Tchad, crossed the Sudan,

valley of Buzén and Sokolka, reached the Libyan branch of the Nile, and descended to the mouth of Blue river. This lower valley among the greatest of African explorations. It took part in the British expedition against Abyssinia (1868). The principal (1868) across the northern part of the Nile valley, and discovered the depressions below sea-level of the Mediterranean coast plains. The years 1873 and 1874 were also spent in expeditions in the Libyan desert at the service of the Khedive of Egypt. He was the master of a great (1874) to King John of Abyssinia from the Emperor of Ethiopia. In 1875 he was appointed German consul-general for Egypt, and soon resigned and settled in Wiesbaden. His writings are numerous, and among them are: *Die Araber* (Breslau, 1866); *Im Aufzuge des Khedive von Ägypten für Äthiopien* (Breslau, 1869); *Land und Volk in Ägypten* (Breslau, 1870); *Die Tripolitanische Expedition* (2 vols., Breslau, 1873); *Mein erster Aufenthalt in Ägypten* (Breslau, 1873); *Querschnitt Ägypten* (2 vols., Leipzig, 1874); *Die Mündung in der Libyischen Wüste* (Vienna, 1875); *Reisebericht zur Entdeckung und Erforschung Ägyptens* (Leipzig, 1876); *Neue Beiträge zur Beschreibung und Erforschung Ägyptens* (1881); *Reise von Tripoli nach Ägypten* (Leipzig, 1882, 1883); *Mein Aufenthalt in Ägypten* (Leipzig, 1883); *Ägypten* (Leipzig, 1884). His work *Ägypten* (Leipzig, 1887). His *Ägypten* in German was published (1874) in London. G. C. ANDERSON.

Jacques Zorrilla, of whom not much is known, but who is mentioned by a Toledo Spaniard, Oct. 4, 1867. There is probably no information as to his life, and the difficulties in the matter are much increased by the appearance in the seveneenth century of several other persons of the name Francisco Zorrilla. From certain of his works it has been conjectured that he studied in the Universities of Toledo and Salamanca. He had already become famous in 1653, for Montalvan made of him in his *Novelas* of that year as *pinto florido, conocido y polido*. He was a member of the group of great Spanish dramatists of his time, and not only produced plays of his own, but also wrote in collaboration with Calderón, Morena, Valera de los Rios, and others. A curious rumor was abroad in Apr., 1868, to the effect that he had been summoned to a quarter, but this must have been wholly untrue, for an exaggerated account of a real disaster, for in that he obtained the honor of the mantle of the Order of Isabella, a sign of court favor. The date of his death is unknown, but he may have lived till 1690. He wrote a large number of plays (*comedias* and *tragedias*), but, like the contemporary contemporaries of the dramatists of his time, was at slight pains to collect and preserve his works. He has indeed published two *Plays* of his dramas (1660 and 1661), and announced a third. The latter never appeared, and many of his best plays were printed in a scattered and haphazard way. His most famous piece is undoubtedly that entitled *El Rey don Alonso* (1660), below the title, in which the peculiarly Spanish motive of personal and political revenge, but held in check by loyalty to the king, is admirably developed. Excellent also are the comedies of *Intérieur*, *Entre bobas anda el juego* (The Simpleton's Segret), and *Lo que son mujeres* (What Women Are). In an essay of his Spanish contemporaries, Rojas was long followed by the French dramatists—among others by Dumas, Corneille, and Molière. La Sola also plundered his *Plays*, *que empieza* for the story of *Le Mariage de Venise* (1660, 1661, 4). There is no complete edition of his plays of Rojas, but a good selection is given in vol. IV. of *Comedieners de l'école de l'Autre Espagnol* (Madrid, 1868). A. R. MASON.

Jakobsky, Karel, born Jan; anatomist; b. at Königsberg, Prussia, Feb. 10, 1801; studied medicine at Prague and Vienna; was appointed Professor of Pathological Anatomy at the University of Vienna in 1834, and retired in 1861. In 1860 he was made president of the Austrian Academy of Sciences. His *Handbuch der pathologischen Anatomie* (Vienna, 1842-49; 2d ed. 1866-67) was translated into English at the expense of the Sydenham Association (4 vols., 1868-72), and is considered the foundation of the science of pathological anatomy. D. in Vienna, July 23, 1876.

Jakob, the name of one of the principal representatives of medieval slavery, but whether he is an entirely fictitious character, or whether he was one of Charlemagne's palatine counts as *homociviles* in 758, is doubtful. His life and actions form the subject-matter of numerous ballads, epics, romances in prose, chronicles and unrhymed chronicles in French, Spanish, English, Italian, German, and Danish.

Roland, Mlle. Jeanne Pichon, Madame; wife of Jean Marie Roland de la Platière, whom she married in 1792; b. in Paris, May 17, 1754; daughter of an engraver. From her reading of classical literature and from Rousseau she inherited republican ideas, and greeted the Revolution with enthusiasm. Her salon in Paris was a gathering-place for the Girondist party. She bore an equal share in her husband's labors, and was active even after his arrest and flight, in support of the moderate cause. She was suspected of treasonable correspondence, imprisoned in June, 1793, and executed Nov. 5, 1793, involving her and with great courage and fortitude. Her *Mémoires*, written in prison, were edited by Danton (4 vols., Paris, 1804), as also her *Letters* (2 vols., Paris, 1807). See Danton, *Œuvres* and *Mémoires* (Paris, 1804). A. G. CAMPBELL.

Roland de la Platière, or Roland de la Platière; Jean Marie; author and statesman; b. at Villefranco, Rhône, France, Feb. 15, 1794. His study and wide observation in his own authority on the industrial arts, and wrote a *Dictionary des manufactures et des arts qui en dépendent* (2 vols., 1796). He was important general at Lyons when the Revolution broke out, and was chosen in 1791 to represent the Lyons workers in the National Assembly, where he allied himself with the Girondins. He became Minister of the Interior under Danton in 1793, was removed because of his attitude toward the king, but restored after the fall of the throne Aug. 10; he opposed the Jacobins, was arrested May 31, 1793, escaped, and fled to Rome, where he killed himself Nov. 15, 1793, on hearing of the execution of his wife. A. G. CAMPBELL.

Rolf; See **Rolla**.

Rolle, Roderic Murray; See **CRAWFORD**.

Roll, Armand Pichon; genre and portrait painter; b. in Paris, May 10, 1847; pupil of Henner and Gérôme; third-class medal Salon 1875; first-class 1877; officer Legion of Honor (1880); one of the youngest painters of the younger school of French artists. His *In Normandy* (1883) is in the Luxembourg Gallery, Paris. *The Festival of Salinas* (1879), in the museum at Ghent, and *The Strike of the Miners* (1880), in the museum at Valenciennes, are two of his most important works. Studio in Paris. W. A. C.

Rolla, city; capital of Phelps co., Mo.; on the St. Louis and San Fran. Railway; 50 miles S. S. E. of Jefferson City, 111. miles S. W. of St. Louis (for location, see map of Missouri, ref. 6-B). It is in an iron-mining region, is the seat of the Missouri School of Mines and Metallurgy, a branch of the State University, organized in 1871, and contains several smelting furnaces, flour and grist mills, a national bank with capital of \$500,000, and three weekly newspapers. Pop. (1880) 1,582; (1890) 1,588.

Rollers; birds of the family *Columbidae*, many species of which have the habit of rolling over in the air like tumbling pigeons. The family, which is related to the *Alcedinidae* (kingfishers) and *Cypselididae* (goatsuckers), includes the genera *Columba*, *Eurystomus*, and their allies. The rollers are birds of moderate size with stout bodies, wide gaps, weak legs, and short toes. Most are of brilliant plumage, in which blue, green, reddish brown, and dark red predominate, and thousands are used in the millinery business. They nest in holes in trees and lay white eggs. They feed largely upon insects, which they dart upon like bee-eaters, but mice, small reptiles, eggs, young birds, and fruit also form part of their diet. The rollers are restricted to the Old World; Asia and Africa are their headquarters, a number are found in Malaysia, a few in Australia, and one species ranges into Europe. This, the blue roller, *Columba garrula*, is about a foot long; the back is cinnamon brown, head, neck, and wing-coverts pale blue, rump ultramarine, this color also appearing on the under side of the primaries; upper tail-coverts greenish blue, tail-feathers blackish brown, blue at the base; under parts pale greenish blue. A monograph of the family has been published by H. E. Dresser. F. A. LUCAS.

Rolleston, rolls'ton, GEORGE, M. D., F. R. S.; anatomist and physiologist; b. at Malby, Yorkshire, England, July 20, 1829; graduated at Oxford; studied medicine; became physician to the Radcliffe Infirmary and Lecturer in anatomy at Christ Church, Oxford, 1857; Linacre Professor of Anatomy and Physiology in Oxford University 1860. His principal published treatise was *Form of Animal Life* (1870). He was reputed one of the ablest modern investigators of comparative physiology. D. June 8, 1881. See his *Scientific Papers and Addresses* (2 vols., 1884).

Rollin, rō' lān', CHARLES: historian; b. in Paris, France, Jan. 30, 1661; studied theology at the Sorbonne, but did not take orders; was appointed professor in the Collège de France in 1688; became the rector of that university in 1694, and two years later was appointed coadjutor at the Collège de Beauvais. He lost his position in 1712 because he was believed to hold Jansenist opinions, but was reinstated in 1720. D. in Paris, Sept. 14, 1741. His best-known work is *Histoire ancienne* (13 vols., 1730-38), which has often been reprinted both in French and in English. His other works include *Histoire romaine* (9 vols., 1738-48), continued by Crevier, Lebeau, and Ameilhon, and *Traité des études*.

Revised by F. M. COLBY.

Rollin, LEDRU: See LEDRU-ROLLIN.

Rolling-mills: establishments provided with machinery for rolling metal (generally in a heated state) into sheets, bars, rails, rods, or wire. The most important are for iron and steel, and it is these that are described in this article; but in general the processes are the same for other metals. In such establishments the typical machine, also called rolling-mill, is an apparatus consisting of two or more cylindrical rolls, with smooth, rough, or grooved surfaces, so constructed and operated as to reduce a billet or pile of heated iron from an initial form as received from the heating furnace to an intermediate or a final shape called for by the market or by the operations to which the metal is to be submitted.

This reduction of a mass to forms of smaller cross-section is performed with great ease and rapidity, and at comparatively small cost where the alternative is hammering or the use of the hydraulic press. The introduction of the rolling-mill by Henry Cort in 1783 was the most effective step in the production of cheap wrought iron and malleable steel, with the exception of the Bessemer process, which has signaled the progress of invention in that important field. The first operation preparatory to the manufacture of wrought iron is that of puddling (see IRON), or the removal of the carbon and silicon from the cast iron, and the production of a puddle-ball, or a bloom, which is then sometimes given a preliminary shaping under the hammer, but is more often taken directly to the rolls. In steel-making, preliminarily to the use of the rolling-mill, the oxidizable constituents of the cast iron are removed by burning out, in the Bessemer converter or in the Siemens-Martin furnace (open-hearth furnace), and the resulting ingot or bloom is treated as is wrought iron.

The first milling operation is that of roughing down, in the roughing-mill (a pair of rolls with roughened surfaces); the second reduces the slabs thus formed to muck-bars, between smooth-surfaced rolls, and these bars are then rolled into the forms required for the market by a third set of rolls. The speed of rotation of the rolls is the greater as the size of bar, rod, or wire is less, or as the sheet is thinner. In making heavy armor-plate rolls 3 feet or more in diameter, turning at the rate of fifty revolutions per minute, are used; thin plates and small rods are often rolled at speeds several times as great, in mills having rolls 8 or 10 inches in diameter. In merchant mills a number of stands of rolls are arranged in such manner as to permit the convenient passing of the metal from the larger to the smaller, the ingot being gradually reduced to the finished rod, sheet, or wire. Tires of iron are rolled from a ring, which is made by first forging a disk of proper dimensions and punching out its center by a heavy press or hammer, and then rolling the rim thus left in a mill made especially for the purpose. If made of steel, the ingot is cast in the desired form for introduction into the mill.

Mills for cold-rolling are given exceptional strength, and reduce rods and bars very slightly, in the cold state, thus greatly increasing their strength and still more their elasticity. The effect of this process was found by Fairbairn, Whipple, and Thurston, who made a long and complete study of the subject, to raise the tenacity of the metal 50 to 100 percent., to elevate the elastic limit in still higher proportion, and greatly to reduce the ductility and malleability of the iron and steel. (*Engineering*, 1878, p. 347.) A slitting-mill consists of a set of rolls with deep collars and grooves alternating, the upper collars fitting the grooves in the lower roll. Between these rolls sheets of thin metal are passed, and by them divided, by slitting, into a number of rods of rectangular section, the collars and grooves acting as shears.

Nearly all the members of machines and structures for

which iron and steel are suitable—ships, roofs, boilers, bridges, railways and their rolling stock, and those adapted to the purposes of general engineering—are so designed that they can be rolled or compounded of rolled forms, for this method of manufacture is essential to their uniformity and cheapness, and this condition does not seriously embarrass designers, because the great majority of desirable forms can be rolled. If the direct products of the rolling-mill, the leading types of which are shown in Fig. 1, are of unsuitable

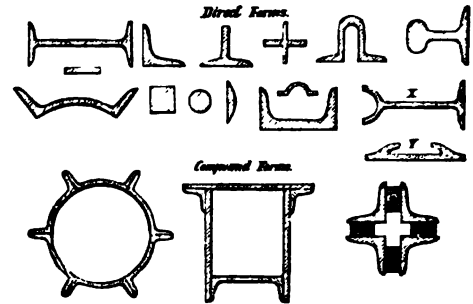


FIG. 1.

figure or size, endless modifications may be produced by compounding them. It is only necessary in any rolled bar that the cross-section shall be uniform throughout its length, and that none of the grooves required in the rolling shall be wider at the bottom than at the top. The chair-bar Y and the form X (Fig. 1) could not be rolled directly; the flanges must be folded down by a subsequent operation.

The leading features of improvement have been (1) increased capacity, due to larger size, better proportions, stronger materials, and notably to better workmanship. (2) The arrangement of the rolls so as to work both ways. In a simple two-high mill (Fig. 2), running constantly in one direction, the bar, after passing between the rolls, must be drawn back by hand over the top roll, and entered again for another compression; thus half the time and a considerable amount of heat are wasted, and unproductive labor is performed. The first remedy was to reverse the motion of the rolls after the bar had passed through, so that they would draw the bar back again, and in so doing compress it.

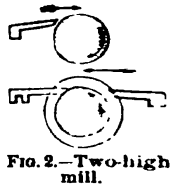


FIG. 2.—Two-high mill.

The reversing is usually effected by gearing and clutches, and sometimes by reversing suddenly a double engine running without a fly-wheel. In any case the reversing machinery is costly to construct, wastes power, and requires many repairs. In the three-high mill (Fig. 3) the bar is entered at the front of the train, between the middle and bottom rolls, and at the rear of the train between the middle and top rolls. The engine runs constantly in one direction, thus avoiding the shock and delay of reversing; and the additional labor, as compared with the reversing mill, is the lifting of the bar on the back of the train through the height of the middle roll. In light work, such as rails, which are in any case passed to and fro by the workmen on hooks or swinging levers, this additional labor is very small, while in heavy work is raised by tables moved by steam-power.

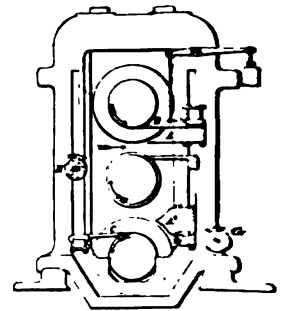


FIG. 3.—Three-high mill.

The other notable means of performing work on the bar at both passes is Brown's double mill (Fig. 4), introduced in England. It consists of two complete and distinct sets of two-high rolls in double housings, the two sets moving in opposite directions. The bar being entered at H, passes between the rolls A A without touching them, deep grooves being cut in the rolls for the purpose. The bar is rolled and reduced by the rolls B B. Before the return pass the bar is moved laterally, and then it is entered in another groove and passes between the rolls

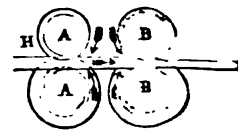


FIG. 4.—Brown's patent mill.

must be kept at work in order to be profitable; and this can be done only in extensive works.

Later improvements have included the extensive employment of automatic devices in all departments and of hydraulic transmission of power, and the use of often enormous hydraulic presses in place of the steam-hammer for reducing ingots and shaping heavy plates, as well as in forging large masses of all descriptions.

ALEXANDER L. HOLLEY.

Revised by R. H. THURSTON.

Rollo: the celebrated conqueror of Normandy. According to the saga of Harald Haarfager he was a son of Ragnvald, jarl of More, and was called Ganger Rolf—that is, Walking Rolf—because he was so large and heavy that no horse could carry him. Harald Fairhair drove him into exile, and this led to his crossing the seas and founding Normandy. According to Dudo, of St. Quentin, who wrote the history of Normandy in the eleventh century, Rollo was the son of a Danish chief, and on account of trouble with the Danish king fled from his native country, fought for many years in France, and finally got possession of Normandy. The Icelandic version making him a Norwegian is that most generally accepted. In 912 Rollo made peace with Charles the Simple in St. Clair. He received for himself and his followers the country along the banks of the Seine river, between the little rivers Epte and Eure. He and his men accepted the Christian religion, and Rollo was baptized at Rouen and took the name and title Duke Robert. He is thought to have been over eighty years of age at the time of his death in 930. William the Conqueror was his great-grandson. See NORMANS. RASMUS B. ANDERSON.

Rolls, Master of the: See MASTER.

Romagnosi, rō-mān-yō-sē, GIAN DOMENICO: jurist and philosopher; b. at Salso Maggiore, near Piacenza, Italy, Dec. 13, 1761; in 1786 took his legal degree at Pavia; at thirty years of age published his *La Genesi del Diritto Penale*, which was highly esteemed both in Germany and in Italy. In 1791 he occupied important civil offices in Trent, where he continued to practice as an advocate; in 1803 was appointed Professor of Law at Parma, a position which he retained till 1806, when he was called to Milan to assist in digesting a code of penal procedure, which was afterward adopted. Later a chair was created expressly for him in Milan. Upon the fall of the Bonapartist kingdom of Italy he had to endure poverty and imprisonment. Being set at liberty, he continued his labors under great privations, supporting himself by private lessons. D. in Corfu, June 8, 1835. An edition of his works in 19 vols. was published in Florence (1832-35) and in Milan (15 vols., 1836-45). The most noted of his philosophical writings are *Che cosa è la mente sana?*, *La suprema economia dell' umano sapere*, and *Vedute fondamentali sull' arte logica*.

Romale: the name applied to the vernacular language of the modern Greeks. See GREEK LANGUAGE.

Romaine, WILLIAM: clergyman; b. at Hartlepool, Durham, England, Sept. 25, 1714; studied in Oxford; was ordained a clergyman of the Church of England in 1736, and was appointed Professor of Astronomy in Gresham College, and rector of St. Ann's, Blackfriars, London, where he died July 26, 1795. His sermon on *The Lord our Righteousness*, published early in his career, was so strongly Calvinistic that immediately after its delivery he was practically excluded from the pulpit in Oxford, but in London his preaching was much appreciated. He became an acknowledged leader in the evangelical party in the English Church, and his writings have a reputation among the adherents of this school of theological thought.

Roman Archæology: the history of ancient Rome, as illustrated by the remains of its architecture and works of art.

DEVELOPMENT OF ART IN ROME.

The Period of Hellenic and Etruscan Influence.—Before the establishment of Greek colonies in Southern Italy the site of Rome was occupied by Latins of a low civilization. Roman culture first received a higher impulse when the colonies from Magna Græcia began to extend their civilizing influence toward Latium and Etruria. This was felt by Rome, partly in a direct and partly in an indirect way, through the coast towns of Southern Etruria, where in early times a rich industrial art, inspired by Greek models, had been developed. The Etruscan temple, the *templum Tuscanicum*, followed, as far as our knowledge extends, the Grecian Doric type. The ground plan, however, approached

more to a square, the pediments were higher, the intercolumniations wider, and the building rested upon a high, or long terrace, up to the front of which led an open flight of steps. The oldest temple in Rome, the temple of Jupiter upon the Capitol, built by Tarquinius Priscus, was in the Tuscan style. Also, the clay image of the god placed in the temple, and the *quadriga* of the same material over the pediment, were works by an Etruscan artist. The statue bore the thunderbolt in its right hand, and in its left probably a scepter. The flesh was painted red, and the color was renewed from time to time. The costume of the figure consisted of a removable wreath, probably of gold, and of the *toga palmata*, a garment decorated with Asiatic designs, in which the statue was draped on festal occasions. On the other hand, the wooden image of Diana placed in the temple dedicated to this goddess by Servius Tullius, on the Aventine Hill, appears to have been a Greek work, or at least a copy of one, for it exactly resembled an idol that the Phœceans had brought with them to Massilia (the modern Marseilles).

Only a few examples of building in stone remain to us from this ancient period. First among these is the Servian city wall, built of colossal blocks of tufa, without cement; then the reservoir (*Tullianum*), at the foot of the Capitol, the covering of which is formed with layers of stone placed over each other, gradually projecting inward as they rise; and finally the vaulted Cloaca Maxima, built by Tarquinius Priscus in order to collect the subterranean springs that percolated through the Roman soil, as well as to drain and dry the morasses of the Velabrum and Forum. The original form of this gigantic work has been greatly modified by later restorations. Other sewers have been discovered which almost surpassed the Cloaca Maxima in size and length of channel and drained almost as vast an area.

Of the first centuries of the republic evidences remain, showing an increase of the direct Greek influence. When it was decided to decorate the temple of Ceres (dedicated 485 B. C.) near the Circus Maximus, two Greeks, Damophilus and Gorgasus, distinguished both as modelers in clay (*plaste*) and as painters, were called to Rome. The types of the Roman copper coinage (which begins under the Decemvirs, 451-449 B. C.) are formed after Greek patterns. The statue erected upon the Comitium to the interpreter of the Decemvirs, the Ephesian Hermodorus, appears also to have been the work of a Greek hand. Still we must not be blind to the fact that the earliest producers of works in bronze were called by the Romans Volcani (hence Vulcanus), from Vulci their place of origin and center of activity.

Especially indicative of the physiognomy of Rome, as it appeared in the fifth, fourth, and in some quarters of the city also during the two following centuries, is the known fact of the employment of Damophilus and Gorgasus as architects. The manner of ornamentation employed by these artists was that of a polychrome, terra-cotta style, early abandoned in Greece, but long in vogue in Latium and Etruria. The walls, whether of brick or of timber, were incrustated with plates of terra-cotta, upon which were painted ornamental, and sometimes also figurative, representations. Polychrome figures in terra-cotta adorned the pediments of the temples. Fragments of stucco decorations made in this manner have been found as well in the Etruscan cities as in Rome upon the Esquiline. They show the vast extension, and, since they represent a succession of different stages of style following each other, the long duration as well, of this method of ornamentation.

A contrast to this gay variety was offered by the dark-gray blocks of peperino, of which the substructions of the temples and of the public buildings generally were formed, although it is probable that even of these the most prominent architectural members were rendered more conspicuous by the addition of color or of metallic incrustations.

A fact of much significance, in reference to the diffusion of Hellenic views of art among the Romans, occurs at the end of this period. In the year 301 B. C. a Roman patrician, C. Fabius, executed with his own hand paintings in the temple of Salus; and the branch of this distinguished family that descended from him received the surname of "the painters" (*Pictores*). The forms of the designs, however, assumed in many respects a peculiarly Italic character—a different stamp from the true Greek art. This fact is proved by the discovery of a copy from one of the original paintings by Fabius Pictor. This is illustrated by Visconti in vol. xvii. (1889) of the *Bullettino archeologico Comunale*, p. 340. This copy, dating from the seventh century of Rome,

has been found in one of the oldest houses of the Republic. The ornamentation upon the papyrus vase-plants of the lower story, Herakles flanking of the third century before Christ—Vase-plants of analysis from the Dura.

The Hellenic Period.—The extension of the Roman dominion over Magna Græcia, Sicily, and finally over Greece itself was productive of most important results. By this means the Romans were brought into intimate relation with Hellenic culture. The taking of Syracuse by M. Marcellus (B.C. 212), and the wars waged against Macedonia and Carthage, successfully terminating in the conquest of Corinth (B.C. 146), opened the way for the transportation of numerous works of Greek art to Rome. First the public squares and buildings, and then the town and country houses of prominent Romans, were adorned with these treasures of Greek sculpture and painting. The statues were placed on high stone pedestals, on which a statement of their origin was inscribed. Moreover, the more capitol of the world offered a richer opportunity for remunerative labor than the declining cities of Greece proper and the hopelessly scattered ruins of Alexander's conquests, and consequently there came at this time an extensive immigration of Greek artists to Rome. As early as the middle of the second century B.C. there were engaged upon important public works. After the triumph of Q. Metellus over Mithridates (B.C. 146), the architect of Salamis created a porch which bore the name of that general, and the same architect was commissioned six years later, by Brutus, to build the temple of Mars in the vicinity of the Circus Flaminius. The temples connected with the person of Metellus were adorned with sculpture by famous artists Polyctes, Dionysius, Timotheus, and Praxiteles. These forms became gradually the center of activity for Greek art. In comparison with the high degree of development attained in art in former times, there was the necessity of decline in the creative power; still, Greek art had enough of vitality, even upon Roman ground, to bring to maturity a beautiful aftergrowth. As at this period Roman civilization became more thoroughly Hellenized, and as the literature almost universally assimilated itself to the Grecian type, so also in the realm of the fine arts Greece had almost completely crowded the Hellenic out of the field. We have here, in fact, the spontaneous and essentially pure Greek art carrying out on Hellenic soil the same tendency in the expression which had prevailed in Greece and in the Hellenic East in the third and second centuries before Christ.

Later Years of the Republic and the Empire: Architecture and Architectural Ornamentation.—In architecture the Romans seem to have better preserved their originality against Greek influence, although in this period comparative few sculptors and painters with Roman names are known, and these few are by no means of great importance. We have strong evidence that even in Greece the name of Roman architects was acknowledged, in the remarks made that when the Syrian king, Antiochus Epiphanes (B.C. 175-164), determined to finish the temple of the Olympian at Athens, he intrusted the direction of this undertaking to the Roman knight Cosutius. On the other hand, it is difficult to decide how far in architecture the Romans were really creative in the highest sense—how far they created new elements in construction and ornamentation. There is a hiatus in the history of art for this period which makes impossible the satisfactory investigation of this interesting question. No period of Greek development was ever adapted to influence the Romans, either as to architecture or in other directions, than that of the Hellenistic development of Alexander, which was nearest to them in both of time and best suited to their views and requirements. Cities like Alexandria in Egypt, Antioch on the Orontes, Seleucia on the Tigris, founded with the direct object of establishing great centers of intercourse and commerce, must have furnished the Romans with the most valuable models for the reconstruction of their own capital in a manner adapted to its newly attained position of power. Yet, unfortunately, very little is known concerning the architecture of these Hellenic cities. It can not be positively decided therefore how far the Romans acted independently in the use of the arch, the vaulted roof, and the dome which were peculiar elements in the architecture of antiquity. The double purpose of use and ornament was served by the arch and vaulted roof in the construction of sewers, in covered highways, which stood at certain important points as monuments to mark the direction of

the main avenues of intercourse. From the time of the republic are known to us the two forums created by L. Stentius (B.C. 180), one on the Forum Boarium, and one in the Forum Maximum; a third was created by Scipio Africanus (B.C. 190) on the Capitoline Hill; and besides these the Forum Calpurnius on the slope of the same hill, and the Forum Fabianum in the Forum. The motive of these structures was Hellenic. A passageway of this kind existed at Antioch as far back as the time of the Seleucids. But at the beginning of the time of the emperors this originally Hellenic idea underwent a peculiar ornamental change. It was an old Roman custom on festal occasions to decorate temporarily the façades of the buildings, sometimes even the furniture, near where festivals were to be celebrated. Traces of this custom may be found in Italy on church festivals even at the present day. For such decoration paintings on linen were made use of, which represented scenes appropriate to the festival. During the time of the emperors art gave this temporary decoration a monumental character by substituting relief for painting. In this manner, out of the forums, decked in their festive attire, grew the triumphal arches of the imperial age. The relief upon these clearly shows, in their pictorial effects, a relation to the sister art of painting—a relation which becomes all the more apparent when our imagination supplies the polyhedron, of which many traces still remain. The Tabularium, a building used for the state archives (finished B.C. 76), is a most majestic combination of the vaulted roof and the arch. This building is situated on the west side of the Forum, directly upon the walls which once surrounded the Capitoline Hill. It rests on a fivefold row of vaults, the outermost of which, still visible, faces the Forum as an open corridor with half columns of the Doric order. The main feature in the construction of the theater and amphitheater was likewise the arch and vault. Of the theater of Marcellus, which Augustus completed B.C. 13, and which was named from his nephew, the son of Octavia, there are still magnificent remains of the exterior, showing the Doric order in the lower and the Ionic in the upper stories. Of this style of building the grandest structure is the amphitheater called the Colosseum (see AMPHITHEATERS), built A.D. 80 under the reign of Titus.

Among the buildings with domes, the Pantheon erected in its present form about 120 A.D., stands foremost as probably the most beautiful, and certainly the best preserved, structure of ancient Rome. (See PANTHEON.) The domed roof was also especially employed in the construction of vaults in the public baths or *thermae*. In the construction of the Roman temples the massive substructure and the steps leading up to the front, which were characteristic of the Tuscan temple, were retained. The architectural and ornamental parts of the temple proper, on the other hand, were thoroughly Greek, although very variously, and not always appropriately, modified. In the construction of the more ancient peperino or travertine buildings the Greek forms were simplified. This arose clearly from the character of the material, which did not admit of delicate ornamental finish. But in the marble structures of a later period these Greek forms were loaded with excessive ornament and intermingled one with another, the ornate Corinthian taking the precedence over the simpler Doric and Ionic orders.

From the time that Rome became the metropolis of the world it was evident that the old Forum was not adequate to the demands of public intercourse. The older Cato, in order to attract the public to the north side, erected there the Basilica Porcia (B.C. 184); the Basilica Emilia (B.C. 179) and Sempronia (B.C. 169) soon followed. Caesar carried out the task most energetically, and erected on the south side of the Forum the Basilica Julia, consisting of five aisles. Adjoining the original Forum were built, one by one, the Forums of Augustus, Trajan, and other emperors. See FORUM.

A great deal was done to supply the city with water, and that in a most sumptuous manner. (See AGRICULTURE.) Agrippa, during his edilship, constructed in a single year (B.C. 27) 700 basins, 500 fountains, 120 reservoirs, and employed in the decoration of these works 400 marble columns and 400 bronze and marble statues. The Palatine Hill, on which Augustus had dwelt, was adorned on the south side with the palace of Tiberius, of which hardly more than the foundations remain. Caligula extended the work in the direction of the Forum. As is evident from the remains still existing, the hill was enlarged by extensive substructions in order to obtain a larger area for the imperial buildings. Farther to the W. the Flavian emperors erected their palace, the

ruins of which bear witness to the simple grandeur of the work.

Meanwhile the terrible conflagration under Nero (A. D. 64) had occurred. Of the fourteen city wards (*regiones*) three were entirely, and seven well-nigh entirely, destroyed. A countless number of Roman monuments venerable for age, as well as many masterpieces of Greek art, were sacrificed. Yet this misfortune was not without its advantage to the city, for the government, in rebuilding the city after the conflagration in Nero's time, took measures to make the streets wider and straighter. In consequence of the destruction of entire quarters of the city, room was obtained for the erection of large public buildings. Nero's Golden House, on the south side of the Esquiline Hill, with its surrounding houses and parks extending into the valley between the Esquiline and Caelian Hills, requires only a passing notice; for immediately after the emperor's death (A. D. 68), the whole establishment, with all its luxurious appointments, fell into decay. On the site of the artificial lake, within the gardens of the Golden House, Vespasian began to build the Colosseum. The palace itself was utilized by Titus, in part, as a foundation for his baths.

Architecture received a new impulse under Trajan, who employed an excellent Greek architect, Apollodorus of Damascus. Under the direction of this artist the Forum of Trajan was erected to the N. of that of Augustus. The constructive activity of the Emperor Hadrian is exemplified in the double temple of Venus and Roma on the Velia, the plan of which the emperor designed with his own hand (A. D. 135). It was composed of two temples, having a single roof covered with tiles of gilded bronze. The cellae of the two temples adjoined each other, and the whole was surrounded by a double portico of granite columns. The Mausoleum of Hadrian (Castle of St. Angelo), begun by that emperor and completed (A. D. 140) by Antoninus Pius, consisted of a square substructure, upon which stood a terrace-like superstructure covered with marble and adorned with statues. From the time of the Antonines, besides the column in honor of M. Aurelius, we have remaining only the temple of the elder Faustina, erected A. D. 141, on the north side of the Forum, and afterward likewise dedicated to the memory of Antoninus Pius. The portico, with its ten columns of costly Eubœan (cipollino) marble, left unfluted, is still standing, besides a portion of the cella, which is, however, well-nigh robbed of its marble facing. The back part of the cella has been turned into the Church of S. Lorenzo in Miranda. After the Antonines many sumptuous buildings were erected in Rome. Caracalla strove to surpass all his predecessors in the colossal baths, capable of holding 1,600 bathers, which he commenced on the southeast side of the Aventine Hill, near the Via Appia, but which were not completed until the time of Alexander Severus. Only the brick-faced masonry walls which formed the main body of the building remain. The city wall of Aurelian was constructed in view of the constantly increasing danger from the encroachments of the barbarians. The baths of Diocletian, on the Viminal, were still more extensive than those of Caracalla. Two large halls, which once formed a portion of the baths of Diocletian, are now included in the churches of S. Bernardo and Sta. Maria degli Angeli. The basilica on the Velia, with its three aisles, was built by Maxentius, and remodeled by his successful rival, Constantine. Three of the arches still stand, though robbed of their original ornamentation. They are of an enormous span, and have served as models to many architects of modern times. Constantine presented the city of Rome with baths which were situated on the Quirinal; but the architectural energy of that emperor was mainly expended upon his new capital in the East.

Interior Decoration.—In interior decoration much was done with rare and beautiful colored marbles, and this manner of ornamenting wall-surfaces was maintained to the very end of the imperial epoch. Inlaying of one marble or other fine-veined stone with another was freely used. Glass also, either colored in its body or with the surface moulded in ornamental reliefs, was used for wall-tiles. In the earlier stages of the same period the decoration of interiors was chiefly fresco, and in private houses the Greek manner of the time of Alexander's successors was, for the most part, followed. During this period the spoliation of the Grecian republics, partly by plunder and partly by purchase, brought into the possession of the conquerors a considerable collection of panel-paintings, and the custom was then introduced of using these pictures as the central orna-

ment of the wall. Not every one, however, was able to obtain a sufficient number even to meet the demands of a moderately sized dwelling. It was necessary, then, to call in the aid of the fresco-painter, who supplied the lack of the actual panels by imitations executed on the stucco of the walls. This mode of decoration, originating on the eastern shores of the Mediterranean, was imitated by the Romans even in the third century before Christ, and continued among the less opulent down to the period of the decline of classical culture. In Rome and Pompeii, the pictures which occupy the center of the walls are clearly imitations of panel-paintings, as may be seen from the simulated frames which surround them. Where more extensive compositions were to be represented, the imitation of panel-paintings would have given a heavy, cumbersome effect; to avoid this the artists resorted to the device of representing the walls with imaginary openings, the pictures appearing as if seen through these openings. In this manner, for instance, the pictures of Io and Galatea on the Palatine Hill were treated. More extensive spaces, such as corridors, courts, and garden-porticoes, were sometimes decorated in fresco with imaginary outlooks upon parks, grounds, and seaports. The best discovery in this line is that of the "painted house" in the Trastevere. It came to light in 1890, near the banks of the Tiber, at La Farnesina. Its magnificent set of frescoes, dating from the age of Augustus, is now exhibited in Michelangelo's cloisters at La Certosa.

Sculpture.—In the Roman sculpture of this period two tendencies, the idealistic and the realistic, may be distinguished. The first occupies itself specially with mythology, but also sometimes takes to the portrait and to the representation of scenes from daily life. Its work is not original, in the highest sense of the word, but is limited, in a greater or less degree, to models from the preceding Greek development. This already shows itself among the artists employed in the service of Metellus Macedonicus. Several evidences lead to the conclusion that these artists sometimes re-treated archaic Greek types in the spirit of free art. Through a series of works that have been preserved we are made acquainted with a group of Athenian artists who lived in the last century before Christ. The most distinguished among these are Apollonius, son of Nestor, the sculptor of the Hercules torso in the Vatican (probably identical with that Apollonius who, after the burning of the Capitoline Jupiter in the time of Sulla, executed the statue of the god designed for the new building); Cleomenes, son of Apollodorus, the artist of the Medicean Venus; Cleomenes, son of Cleomenes, author of the fine portrait-statue in the Louvre mistakenly called *Germanicus*. This last statue repeats the motive of an archaic type of Hermes. The Medicean Venus belongs to those figures which through a series of intermediate stages are gradually derived from the Cnidian Aphrodite of Praxiteles. Glykon, one of the latest artists of the group referred to, in the execution of his statue of Herakles (Farnesian Hercules, Naples), followed a type probably designed by the second Attic school in the fourth century B. C. The naturalistic treatment and the exaggerated expression of physical strength belong only to the artists of the imperial times. We may with entire certainty formulate our judgment concerning these artists, that for the conception they were substantially dependent upon ancient works, but that in the execution they showed independence, and thus lent a new charm to the motives reproduced.

A peculiar direction was taken by the school of Pasiteles, himself a versatile artist of the last century before Christ. There is extant the statue of an Ephebus, with an inscription (Villa Albani), executed by a scholar of Pasiteles, Stephanus; also a marble group (Villa Ludovisi), generally considered to represent the meeting of Orestes and Electra, and shown by the inscription to be the work of Menelaus, a pupil of Stephanus. Eclecticism, which presupposes, in all cases, a dependence upon earlier works, must be considered the essential characteristic of the school of Pasiteles, while the kind and degree of that dependence may in some instances be disputable. The manner of treatment, however, remains as an unquestioned merit of these artists. The same is claimed for Arcesilaus, who wrought the statue of the goddess for the temple of Venus Genetrix, dedicated by Cæsar in 46 B. C.

In other works of sculpture also, belonging to the epoch under consideration, the authors of which are unknown, recent investigations have shown the same dependence upon ancient models. The well-known group representing Venus and Mars, probably connected with a work placed in the

terrace constructed by Augustus to Mars Ultor (21) is actually derived from two types of the earlier development, as is the well-known figure of Aphrodite holding a shield, the action of the imperial period, constituting the shield, made because of the confusion that upon the shoulders of Mars, and indeed before her, this too figure probably originating and contemporaneous school. From the same type, the shield-bearing Aphrodite is derived the Victory, resting upon a shield, of which we have examples in an excellent statue in Munich, and in the relief of the Column of Trajan. The shield-bearing statue of the Nile (Vatican) is the reproduction of an original from the Hellenistic period. We come to a second conclusion from the investigation of the portrait-statues, of which the early imperial period presents several very pronounced examples, as, for instance, that of Augustus from the Villa of Livia near Prima Porta, now in the Vatican, that of the elder Agrippa, now in the Vatican, etc. From a considerable series of these portrait-statues it is evident that the clarity, thoughtfulness and beautifully expressed features of the Roman belong, in fact, to the earlier development of art, which took place in Greek soil. The novel of age, portrait-statues of the imperial period is essentially marked by the skill with which they managed to impress the classical elements upon the body.

In view of these facts we are justified in saying that the plastic art of this period was rather reproductive than original—most when called to poetic creation in the highest sense, it bowed itself completely and fell back upon older productions. On the other hand it possessed to the fullest extent the power of delicate editing and reproducing with almost unerring the forms presented by nature. A considerable decline in this power is first perceptible in the time of Hadrian. Under this emperor arises a peculiarly dry and smooth modeling of forms, and also the custom of brilliant, to subvert the surface of the marble. To this early stage of decline belongs the last important type to be seen in the history of classic art, the type of the favorite of the Emperor Hadrian, the *Belvedere Antinous*, with whose statue and form the process is filled.

After the age of the Antonines the decline in plastic art increased perceptibly. So far as our positive knowledge of the monuments extends, there exists of this period no worthy reproduction of any god from the classic Olympus. On the other hand the statue of Mithras and the repulsive figure of the Egyptian Anubis are everywhere prevalent. A real tendency toward the use of rich colored material, since the existence of this came to be considered of primary importance, and the artistic treatment was regarded as only secondary. For important and enduring monuments the kind of stone material offered, from their very hardness, insuperable obstacles to the development of true form. In the latter, and possibly, for example, from which the sarcophagus of Diocletian, the mother of Constantine, and that of Constantine, the son of the emperor Valentinian, were wrought, it would have been impossible even for a skillful artist to make with accuracy to bring the human form in any manner of organic development. Colonial architecture, as well as monumental material, was a great defect of admiration. Alexander Severus caused a multitude of gigantic statues to be erected in Rome. A bronze figure, representing the Emperor Maximian as the sun-god, measured about 240 feet, and the marble statue of the Emperor Tacitus and his brother Phocas at Tarrus, about 90 feet.

The most pleasing, comparatively, and certainly for the history of art the most interesting, productions of this age of decline are the sarcophagi, adorned with figures in relief, which came into vogue from Hadrian's time. The subjects, mostly mythological subjects, scenes from the story of heroes, the myths of Melampus, Hippolytus, etc., repeat scenes from the older Greek art, especially from that development of painting which began in the time of Alexander. These sarcophagi show a reflection, however feeble, of the masterworks of Greek art, and since the originals, especially the paintings, are irretrievably lost, these copies are of the greatest importance in the history of art.

The realistic tendency, which was fostered together with the ideal one, remained secondary and limited to a lower sphere at least until the time of Hadrian. The realistic element of this period is distinguishable from the ideal by some mechanical methods of producing expression. In sculpture the models are elaborated with a strong feeling for light, and there is no intimation of the eyebrows; the nostrils, which mark the signs of the lids rest upon the eye, as if the eye is nature, and marks the form of the brow.

Sometimes the pupils are indicated by grooves a practice which first became general in the third century after Christ. Traces of a similar tendency in portraiture are already perceptible in the time of Alexander the Great and of the Diadochi. While, judging from the few monuments remaining, art at that time reproduced the elements offered by nature with a certain reserve, and distinguished between that which she intended and that which was accidental, the Roman tendency was to copy them exactly as they appeared to the eye. This confirms the supposition that this increased realism was encouraged by the Roman custom of fabricating waxen images of their ancestors (*imagines majores*), in which a precise copy of nature, or what passed for it, was obviously required. Still, the portrait statues, especially those made in the capital during the first century of the imperial time, adhere, as a whole, to the principle of clarity. In the second century the realistic principle prevailed, and preserved the vital force even longer. During the whole of the third century this school produced admirable works as is proved, among others, by the busts of Caracalla, which represent in a masterly manner the brutal nature of this emperor. The same phenomenon appears in the province of *genre representations*. In the earlier portion of this period a realistic tendency appears only in the reliefs on the monument of the baker *Bartholomaeus* of the time of Sulla—a work of very plain, not to say coarse, execution, representing the various processes in the preparation of bread.

Undoubtedly, on the other hand, is the way of the realistic tendency in the historical representations with which triumphal arches and other similar monuments were adorned in the imperial ages. Already, during the period of Alexander the Great and of the Diadochi, may be seen in the representations of contemporary events—battles, fatal processions, hunts, etc.—an endeavor to portray characteristically scenes from real life. The historical reliefs of the imperial times appear as a further development of these works—a development in which the endeavor to be true to the real emancipates itself more and more from artistic fetters. The band of figures winding up the triumphal column narrates, chronicle-wise, the principal events of the campaign according to the imperial bulletins. Then follows another peculiarly picturesque mode of treatment, explained by the fact that the historical relief of the imperial times stands in close relation to a preceding development of painting, and was, in fact, used for decorative purposes in much the same way as the older art has since been employed. By the multiplication of the planes of relief an attempt was made to obtain an effect corresponding to perspective in painting. Bold foreshortenings, intimations of landscape detail, and other means of expression properly belonging to the pictorial art, become, with the advance of this development, more and more frequent. As late as under Trajan it continues to be characterized by a freshness and energy which reconcile us, in a certain degree, to the violation of the rules of plastic composition that frequently occurs in these monuments. After his time there is a rapid decline even in this form of art. The defects, which in the Trajan monuments appear in isolated cases and without exaggeration, are now multiplied. The reliefs of the Arch of Septimius Severus show a multitude of planes, piled one above another, each filled with a crowd of figures which confuse the eye.

Painting under the Later Empire.—The pictorial art shows, in every respect, a development analogous to that of the plastic. It is true that the writers preserved to us make very little mention of the painting of this period. In works of the first century of the empire there are passages which speak very disparagingly of the state of contemporary painting. Ptolemy, the best art connoisseur among the Roman authors whose works are preserved, and who probably lived under Nero, says in plain terms that painting was entirely a thing of the past, and Pliny characterizes it as a dying art. These individual statements are corrected by an examination of the wall-paintings found in Rome and in the Campanian cities that were buried under the eruptions of Vesuvius. These place us at once in a position to estimate rightly the severity of the contemporaneous criticisms. The execution of the frescoes, however hastily sketched they may have been, is on the whole excellent. Since the execution of decorative fresco maintained itself at so considerable an elevation we have a right to suppose the same to be true in a greater degree of the contemporaneous pictorial panel-painting. Thus the condemnatory verdict of competent contemporaries does not refer

so much to the execution, of which there was no reason to complain, as to the conception; and this supposition is strikingly confirmed by an investigation of the originals reproduced by the mural painters. The compositions occurring in these frescoes, representing scenes from Grecian mythology and from ancient daily life ideally depicted, are by no means conceptions of the imperial period, but rather creations of true Greek art, reproduced here with more or less freedom. Some of these compositions have been traced back with certainty, or at least probability, to known Greek masters. We can easily understand that the selection of the compositions to be reproduced in fresco should fall especially upon those of the Alexandrian period; for this development lay nearest the Romans in respect to time, and exercised also in other directions a manifold influence upon their civilization. Very few wall-paintings can, with any probability, be traced to originals earlier than the time of Alexander. Among the examples found in Rome we may reckon as properly belonging to these only the Nozze Aldobrandini (Vatican Library), the composition and forms of which do not show the artistic principle which was brought to full development in the time of the Macedonian hero. On the other hand, the art of the Alexandrian and Diadochi age occupied itself less with grand subjects of a monumental character (megalographia) than with those suited for cabinet pictures intended for private enjoyment. As these cabinet pictures were not rich in figures, and were of proportionally small dimensions, and as they did not so much attempt powerfully to strike the spectator by the grandeur of the subject as to impress him agreeably by graceful representations of situations easily understood, they were well adapted for reproduction in Roman mural painting. In Roman dwellings these pictures, being placed in the centers of walls generally very limited as to space, satisfied all the demands which could reasonably be made upon such a style of decoration, and afforded an agreeable resting-point for the eye, without absorbing the attention. The subject of the scenes represented, and the sentiments associated with them, were as perfectly comprehensible to the Roman even if he did not understand the Greek language, as to the Greek of the Diadochi period; for the Latin poetry of the Augustan age had borrowed many of its themes from the Alexandrian poetry which had inspired these very pictorial compositions, and they treated the same subjects as their predecessors had done, and in the same spirit.

In Roman fresco-painting an important place is occupied by the landscape, a province of art which also came into independent development during the age of the successors of Alexander. The most beautiful extant paintings of this kind are the landscapes discovered on the Esquiline, with scenes from the *Odyssey* (Vatican Library). The essential merit of the artist who originated the *Odyssean* pictures lies in the plastic development of the landscape, in the clear arrangement of the planes, the harmony of the proportions, and the nobility of form in the figures introduced.

An exclusively realistic tendency manifests itself only in the mural painting of a very inferior kind. In Pompeii this class of pictures is almost entirely confined to houses of a very poor character. After the year 79 A. D., in which the Campanian towns were buried by the unexpected eruption of Vesuvius, we can no longer follow with any certainty the history of this art; however, the few frescoes of later date which are preserved to us show that then, as before, they repeated the traditional mythological motives transmitted from the earlier antiquity, but that at the same time the execution deteriorated from generation to generation. The paintings of a tomb on the Via Latina, belonging to the Hadrian period, show already a considerable decline, as far as the freshness and energy of the work are concerned, when we compare them with the average of the mythological pictures of Pompeii. The rise of Christianity did not tend to arrest this decline, but rather hastened its downward course. Unlike paganism, which in all times had permitted a high degree of independence in the treatment of the forms of the gods and of all mythological subjects, the Church kept art closely hampered by the bands of an orthodox discipline which could not but be detrimental to it. The programme of the Christian faith was especially announced by means of pictures in mosaic, a species of art which makes any individual rendering of the outlines difficult, but which answered admirably the purpose of the Church, to bring before the eye sacred forms and histories under orthodox types and clothed with great brilliancy.

W. HELBIG.

RESULTS OF RECENT EXCAVATIONS.

The works for the extension and embellishment of Rome executed since 1870 have been the occasion of a great number of archaeological discoveries, which will be described briefly in order to show what immense progress knowledge of the history and topography of the ancient metropolis of the world has recently made. Properly, this description should classify the new monuments according as they belong to architecture, to painting, to sculpture, to epigraphy, but as most of the discoveries relating to the three latter classes must necessarily be mentioned in connection with the edifice to which they belong, it will be simpler to give a topographic description of the architectural monuments.

Fortifications.—Rome has been defended at three different periods by three different walls—that attributed to Romulus, which surrounds the Palatine; that of Servius Tullius, which encircles the Seven Hills; that of Aurelian, which forms the inclosure of the city at present. Four fragments of the wall of the Palatine have been discovered, as well as the sites of the gates Mugonia and Romanula.

A third ascent to the primitive city has lately been traced on the side facing the Circus Maximus. It is cut in steps and gradients, and well deserves its classic name of *Scala Caci*. The prehistoric walls of the Palatine are built with tufa quarried on the spot, the quarries being afterward turned into reservoirs for rain-water in case of siege. As to the walls of Servius Tullius, they can be traced to-day at fifty-six different points. They start from the left bank of the Tiber near the Porta Flumentana, skirt the northern cliffs of the Capitoline (discovered 1715, 1873, 1892), and Quirinal Hills (discovered in the Via di Marforio in 1865, in the Piazza di Magnanapoli 1875, in the Colonna gardens, in the Via delle Quattro Fontane 1873, in the Barberini gardens 1827, etc.). Near the Collina gate (Via 20 Settembre) the system of defense and fortification of the city suddenly changes. From a simple wall, built on a ledge of the craggy slopes, half way between the bottom of the valleys and the plateau above, it becomes an *agger* or bulwark composed of a ditch 100 feet wide, 30 deep, of a wall 40 feet high, and of an embankment inside the wall 100 feet wide, from 30 to 40 feet high. The *agger* runs southward to the Porta Esquilina (transformed in 262 A. D. into a triumphal arch of the Emperor Gallienus). It has been discovered since 1870 in its entire length. From the Porta Esquilina to the banks of the Tiber the Servian walls follow the slopes of the Esquiline (discovered in the Via Buonarroti 1887), of the Cælian (discovered in the Via della Navicella 1890, in the villa Mattei 1582), and of the Aventine (discovered at Santa Balbina 1884, at San Saba 1858, in the Villa Torlonia 1854 and 1867, at Santa Sabina 1857), and fall into the river near the modern Arco della Salara. The river front inside the city was likewise fortified with a powerful embankment, the remains of which were destroyed in the nineteenth century in widening the bed of the river itself. The Transtiberine region was not protected by walls, but by a detached fort on the top of the Janiculum (the present villa Savorelli-Heyland).

Of the nineteen gates of Servius, seven have been found, and three are left standing. The Ratumena was found in 1865 in the Via di Marforio; the Fontinalis in Nov., 1875, under the Palazzo Antonelli; the Sanguis in 1866 under the Piazza del Quirinale; the Salutaris in Sept., 1892, under the Palazzo Crawshey, Via delle Quattro Fontane; the Collina in 1872 under the Treasury building, Via 20 Settembre; the Viminalis in 1877 near the railway station; the Capena in 1865 near the Church of St. Gregory on the Cælian.

In Dec., 1875, were discovered some vestiges of the citadel, or *arr*, which occupied the northeast summit of the Capitoline, and which seems to have been defended by a double inclosure, the one contemporary with the wall of Romulus, the other with that of Servius.

Temples.—The number of temples, either standing or uncovered, which in 1870 was twenty-one, was thirty in 1894. Among those recently unearthed are the temple of Cybele, discovered in 1870 on the Palatine, with the statue of the goddess; the temple of the Dea Dia (Ceres), discovered in 1868 outside the Porta Portese, at the station of the Magliana, with 1,750 lines of the *Acta Fratrum Arvalium* engraved on marble; the temple of the Fortuna Primigenia, discovered in 1873 between the baths of Diocletian and the Pretorian Camp, with many inscriptions and a statue representing the Roman lady Claudia Justa, with the attributes of

the podium; the temple of Iulia (discovered in 1873 in the south-eastern part of the Forum); the temple of Iulius (discovered in 1886-87, on the west summit of the Capitoline); the theatre of the Palladium (1897), inside the Porta Patena; the temple of Salus and of Honor and Virtus (discovered in 1879 in the foundations of the suburbs of Rome); that of Antonia under the Palatine (1881); of the Victoria by the Forum near the Church of Santa Maria (1886); of Isis and Serapis near the Church of Santa Ignazio (1887); of Mars in the Campus Martius (1873); of Venus with an adjoining section of her porticoes (1891). The temple of Venus and Pallor (1879), of Jupiter Stator (1887), and Venus (1891), at Septuaginta and Roma already known, have been entirely uncovered or explored. The same road to the sea is that the Pantheon, which has been moved to the centre, is not the work of Agrippa, as stated in the inscription of the pediment, but the work of Marcus Agrippa's temple was destroyed under the foundation of Hadrian's forum at a depth of 12 feet (Dec., 1892).

Basilica.—The whole of the surface covered by the Basilica Julia, which occupied the west side of the Forum, has been completely laid open. The pavement, undisturbed by subsequent building, is tolerably well preserved, but the high-arched porticoes which surrounded it has almost completely disappeared. The basilica of Constantine has also been discovered from the pedestal buildings which concealed and destroyed the base. Under the floor of the basilica the podium of the Basilica Papalensis (theater for Eastern episcopals) has been found, as well as a tunnel which connected the Basilica with the Carinae.

Theater.—In Jan., 1870, in the course of some restorations of the Palace Farnesina-Ostia, which occupies the site of the theater of Marcellus, there was discovered a considerable portion of the lower portion, filled with architectural fragments of every kind. An imperfect imperial inscription, found in the same place, mentions a restoration of the stage in the theater by Antoninus Pius. The porticoes which surrounded Pompey's theater have been discovered in four places, with a number of granite columns still in situ. As regards the theatre of Pompeius, the theatre of the north corner of the forum came to light during the construction of the new Via Alessandria. A theatre of the theatre was discovered in the garden of the Villa Lancia on the Esquiline.

Amphitheatre.—During the whole of 1874 excavations were made in the interior of the Colosseum. It is now possible to study the system employed for raising and lowering the stage of the wild animals; the small cells in which they were kept before the commencement of the games have been found; in short, all the details of the service of the amphitheatre have been revealed with the greatest minutiae. Almost all the architectural fragments found in these excavations belong to a portico or gallery which crowned the interior of the edifice. Some inscriptions have also been found, indicating the place reserved at the games for persons of the sword and for the higher order of magistrates.

Forum and Basilica.—The palace of Augustus on the Palatine was separated from the palace and the Septimianum of Septimius Severus by a stadium built by Domitian and restored by Hadrian. This stadium was mostly uncovered in 1870; the portico which surrounds it is composed of a number of arches covered with marble, but the imperial tribune was discovered with supporting richness, if we may judge by the scattered columns of Oriental marble, the fragments of mosaic, fresco, and other ornamentation found in the excavations. In building a new quarter N. of the castle of St. Angelo remains of Hadrian's circus have been found. They had already been seen and ransacked at the time of Benedict XIV.

Thermae.—Rome in the period of her splendor had eleven large thermæ and 926 baths of an inferior order for the use of the lower classes. These last have almost totally disappeared, but many of the thermæ still exist, and several of the largest have been explored since 1870. Sculler de Gloux, a French architect, made excavations in the baths of Titus, bringing to light certain details of the plan hitherto unknown. The baths of Antoninus Caracalla have been cleared since the direction of the Government. The superb mosaic pavements of the baths are nearly all preserved, as well as many fragments of architectural decoration and three monumental statues: the Farnese Bull, the Hercules, and the Flora. In the rooms of St. Constantine and in the neighborhood of the Farnese several halls and chambers of the baths of Agrippa have been discovered with fragments of columns, enclaves, and mosaics, have been discovered. The open space paved with

travertine in front of the Pantheon has been uncovered to an extent of 120 sq. meters. In the Aldobrandini and Rosignoli gardens, on the Quirinal, considerable remains of the baths of Constantine have also been brought to light—the theater, or *scenofrons*, and the rooms which formed the southeast angle of the baths. All the foundations of these baths are constructed from the spolia of other monuments, such as columns, capitals, broken statues, friezes, marble roofings, etc. The theatre of Diocletian, which covered an area of some 800,000 sq. feet and which could accommodate at one time 3,000 bathers, have been cleared of modern structures and made more accessible to the public by the construction of a new museum of antiquities in some of their spacious halls. The baths of Novatus in the Vicus Patricius, of Thersites in the Aventine, of Helios near the Lateran, may also be included in the list of modern excavations. Taking 1,000 as the average number of places disposable in each of the great thermæ, and 50 as that of each of the private baths, it is evident that 62,000 citizens could bathe at the same time in ancient Rome.

Forum.—The exploration of the Roman Forum may be considered as complete. It has the form of a parallelogram, and is bounded on the E., W., and S. by streets, on the N. by the Rostre. The pavement is composed of blocks of travertine. Along the west side—that is, in front of the Basilica Julia—may be seen seven pedestals of honorary columns; the south side, being the temple of Caesar, was shut in by a line of shops. In the center of the Forum may still be seen the pedestal of the equestrian statue of Constantine the Great, called in the Middle Ages the Caladus Constantinus, and farther to the N. the two *plutei*, or pedestals, discovered in Jan., 1873, the sculptures of which are regarded as the most perfect that have been found in this locality. These *plutei* indicated the place where all the citizens on their way to the elections were to go and present their *basire*, or tickets of admission. The whole area of the Forum is strewn with remains of historical monuments, such as pedestals raised in honor of victorious emperors, consuls, generals, triumphal arches and pillars, statues, bas-reliefs, etc. The most important topographical details ascertained by recent excavations are the pavement of streets radiating from the Forum itself, such as the *vici* Jugurthæ, Tuscæ, Argentariæ, ad Janum, the Nova and Sæm Via, the Argiletum, etc.; the foundations of the triumphal arches of Augustus (1885), and of Fabius Maximus (1881), the area of the Comitium (1887), the Rostre Julia, the site of the Græcotheatrum, and many other such landmarks familiar to the student of Roman history. The pavement of the Forum Olitorium has been uncovered for an extent of 900 feet between the theater of Marcellus (Piazza Montecitorio) and the Temple of Pietà (San Nicola in Carcere).

The excavations consequent upon the building of the new quarters upon the Esquiline led to the discovery of the Forum Esquilinum, and of the public markets (Macellum Lævium) which surrounded it. In the center of the square lay the pedestal of a statue, with an inscription relating to the embellishments of the Forum executed by order of Flavius Epitychianus, prefect of the city, in the fifth century. The center of the market was occupied by a large fountain. The Forum Boarium, the Forum of Peace, the Forum Transitorium (Domitian's) and the Forum Palatinum have been partially explored, while the beautiful Forum of Augustus is (1895) in course of excavation. Its preservation is surprising—in its marbles are engraved the names of Appian Claudius, Cornelius Sulla, Fabius Maximus, Scipio Asiaticus, Augustus, Nigrinianus—and here also have been found beautiful architectural fragments of the golden age.

Honorary Monuments and Triumphal Arches.—In the sixteenth century a triumphal arch, erected in honor of Gordian the Pius at the entrance of the Pretorian Camp, was demolished by Bramante in order to use the material in constructing the Palazzo Della Cancelleria. Remains of this arch were discovered in 1872 in digging a drain in the Via Cæstia. These remains comprise portions of the entablature, as well as fragments of the inscriptions relating to restorations made by Diocletian. The small arch raised in honor of Septimius Severus by the cattle-dealers from the Forum Boarium has been isolated from the adjacent buildings, and so has the arch of Gallienus on the Esquiline. The seven pedestals of honorary columns found on the west side of the Roman Forum have already been mentioned. Three of these columns have also been discovered. They measure 26 feet in length, and, judging from the deep holes with which the shafts are pitted, they must have been covered with

plates of bronze ornamented with historical reliefs. Among the ruins of the temples of Isis and Serapis, which stood near the Church Della Minerva, had already been found the obelisks erected afterward in the open squares of the Pantheon, of the Minerva, and in the grounds of the Villa Mattei. Recent excavations in the same place have given a fourth obelisk, entirely covered with hieroglyphics, with the cartouches of Ramses the Great.

Military Establishments (Castra).—The military barracks were sumptuous edifices, built, or rather rebuilt, by Septimius Severus, except that of the pretorians, which dates from the reign of Tiberius, and which was restored under the Gordians. Of this latter it was already known that three sides were incorporated into the city walls by Aurelian. The fourth—that is, the west side—has been discovered in consequence of the works in the new quarter of the Viminal (*Castra Pretoria*). It contains seventy-eight small chambers, each capable of lodging six or eight soldiers. A little beyond was found a small apartment, reserved perhaps for the superior officers, the pavement of which was in mosaic, representing scenes of combat, the names of the warriors or the gladiators being marked by the side of each figure. The site of the *Castra Equitum Singularem*—that is, of the barracks of the imperial horse-guards—has been made known by the discovery of thirty-two magnificent monuments, dedicated to their gods by the men who had honorably finished their service (*missi honesta missione*). Hundreds of names are engraved upon them, with indications of paternity, place of birth, dates and duration of service, etc. The men are grouped by squadrons, which are indicated by the name of their commanders, such as the squadron of Marcellus, the squadron of Tranquillinus, etc. These monuments were found in the Lateran district crossed by the Via Tasso. The seven battalions of the vigiles, or policemen, were distributed through the city in such a way that each one occupied the boundary-line between two *regiones*. Recent discoveries established the fact that the barrack of the first cohort (or battalion) was situated below the Palace Savorelli, on the boundary between the VII. (Via Lata) and IX. (Circus Flaminius) *regiones*. That of the second has been found on the Esquiline, very near the Arch of Gallienus; that of the third at the southeast angle of the baths of Diocletian; that of the fifth in the Villa Mattei, by the Church of the Navicella; that of fourth near the Church of San Saba (Aventine). The sites of the sixth and seventh are unknown. Besides the main barracks there were fourteen outposts called *excubitoria*. One of these, belonging to the men of the seventh cohort, has been discovered in the Piazza di Monte de' Fiori, near the Church of San Crisogono. Its preservation is surprising.

Palaces and Houses.—The palace of the Cæsars on the Palatine has no unity of plan or of decoration, but is composed of a suite of palaces, differing one from another, built at different epochs, and separated sometimes by streets and squares accessible to the public. The most ancient portion is the house of Augustus, situated on the side of the Circus Maximus. Then follow the house of Tiberius, at the northwest angle of the hill, on the Velabrum; the house of Caligula, at the northeast angle upon the Forum; the house of Nero, at the southeast corner, toward the Colosseum; the house of Vespasian, which occupies the very center of the hill; and, finally, the house of Septimius Severus, at the southwest angle, toward the Porta Capena. Although the condition of these remains is in general very ruinous, yet many apartments preserve sufficient traces to render possible a decision as to their decoration and primitive destination; and the whole plan of the entire group has been reconstructed with as much precision as can be obtained in a house of Pompeii. Among the palaces and private houses of which the position or new details have been discovered should be mentioned the palace of the Laterans, considerable portions of which have been explored, especially in the garden of the hospital of St. John, where fragments of an imperial statue in porphyry and several mosaic pavements have been found; the house of Germanicus, on the Palatine, in perfect preservation, the pictures which decorate the walls being considered as the best among those thus far found at Rome; the house of Asinius Pollio, discovered in the Vigna Guidi, at the southeast angle of the baths of Caracalla; the house of Q. Fabius Cilo, the site of which is occupied by the church and convent of Santa Balbina, and where have been found two superb busts of Caius and Lucius, nephews of Augustus; the house of the Cornelii, discovered in 1873 under the new ministry of finance. In

the house of Avidius Quietus, governor of Galatia under Domitian, discovered Mar., 1876, near Sant' Antonio all' Esquilino, bronze tablets have been found on which are engraved the decrees in honor of Quietus awarded by the cities of the province which he had administered. On one of the walls of the vestibule of the house of Memmius Vitrasius Orfitus, a consul of the fourth century, inscriptions were found dedicated to their master by the officers of the household. Similar inscriptions preserved on the spot have determined the position of the palace of Neratius Cerialis, prefect of the city in the fourth century, on the piazza of Santa Maria Maggiore; of Numicius Pica Casianus, quaestor under Trajan, on the Via Strozzi; of the senator Q. Octavius Felix, near the Church of Santa Bibiana; of Nummius Albinus and of Martial, the poet, under the new War offices, Via 20 Settembre; of Vettius Agorius Prætextatus, in the Via Merulana, etc. The number of private mansions the ownership of which has been established by late excavations may be estimated as 175.

Villas and Gardens.—The gardens of Mæcenas, on the Esquiline, have been in a great measure excavated, from the Church of Sant' Eusebio as far as the Via Merulana. The most interesting monument as yet found is a magnificent conservatory in the form of a small oblong theater, the walls of which are decorated with beautiful landscapes. In the neighborhood of this conservatory have been found six Caryatides of Pentelic marble, as well as three *Hermes* of fauns, which were generally placed at the intersections of garden avenues; two fountains, one of which is in the form of a rhyton, or drinking-horn, marvelously sculptured by Pontius of Athens; three busts of philosophers; and several other fragments of sculpture worthy of the age of Augustus and of the artistic taste of Mæcenas. Still more important are the discoveries made on the site of the Horti Lamiani, which adjoined those of Mæcenas, occupying the whole of the rectangle comprised between Via Labicana, Via Merulana, Santa Croce, and San Matteo. In the very center of these gardens the remains of a palace have been found, the east and west sides of which were adorned by porticoes with columns of *giallo antico*. On the two other sides—that is, on the N. and S. of the rectangle—were found bath-rooms of extraordinary splendor. The floors were paved with slabs of precious marble, such as *occhio di pavone*, fleece-alabaster (*a pecorelle*), jasper, agate, etc. Some of the walls were covered with slate ornamented with arabesques in gold; others were incrustated with *opus sectile marmoreum*, or what is called "Florentine mosaic." It was in one of these rooms that on Dec. 24, 1874, there was discovered the group of sculptures which forms the principal ornament of the new museum of the Capitol. This group includes a statue of Venus, a Greek work anterior to the type of that goddess, created by Praxiteles; statues of the muses Terpsichore and Polymnia; a bust of Commodus, represented as the Roman Hercules, perhaps the most perfect work of the kind which antiquity has bequeathed; and a head of the young Commodus. In the same room was found an inscription relating to the improvement of the gardens and the reconstruction of the palace by the Emperor Alexander Severus—that is, by the same who restored the gardens of Sallust, as is proved by another inscription found Apr. 2, 1876, in the villa Spithöver on the Quirinal.

Recent researches also show that almost the whole surface of the Esquiline was occupied by gardens, which, laid out at first for private use, had fallen by degrees into the hands of the emperors, who opened them to the public; so that Rome became perhaps as rich in parks and delightful promenades as is London or Paris. Among the gardens recently discovered may be mentioned those of Vettius Agorius Prætextatus, the site of which is very near the Porta San Lorenzo. Nearly all the foundations of the buildings belonging to these gardens are composed of fragments of statues. A single one of these walls, scarcely 100 feet in length, has yielded 2,500 pieces of sculpture, which, united with infinite patience, have already furnished the museum of the Capitol with seventeen statues and two sculptured vases. It is enough to say that the single statue of a Hercules carrying off the mares of Diomed has been recomposed out of nearly 250 fragments. Foundation-walls built with fragments of statuary are the work of the semi-barbaric Romans of the sixth to the ninth century of our era. They are discovered by hundreds. One, found in 1890 on the banks of the Tiber by San Giovanni de' Fiorentini, contained the now famous account of the Ludi Sæculares celebrated by Augustus in 17 B. C. and by Septimius Severus in A. D. 204.

explicit form to beliefs that are implicitly contained either in Scripture or in tradition. The sources of tradition are in general whatever makes known to us the belief held by the Church at any time on any subject. The documentary sources are the writings of the early apologists, the acts and epistles of the apostolic churches, the works of the Fathers, doctors, and theologians. Moreover, the articles of faith have at various times been summarized in creeds or symbols. Such are the Apostles' Creed; the Nicene, promulgated by the Council of Nice (325); the Athanasian, by St. Athanasius, Bishop of Alexandria (d. 373); and that published by the Council of Constantinople (381).

2. *The Means of Sanctification.*—These consist in the application to each soul of Christ's merits. The sacraments, the ordinary channels of grace, are seven in number: Baptism, confirmation, Holy Eucharist, penance, extreme unction, orders, and matrimony. These are administered with ceremonies peculiar to each prescribed by the ritual of the Church. The Eucharist is not only a sacrament, but also a sacrifice, and as such is offered in the Mass. This is the principal act of worship in the Church and the center of her liturgy. The Office, or public prayer of the Church, is a collection of psalms, extracts from both Testaments, commentaries of the Fathers, and short lives of the saints. It is divided to suit the different hours of the day, and is either chanted in common, as is the case in monastic orders and canonries, or is recited in private, its recitation being obligatory on all who have received the subdiaconate. Both in the Mass and Office there are certain portions which vary according to the liturgical season and the festival which is observed on a given day. Ecclesiastical feasts are days set apart for honoring in a special way some event in the life of Christ, of the Blessed Virgin Mary, or of the other saints. The greater of these feasts are preceded by seasons of a penitential character—such as Advent before Christmas, Lent before Easter, and the vigil of many other festivals. The chief practices enjoined for this preparation are fasting, abstinence, and prayer. Beside the administration of the sacraments, the Church attaches a sacred and symbolical character to various objects, the use of which is destined to inspire reverence and devotion. Hence the blessing of ashes, water, palms, candles, etc., in virtue of which these sacramentals profit those who employ them according to the intention of the Church and with proper dispositions. The language of the Liturgy in the Western Church is Latin, while in the churches of the East the vernacular, mostly in its archaic form, is employed. There exist also differences in the form of the Liturgy itself, and consequently a variety of rites, such as the Coptic, the Armenian, and the Greek. Along with these general means of sanctification for all the faithful, the Church has encouraged the founding of religious orders, i. e. of associations whose members are bound by special vows, live under particular rules, and labor for some peculiar purpose, such as caring for the poor and sick, spreading the Gospel, and carrying on the work of education.

3. *The Government of the Church.*—To fulfill her mission of teaching and sanctifying men the Church must enact laws to be obeyed both by clergy and laity. While her doctrines are unchangeable, her discipline varies according to circumstances of time and place. Ecclesiastical legislation is incorporated in the canon law. It is either general—decrees of the pope and of general councils, or particular—statutes of national, provincial, and diocesan synods. As regards its subject, it is either public (*jus ecclesiasticum publicum*) or private (*jus ecclesiasticum privatum*). The former is for the government of the clergy; the latter for that of the laity. The penalties inflicted for violation of ecclesiastical law are of two sorts: the *pœnæ communes*—excommunication and interdict—which may be incurred by clerical and lay offenders, and the *pœnæ particulares*—suspension and deposition—to which clerics only are liable. The penal law of the early Church was severe; but this rigor has been mitigated in the course of time. (See PENANCE.) Finally, as the members of the Church are at the same time subjects of the civil power, it has often been found necessary for Church and state to define their relations and settle upon a *modus vivendi*. These agreements regarding the external relations of the Church are termed concordats.

STATISTICS.—1. *General:* The number of Roman Catholics in the world is about 230,000,000. There are 64 cardinals and 12 patriarchs. In the Latin rite there are 820 archbishops and bishops, and in the Oriental rites 56; while the titulars, i. e. those who have no diocese, number 322. 2. *In the United States:* The Catholic population is about 10,000,-

000. The Church has 1 cardinal, 1 apostolic delegate, 14 archbishoprics, 72 bishoprics, and 9,700 priests.

See also the articles PAPAL STATES, JESUITS, GALLICAN CHURCH, TRENT, COUNCIL OF, and VATICAN COUNCIL.

STATISTICAL LITERATURE.—For the statistics of the mediæval Church, the works of Carolus a Sancto Paulo, Miræus, Holstein, Clericus, Schelstrate, and Weidenbach may be consulted with profit. In the nineteenth century Stäudlin, Wiggers, Neher, Silbernagl, Carolus a Sancto Aloysio, Wiltch, Petri, and others have treated the subject with more or less accuracy. The episcopal catalogues of the Roman Catholic Church have been edited or compiled down to modern times by the Benedictine Gaius: *Series Episcoporum Ecclesiæ Catholicæ . . . a Beato Petro Apostolo* (Lisbon, 1873). Diocesan, provincial, or national religious almanacs and directories are published in most places, to which may be added the reports of the various missionary bodies made known from time to time. The actual state of the Roman Catholic hierarchy is made known yearly in *La Gerarchia Cattolica*, a quasi-official Roman publication; *Les Missions Catholiques*, and the *Annales de la propagation de la foi* furnish details of great value. The Propaganda issues an official yearly bulletin entitled *Missiones Catholice*. The best and newest general summary of the public administration of the Roman Catholic Church is by O. Werner, S. J., *Orbis terrarum Catholicus*, etc. (Freiburg, 1890), and for the Catholic missions, the same, *Atlas des Missions Catholiques* (*ibid.*, 1886), and *Katholischer Kirchenatlas* (*ibid.*, 1888). Official reports of all dioceses, vicariates, prefectures, etc., are made to the proper Roman authorities at stated intervals, and are preserved in the special archives of the respective Roman congregations. For the actual working of the latter bodies, cf. Bange (Catholic), *Die Römische Curie* (Münster, 1854), and O. Meyer (Protestant), *Die Propaganda* (Göttingen, 1852), and the sixth volume of Phillips's *Kirchenrecht* (Regensburg, 1864). The latest statistics of the Roman Catholic Church in the U. S. are found in Sadlier's *Catholic Directory* (New York) and Hoffman's *Catholic Directory and Clergy List* (Milwaukee). Special Catholic directories are annually published for Canada, England, Scotland, and Ireland. J. J. KEANE.

Romance Languages, or Romanic Languages [*Romanic* is from Lat. *Romānicus*, Roman, deriv. of *Roma nus*, Roman, deriv. of *Ro'ma*, Rome]: those modern languages which, as the result of continuous oral transmission, are the current forms of spoken Latin. The languages grouped together under this name are French, Provençal and Catalan (the latter is hardly more than a dialect of Provençal), Spanish, Portuguese, Italian, Roumanian, and the Rhaeto-Romance dialects. The territory is in general that of the Roman empire, excepting those parts which by later popular migrations or conquest were afterward removed from the sway of the Latin language, and those regions which were never completely Romanized.

The Latin spread in the conquered provinces was naturally the vulgar speech of the soldiers and colonists, not the Latin of the classic writers. Though in the beginning differing from the latter only as careless conversational speech always differs from the more elaborate usage of literary works, it was more subject to local variations, and changes were more rapid than in the literary language. The latter was also studied, however, in the provinces, and there were writers of a certain eminence in Spain and Gaul long after those countries had become Roman provinces. Borrowings from the Latin of literature became later very considerable; they are numerous in mediæval times after the modern languages began to be used in literature, and they have continued up to modern times. In general, the old popular words can be distinguished by their strict observance of the laws of phonetic change, while learned or semi-learned words have been less altered. Compare Fr. *peu*, from *paucum*, with *paucité*, *père* with *paternité*, *chose* with *cause* (both from *causa*).

The vulgar Latin of post-classic times was in the beginning very similar over the whole territory. In its vocabulary it differed somewhat from the literary Latin, more or less vulgar words or meanings being used, as for "horse," *caballus*, a nag, for "fire," *focus*, for "to strike," *batuere*, for "to turn," *turnare*, etc., and derivative words, especially diminutives, were used sometimes instead of the simple ones. Some words from foreign languages were added to the vocabulary. The oldest borrowings from Greek show Greek sounds to have been imitated as heard in Italy. Many of the

were at the stage of voiced (except when unvoiced at the end of the word) spirants; compare *chantée* from *cantata(m)*, *nouer* from *nodare*. The doubled consonants of Latin were simplified except in Italian, which language has by assimilation produced a number of new doublings, as in *fatto* from *factum*, *freddo* from *frig(i)dum*. The Roumanian treatment of some consonant groups is remarkable; compare *opt* from *octo*, *demn* from *dignum*. The phenomena of palatalization can not be discussed here.

The most important final consonants in Latin are *m*, *s*, *t*. Of these, final *m* early disappeared entirely except in a few cases where it followed an accented vowel; compare Fr. *rien* from *rem*. Final *s* and *t* were lost in Italian and Roumanian, but elsewhere *s* was retained, and final *t*, which was for the most part lost, was in French, under certain conditions, retained. The retention of old final *s* and *t* in modern French is to a great extent only for the eye.

The Latin inflections of nouns and adjectives have suffered considerable change. The fourth and fifth declensions disappeared, the former being absorbed in the second declension, the latter in the first and third, so that only three of the old classes remain at all. The neuter gender is no longer distinguished in nouns, but neuter uses of adjective words (as in Spanish) and pronouns are not wholly lost. The old neuters became for the most part masculine, but there are many traces of Latin neuter forms. The Latin cases were reduced in number, partly by the results of phonetic change, partly by the substitution of prepositions with the accusative. The Roumanian still has, in the singular of feminine nouns, a case corresponding in use to the Latin genitive and dative, and the same language has a vocative which may be in part descended from the Latin vocative, but it has no distinction in form between nominative and accusative in nouns. In the other languages of the family the dative in nouns was soon lost, as were also the genitive and the ablative, except in a few instances. In Old French and Provençal a declension with two cases, representing the Latin nominative and accusative, existed; thus in Old Fr. nom. sing. *murs* (from *murus*), obj. sing. *mur*, nom. plur. *mur*, obj. pl. *murs*. Feminine nouns, however, from the Latin first declension were generally alike in both cases, as in modern French. Traces of a similar declension exist in Rhaeto-Romance dialects still; but the modern forms of the languages which had this declension have, with some exceptions, lost the old nominatives, and it can be said that, with the exception of Roumanian, nouns in the Romance languages no longer have any cases, the inflection being reduced to a distinction of plural and singular forms, and even this distinction is largely lost in spoken French. The modern forms as a rule represent the Latin accusative, but in Italian and Roumanian the single form of the plural is from the Latin nominative in nouns coming from the Latin first and second declensions: Ital. *rose*, Roum. *roase* from *rosae*, Ital. *anni*, Roum. *ani* from *anni*; but Fr. *roses*, *ans*, Span. *rosas*, *años*, from *rosas*, *annos*. The declension of adjectives is very similar to that of nouns. Some comparative forms of Latin are widely retained; compare Fr. *meilleur*, Ital. *migliore*, Span. *mejor* with Lat. *melioiorem*; but commonly the comparative is expressed by the aid of an adverb meaning "more" (modern forms of *plus* or *magis*), and for a superlative the comparative with the definite article is regularly used, there being no true superlative.

Among pronouns occur some forms which go back to Latin nominatives, accusatives, genitives, and datives, and these four cases are still more or less living, partly through the aid of new formations, as Fr. *en*, Ital. *ne*, from the adverb *inde*. Ital. *loro*, Fr. *leur* are from *illorum*, though they are now used as datives (Ital. *loro* can also be used as an accusative or even as a nominative) or as possessives. Ital. *lui*, *colui*, etc., Fr. *lui*, *celui* go back to vulgar Latin datives (as *illui*; compare Latin *eui*, *huic*). It is true that these forms are no longer confined to use as object cases. Nominative forms from *ego*, *tu*, and vulgar Latin *illi* or *ille* are also preserved; as from *ego*, Ital. *io*, Roum. *eu*, Fr. *je* (Old Fr. also *jo*, *jou*), Prov. *eu*, *seu*, Span. *yo*, Port. *eu*, while the accusative is shown, for example, in Ital. *me*, Fr. *moi*, etc. Among the descendants of Latin pronouns is to be especially noted the definite article which comes from *ille* (in some dialects from *ipse*) in an unstressed form. Fr. *le*, *la*, Ital. *lo*, *la* represent respectively *illum*, *illa(m)*, just as the same forms are also used as unstressed personal pronouns in the accusative, while the stressed form *illa* gave Fr. *elle*, Ital. *ella*. The indefinite article goes back to Lat. *unus*.

In verb inflexion the passive voice is entirely lost, except the past participle, which is used to form the passive (over

most of the territory) and tenses for completed action in the active voice; further are lost the future indicative, the future or emphatic imperative, the perfect infinitive, the gerundive (not the gerund), the future participle, the supines (in Roumanian the form of the past participle is used also with prepositions in a sense like that of the Latin supines), the imperfect subjunctive (retained in Sardinia), and perhaps also the perfect subjunctive (see below). But of the remaining forms not all are found in every one of the Romance languages. The pluperfect indicative was retained in Spanish, Portuguese, Provençal, and the oldest French among the recognized literary languages, and in these its sense has generally been changed to that of a conditional or (as in Old French) to that of a simple preterite. The future perfect remains in Spanish, Portuguese, and the older Roumanian (but the perfect subjunctive may be in part the source of these forms). The present participle (lost in Roumanian) is mostly found only as a verbal adjective, its place being largely taken by the gerund. The old pluperfect subjunctive is now mostly an imperfect subjunctive; in Roumanian it has become a pluperfect indicative. The perfect indicative where retained has become simply a preterite. By the aid of auxiliaries, however, and of new formations all deficiencies are well supplied. New formations are those for the future indicative and the so-called conditional mood. The former is the result of an old combination of the infinitive with the present indicative of *habere*, the latter of a similar combination of the infinitive with the imperfect or perfect indicative of the same auxiliary. "I shall sing" was expressed by "I have to sing," *cantare habeo*, and "I should sing" by "I had to sing," *cantare habebam* or *cantare habui* (the latter is the basis for the usual Italian form). As such phrases coalesced into single words contraction somewhat disguised the original forms, but the terminations still show the connection with the verb "to have." This method of formation is not the only one in use. Roumanian uses an auxiliary corresponding to Latin *volo* to form the future, and in the western part of the Rhaeto-Romance territory is found a formation for the future corresponding to *venio ad cantare*. To the Romance formations are to be added, besides the future and the conditional, many new past participles, needed to form compound tenses for intransitive verbs, and some others of less importance.

The four Latin conjugations are still more or less well preserved in much of the Romance territory, but the second and third are to a great extent confused, and the greatest vitality is shown by the first and fourth conjugations. In personal endings and in tense formation the influence of analogy has been strong, no conjugational type having escaped it. Remarkable are the variations in the form of the stem, due to different positions of the accent; compare Fr. *tient* and *tenir*, Ital. *tiene* and *tenere*, Fr. *meurt* and *mourir*, Ital. *muore* and *morire*. Old Fr. *aime* and *amer* (now *aimer*), etc. In most verbs of the fourth conjugation an inchoative ending, originally *-isc-*, was added to the stem, appearing in only some forms of the present tenses, in Italian and Roumanian, spreading in French somewhat more, and in Spanish and Portuguese appearing in all the forms of the verb, so that the infinitive in these last ends in *-ecer* instead of *-ir*, and these verbs cease to belong to the fourth conjugation. Compare Fr. *finis* (pres. indic.), *finissais*, *finissant*, with the infinitive *finir*, Ital. *finisco* with *finire*. The formation of the preterite indicative and the past participle is somewhat complicated, especially in the so-called irregular verbs. The occasional Latin reduplication, as in *cucurri*, is lost and other formations substituted, especially with *s* and *x* (cf. Ital. *corsi*, Pr. *courus*); but the perfects *dedi* and *steti* (or vulgar *stetui*) extended their endings to other verbs considerably in vulgar Latin. The past participle also shows influences of analogy, notably for the many forms going back to the ending *-utum*, as in Fr. *eu* (formerly *eü*, *ou*), Ital. *avuto*.

The Romance languages are well supplied with derivative endings or suffixes forming nouns, adjectives, and verbs. One of the most interesting suffixes is the descendant of Latin *mens*, *mentis*, mind, now widely used as an adverbial suffix: Fr. *-ment*, Ital., Span., and Port. *-mente*. These suffixes are mostly of Latin origin, but some are from Greek, as Fr. *-esse*, Ital. *-essa*, forming feminines, from Greek *-essa*, Fr. *-oyer*, Ital. *-eggiare*, Span. *-ear*, and, in less popular form, Fr. *-iser*, Ital. *-izzare*, Span. *-izar*, from *-laeu*; others are from the Germanic, as Fr. *-ard*, Ital. *-ardo*; and the origin of yet others is not quite certain, as of the diminutive *-et* in Fr. *-etto* in Ital. Slavic and other languages have supplied some suffixes to Roumanian.

numerous family to which Cervantes paid his respects. It is impossible, however, to follow all the later and divergent paths of the romance, which lead not to distinct persons so much as to special subjects. Such are romances of the innocent wife, like *Griseldis*; romance interwoven with allegory, like the *Roman de la Rose*; romance with satiric leaning, as in *Reynard the Fox*, which lays the beast-epic under contribution; pastoral romances, like Sidney's beautiful *Arcadia*; and long romances of later date, such as those of Mlle. de Scudéry.

The literature of the romances is enormous, but two works contain ample bibliographical as well as direct information: Ward, *Catalogue of Romances in . . . the British Museum* (i., 1883), and Dunlop, *History of Prose Fiction* (revised ed. London, 1888). For English romances, see G. Ellis, *Specimens of Early English Metrical Romances* (1848), and the various editions in the publications of the Early English Text Society. For the French, see Nyrop, *Den oldfranske Helledigtning*, and G. Paris, *Histoire Poétique de Charlemagne*.

FRANCIS B. GUMMERE.

Romanes, rō-mānz', GEORGE JOHN, F. R. S., LL. D.: biologist; b. at Kingston, Canada, May 20, 1848; graduated with honors at Cambridge, England, 1870; fellow of Royal Society 1879; became an intimate friend of Charles Darwin while in Cambridge; was Fullerian Professor of Physiology in the Royal Institution of London, and Rosebery Lecturer on Natural History in the University of Edinburgh. He devoted himself principally to extending evolutionary doctrines in the field of psychology; published *Animal Intelligence* (1881); *Mental Evolution in Animals* (1883); *Mental Evolution in Man* (1888); *Origin of Human Faculty and Philosophy of Natural History before and after Darwin*, and numerous scientific essays. D. at Oxford, May 23, 1894.

C. H. THURBER.

Romanesque: See ARCHITECTURE.

Romanic Languages: See ROMANCE LANGUAGES.

Roman Law: primarily, the body of rules which governed the city of Rome and its citizens. As the power of Rome grew, this system of law was extended over a large part of Italy, but it was not generally introduced into other territories nor made applicable to Rome's subjects as distinguished from her citizens. For the conquered provinces and their inhabitants a different body of rules was worked out. This new law was only in small part a further development of the law of the city; in the main it was a distinct and superior system. It was based on the customs of the various Mediterranean peoples, and representatives of nearly all those peoples ultimately played some part in its development. During the imperial period these two systems were gradually fused into one, and in the codification of Justinian they are presented as a single and substantially homogeneous body of law.

Much of the Roman law has only an historical interest. This is the case with the older law of the city as a whole; this is the case also with the public law of the empire. On the other hand, the principles governing private relations, which were worked out in the later republic and the early empire and which were incorporated with little change in the law-books of Justinian, have more than an historical significance—they are to-day a living force. It was in large part on the basis of the Roman law that the mediæval Church worked out for all Christendom its law of family and of testament. Toward the close of the Middle Ages the law-books of Justinian, as modified by the Roman canon law, became the chief basis of adjudication in the secular courts of continental Europe, and in the so-called "modern Roman law" Europe obtained a body of substantially uniform rules for property and obligations. The principles of the Roman law have not exercised a controlling influence upon the English common law; but in all modern states, except those founded by Englishmen, the existing law is based on Roman conceptions of private right, reveals in its form the influence of Roman legal science, and expresses itself in Roman terms. The modern civil codes of Europe and of Central and South America are Roman in much the same sense in which the existing law of the self-governing British colonies and of the U. S. is English; and in this sense the Roman law and the English law are the two great systems that rule the modern civilized world.

1. **THE LAW OF THE CITY (*Jus Civile*)**.—According to one tradition the city was governed during the first three centuries of its existence (i. e. during the royal period and the first half-century of the republic) by unwritten custom.

According to another tradition the earliest laws were royal enactments. A considerable body of ancient rules, described as royal laws (*leges regie*), existed and were collected in the republican period. Many of these have come down to us, and it is evident that they are simply rules of early custom, similar to those which prevailed among other Aryan peoples. Precepts of a religious or moral nature are blended with rules of a legal character. Their formulation suggests a strong sacerdotal influence—an assumption which is corroborated by other Roman traditions.

The Twelve Tables.—Early in the republican period the plebeians complained that the ancient customs of the city were misinterpreted by the patrician priests and misapplied by the patrician magistrates. They therefore demanded that the law be reduced to writing and enacted in statutory form. In compliance with this demand the law of the Twelve Tables was drafted by a commission of ten elected for the purpose, and was approved by the popular assembly (451 and 450 B. C.). Much of this early code has come down to us. It is clearly nothing but a compilation of the older customary law. It differs from the so-called royal laws in that it contains fewer religious precepts and gives a clearer formulation of personal and property rights. It was regarded by the Romans as the great charter of their liberties. As late as Cicero's time Roman schoolboys learned its text by heart; and during the greater part of the republican period it was practically impossible to secure the adoption of any law which directly and overtly abrogated or changed the provisions of the Tables.

The Republican Jurists.—Under these circumstances the development of the law was accomplished mainly by interpretation. The scanty and rude provisions of the Twelve Tables were supplemented and modified by a free use of analogy and of fiction. For nearly two centuries after the enactment of the Twelve Tables the priests of the pontifical college controlled the forms of pleading and retained a practically exclusive power of interpreting the law; and it was not until the plebeians had forced their way into this last stronghold of the conservative party (300–254 B. C.) that Roman jurisprudence was secularized. Thenceforward the Roman who wished to study the great body of rules that had grown up around the Twelve Tables was no longer forced to seek an election as pontifex; he placed himself under the instruction of some older jurist. The knowledge of the law was not treated as a means of gaining a livelihood; legal advice was given gratuitously. Next to conspicuous service in war the knowledge of the law furnished the ambitious Roman with the best opportunity of recommending himself to the favor and the suffrages of his fellow citizens. The jurists did not plead cases; this was the business of the orators. They did not directly decide cases unless they happened to be elected judges or appointed referees (*judices*); but in a doubtful case the opinion of some eminent jurist was brought to the referee or was solicited by him, and such an opinion was regularly conclusive.

Character of the *Jus Civile*.—The civil law of the republic presents many interesting analogies to the older common law of England. It was essentially a body of case law, shaped by decisions. It was very strict and very formal, certainty of law being held in higher regard than equity. It was very technical, but nearly all its technical distinctions were based upon sound principles. The great advance which the Roman civil law represents in universal history is found (1) in the unprecedented clearness with which private rights were marked out and the extent to which the individual was permitted to shape his own legal relations; and (2) in the separation of law and religion. This last step was one which no Asiatic or European people had previously taken.

2. **THE LAW OF THE ANCIENT WORLD (*Jus Gentium*)**.—With the extension of Roman rule over the Mediterranean basin, legal problems were presented which could not be solved by the law of the city. The protection of the civil law could be accorded to aliens only through inter-state treaties, and the conquered provincials (as distinguished from the favored allies of Rome) were not merely aliens—they were stateless aliens. The states of which they had been citizens had been destroyed by war. They themselves were simply subjects of Rome. In theory they were the slaves of the Roman people, and their property belonged to the republic. In fact, they were treated as freemen, and it was necessary to administer justice to them.

A more serious difficulty lay in the inadequacy of the city law to meet the needs of the new empire. The Roman civil law had been worked out by and for a people whose char-

occupied with agriculture. Among the subjects of Rome was the great trading nation of the greatest world, the Greeks and the Phoenicians. Rome itself became more and more the center of Mediterranean commerce, and when piracy was crushed out by her fleets, this commerce rose to unprecedented importance. A new and very different kind of law was required to govern the relations between the numerous Hellenistic and between them and the Romans.

These problems were solved in a thoroughly Roman way—systematically and gradually. A second *prætor* had been chosen at Rome since 441 B.C., and to this magistrate was assigned the duty of administering justice to foreigners in the city. The governments of the several provinces were trained from the outset with similar duties. No notes were sent down to their governors; they were left to make their own law. In accordance with the old Roman rule that cases could not be actually decided by the magistrates, these officers, rather than leaving the litigation of the parties, sent each one to a referee (*judex*), with a brief note of instruction (*formula*) which ran somewhat as follows: "If it appears that such and such allegations are true, condemn the defendant to such and such a sum." Each formula contained, by implication, a rule of law, and a collection of the formulas actually issued would, in course of time, have amounted to a code of the new law. From the very outset, however, the *prætor* of the *res publica* and each provincial governor presided at the beginning of his term as *ediles* (*edictum*), in which he stated the grounds upon which he would give action and "exceptions" or defenses. Each successive magistrate adopted the edict of his predecessor, with such additions and improvements as the latter's experience or his own right suggested; so that the evolution of the new law kept pace with its development. The foreign edict at Rome served as a general model for the provincial edicts, and was itself usually modified by *prætores* when first made their residence in this or that provincial edict. In this whole process, however, the Roman jurists exercised a controlling influence, partly through actual possession of the magistracies, but far more through their activity as counselors. Every Roman magistrate, before entering upon his duties, selected a body of advisers (*consilium*); and these magistrates who were charged with the administration of justice naturally sought the assistance of jurists of established reputation.

Character of the New Law.—In matters which bore no relation to commerce, no effort seems to have been made to change existing law for all the provinces. Family relations and questions of inheritance seem to have been differently handled in the various provincial edicts, in accordance with national or local customs. As regarded property and obligations, however, the foreign edict at Rome and the various provincial edicts were kept in substantial harmony, so that a uniform system of commercial law was established in the entire civilized world. This law, as the Romans themselves declared, was based upon the rules which prevailed among all the nations (or rather upon the common sense found in all their various rules), and upon natural law.

In contrast with the law of the city, the new law was far more liberal, less formal, freer, and more equitable. It gave remedy against mistake and fraud which the civil law did not give. It was built of the form of transactions, and respected their substance. It laid the greatest stress, in contractual relations, upon the demands of "good faith."

A System of Two Systems.—The City Edict.—As soon as the *ius prætorium* was fairly developed, the impulse to alter the law of the city became irresistible. The method whereby the new system had been developed naturally suggested itself as a method by which the old system might be changed. The *ius prætorium* had been created by magistrates whose activity was unfettered by forms and whose activity was unimpeded by law. The basis of its development was the power of the magistrate to instruct the referee. In the *prætor*, who administered justice to Roman citizens, as in the *res publica*. Under the technical forms of civil law (*legis actiones*), the *Prætor* himself formulated his law, and the judges or referees were bound to decide according to established law. By a *lex Ælia*, passed about 193 B.C., informal proceedings were permitted and the *prætor* was empowered to instruct the referee. The use of this magistrate as once became the central factor of the new system. The law of the city was not only supplanted, but "corrected." The principles of the *ius prætorium* were applied to Roman property and Roman contracts, and introduced further improvements. As far as these matters

were concerned, the city edict now set the pace of development for the provincial edicts. The city *prætor* also reformed and modernized the law of the family and of inheritance. The reform of the civil law by the *prætor* is a movement which presents striking analogies to the reform of the English common law by the English chancellors.

The growth of the *prætorian* law practically ceased with the overthrow of the republic. In the reign of Augustus a noted jurist, Salvius Julianus, was charged with a final revision of the edict. From this time the development of the law was accomplished by interpretation and its legislation. Legislative power had been transferred from the people to the emperor and the senate. The controlling influence was exercised by the emperor. At first they legislated with the advice and consent of the senate; but the *senatus consultum*, or proposal of the emperor, was invariably accepted, and in the second and following centuries the emperor habitually employed the form of direct decree or "constitution." In the field of private law, however, the dominant influence was that of the jurists, and the development of the law was carried on by juristic interpretation far more than by legislation.

The Jurists of the Empire.—The recognition and influence which were accorded to the jurists, under the republic, by opinion and custom, now received legal sanction. To the most noted jurists the emperor gave a formal right of response (*ius respondendi*), and the judges or referees were bound to follow the responses of these "patented jurists," unless conflicting responses were submitted. In the second and third centuries, when jurisdiction at Rome had been transferred from the *prætor* to imperial *præfects*, when all the provincial governors were imperial appointees, and when, in consequence of the disappearance of the referees (*judices*), these officials were judges of both law and facts, the leading jurists were regularly charged with the direct administration of justice. The office of *prædictor* *præfect*, in whose court appeals were carried from all parts of the empire, was successively occupied, in the first half of the third century, by Papinian, Ulpian, and Paul, the three writers whose names stand highest in the roll of Roman jurists; and Ulpian and Paul, before their promotion to the chief judgeship, had served as "assessors" or associate justices in the court of Papinian. The great body of new law which was worked out by the jurists of the early empire was therefore judge-made law. The decisions by which it was gradually elaborated were reported and digested by the jurist-judges themselves.

Juristic Literature.—Toward the close of the republican period the leading jurists began to write legal treatises. Early in the imperial period law schools were established, and the development of systematic instruction gave an important impulse to the systematic presentation of the law. The famous *Institutes* of Gaius, written in the second century, is apparently a course of lectures. Most of the great jurists, including Ulpian and Paul, published detailed commentaries upon the civil and the *prætorian* law, as well as monographs upon special subjects. All of them, including Papinian, published books of "questions," "opinions," or "responses." These latter works, as their names imply, were collections of cases, and the systematic treatises were full of illustrative decisions.

In the fourth and following centuries a peculiar degree of authority was attached to this body of literature. The laws of the republic, the *prætorian* edict, the decrees of the senate, the constitutions of the earlier emperors were no longer cited in the courts; the great jurists alone were cited. Their writings were identified with the law existing in their time; *ius* came to mean the juristic literature of the first three centuries. A "law of citations" issued by the West Roman emperor Valentinian III. (426), recognized and regulated the use of this body of jurisprudence. In case of divergent dicta that opinion was to be followed which was supported "by the greater number of authorities." "If the number on each side be the same, that opinion shall prevail which has the support of Papinian." Only when these tests failed was the judge to employ his discretion. Citations were limited to the writings of Gaius, Papinian, Ulpian, Paul, and Modestinus, and of the earlier jurists cited and approved by these five.

A considerable portion of this literature has come down to us in the *Digest* of Justinian. Outside of the *Digest* little remains except the *Institutes* of Gaius (a palimpsest of this work was found in Verona in 1815), and parts of treatises by Ulpian and Paul.

The Edict of Caracalla.—During the first two centuries of the Christian era Roman citizenship had been conferred upon great numbers of provincials. Early in the third century Caracalla declared all free inhabitants of the empire to be Roman citizens. This edict swept away the last remaining differences between civil and provincial law. Technically speaking, the empire was henceforth governed by the law of the city; but as the civil law had been completely remodeled in accordance with the principles of the *jus gentium*, the substantial triumph rested with the latter system.

The Later Empire and the Codification of Justinian.—The list of the great jurists is abruptly closed about the middle of the third century. After Paul but one name of note occurs, that of Modestine. The development of the law was henceforth carried on by imperial decrees or "constitutions." The breach with the old order, however, was less complete than it appears to be. Most of the constitutions issued during the last half of the third century were "rescripts." These were responses rendered in the name of the emperor to petitions requesting imperial decision of concrete cases. Such applications had been made throughout the early empire. In some cases the emperor decided these cases in council; more frequently he assigned their decision to the ordinary judges, with instructions, however, touching the principles which should be applied. In substance, therefore, these rescripts were decisions rather than statutes. The rescripts issued in the reigns of Gordian and of Diocletian are similar in form, and not inferior in the quality of their legal reasoning, to the average responses of Ulpian and Paul. Jurisprudence had not yet sensibly waned, as it did in the fourth and following centuries, but the jurists had disappeared behind the throne, and spoke only with the voice of the emperor.

Technically, however, the rescripts, as well as the general decrees of the later emperors, were imperial "laws" (*leges*), and were distinguished from the older law (*jus*) very much as we distinguish statutes from common law.

The first attempts at codification were confined to the imperial constitutions. A private collection of rescripts was made at the end of the third century (*codex Gregorianus*), and a supplement was issued late in the fourth century (*codex Hermogenianus*). In the year 429 the East Roman emperor Theodosius appointed a committee of codification. It was clearly his intention to have the entire law, both the *jus* and the *leges*, brought into manageable compass; but nothing came of his initiative except an official revision of the imperial constitutions (*codex Theodosianus*). This code was transmitted to the Emperor Valentinian III., and was published in both the Eastern and the Western empire in the years 438 and 439.

The Emperor Justinian (527–565) and his minister Tribonian took up the wider plan of Theodosius. A new collection of imperial constitutions was published in the year 529. A committee was then appointed to digest the juristic literature, omitting all that was antiquated and avoiding contradictions. The result of their labors was the *Digest* or *Pandects*, which consisted of more than 9,000 excerpts from the writings of thirty-nine jurists, arranged under 429 titles and grouped into fifty books. Each excerpt or fragment is preceded by the name of the writer and the title of his work. As a rule, the excerpts were literally reproduced, without condensation or other change. During the progress of this work an official text-book was drafted, intended primarily for use in the imperial law schools. It was based on the *Institutes* of Gaius, and bore the same title. The *Institutes* and the *Digest* of Justinian were published Nov. 21 and Dec. 16, 533. In the meantime the *codex* of 529 had become antiquated. A number of controversies had been discovered in the juristic literature, and no less than fifty new constitutions had been issued for their decision. A *Codex* "of the second reading" (*repetite prelectionis*) was therefore published Dec. 29, 534. It contains more than 4,600 constitutions (more than half of them "rescripts"), arranged in twelve books. The *Institutes*, *Digest*, and *Codex* were declared to be henceforth the sole sources of the law, and to forestall further controversy it was made a penal offense to write commentaries upon these books. During the remaining years of his reign Justinian issued many new constitutions. Of these *Novels* (*novellæ leges*) only private compilations were made.

The value of Justinian's work lies mainly in the fact that the Roman law was not codified in the modern sense of the word; i. e. no attempt was made to set forth the entire law

as a body of positive rules. In the excerpts from the juristic literature which make up the *Digest* and in the rescripts contained in the *Codex* we have a great body of rules stated only by implication, and therefore capable of reformulation. This gives the Roman law that elasticity which is inherent in all case law. This made it possible to apply the underlying principles of the Roman law to the new and different social conditions of the Middle Ages, and this makes the law-books of Justinian of value to-day to the student of legal science.

4. ROMAN LAW IN MEDIEVAL AND MODERN EUROPE.—*In the East.*—The collections made by Justinian continued to be employed in the East Roman or Byzantine empire until the close of the ninth century, when they were displaced by a less bulky compilation, known as the *Basilica* (sc. *nomima*), royal laws. This book remained nominally in force until the fall of Constantinople (1453), but it was superseded in practice by a series of private digests and compendiums, each briefer than its predecessor. One of these, the *Hexabiblos*, compiled in the fourteenth century, was extensively used among the Christian subjects of the Ottoman empire, and was in force in the kingdom of Greece as late as the middle of the nineteenth century. It is said that the Roman law in its later Byzantine form exercised a considerable influence upon the development of the Turkish law.

In the Teutonic Kingdoms.—Half a century before Justinian ascended the throne at Constantinople the West Roman empire had fallen. In most of the Teutonic kingdoms established in Western and Southern Europe the conquered provincials were permitted to live by the Roman law (the so-called system of the "personal statute"), and several of the kings had handbooks of Roman law compiled for the use of their Roman subjects. The most important of these was the so-called *Breviary* of Alaric II., King of the Visigoths (A. D. 506). It included a condensation of the *Institutes* of Gaius, a portion of the *Opinions* of Paul, and a considerable number of constitutions from the older codices, particularly the Theodosian.

Local Law.—As the Romanic and Teutonic elements in Western and Southern Europe were gradually fused into new nations, the system of the "personal statute" was necessarily abandoned, and the Roman law became the local law of those districts in which the Romanic element was preponderant. In France, for example, the southern provinces, where it was regularly applied, were known as the "lands of written law" (*pays de droit écrit*), in distinction from the "lands of custom" (*pays coutumiers*), where Frankish usages prevailed. Until the latter part of the Middle Ages, however, the economic conditions prevailing throughout Europe were so simple that the Roman law which was required and applied was but a slight part of the jurisprudence which had grown up in the second and third centuries. Until the twelfth century the *Breviary* was almost the only source of Roman law employed in Western Europe.

The Canon Law.—Of greater importance was the survival and development of Roman law in the mediæval Church. It was an unquestioned maxim that the Church lived by the Roman law. Its entire sacerdotal personnel stood outside of the tribal and local laws which governed the laity, and in many matters which are to-day regarded as secular (marriage and the family relations, testamentary succession, etc.) it claimed and obtained a practically exclusive jurisdiction over all Christians. From the court of the bishop (see ORDINARY) appeals ran to Rome and by the decisions of the popes a great body of new law was gradually built up—the *jus canonicum*. See CANON LAW and MARRIAGE.

Study and Reception of the Law-books of Justinian (1100–1600).—Toward the close of the eleventh century the law-avers of Lombardy began to have recourse to the *Digest* of Justinian for the solution of questions upon which their local law was silent. In the twelfth century flourishing law schools existed at Bologna and other Italian university centers in which the Roman law, both civil and canon, was systematically taught, and to which students from Western and Central Europe (*ultramontani*) thronged by thousands. In the course of the same century Roman law was read at Montpellier, at Paris, and at Oxford. In the following centuries it became a regular branch of instruction in the new universities established in the Netherlands and in Germany. In those countries where Roman law was already in force the law-books of Justinian began to be cited in the courts, and in countries where the Roman law had previously

found the household group indirectly, through the custodial character these books were gradually reserved, as positive law, under a "reception" of the Roman law took place in common and in the Northernlands in the course of the fifteenth and sixteenth centuries.

The primary reason of this reception was the need of a new clearly developed system of law. With the revival of commerce which helped to loosen the stronger economic conditions found in the villages, and the simple customs by which the greater part of the continent was governed became obsolete. One of the first results of the commercial revival was the extension of the mercantile law of the Mediterranean, which was largely Roman in character, along the coast of Western and Northern Europe from Marseilles to London. But this body of law was applied only to merchants and to transactions of a distinctly commercial character. The new needs of the rest of the community were simply met by the law-books of Justinian. In those parts of Europe, therefore, were not at first touched by the revival of commerce, and in which simple economic conditions continued to prevail, as in Switzerland and the Scandinavian countries, the Roman law was not received.

Positive and negative points of the reception was the nature of the medieval state in which the kind of law that was received. Feudalism had an integrated political organization in most parts of Europe there was no real independent power nor any serious political control. The principal exception was England, where the Norman conquest had constituted the structure the king in Parliament could not ignore. For the custom, and the king's courts were able to develop the national law by their decisions. A second exception was Northern France, where, at the close of the twelfth century, the crown had obtained power enough to reform procedure in the provincial courts and to determine to the king's courts on appeal. In England neither the Roman law was not received at all; and in Northern France its reception was "partial" only—i.e. single law was received, but the Roman law was not adopted as a whole. A third factor of importance was the conviction which prevailed throughout Europe, and which was especially strong in Germany and Italy, that all political authority derived from the Roman empire, and that all the laws supposed from Augustus to Justinian were the legal successors of the medieval rulers. This notion of "continuous empire" did much to facilitate and legitimize the reception.

Finally connected with the reception of the Roman law was the development of popular courts and lay judges and the development of the "learned judiciary." Each of these movements was in part a result and in part a cause of the other.

From the medieval point of view the reception of the Roman law came to be regarded as a first step in that reception of the medieval culture which culminated in the humanistic movement of the fifteenth and sixteenth centuries.

Character of the Reception.—(1) The Roman law was received by the crown and with the modifications which it borrowed as the Italian practice of the twelfth and thirteenth centuries. The Italian jurists had combined with the *Digest*, *Code*, and *Code of Justinian* the greater part of the *Novae*, and to distinguish this mass of law from canon law they termed it "the body of the civil law" (*corpus iuris civilis*). They had also "glossed" or annotated it, comment, and their notes, as digested in the "ordinary law" of Accursius about 1250, enjoyed an authority that passed that of the text. (2) The "civil law" was received subject to the changes introduced by the local law. (3) It was received nominally as subsidiary law—it was to be applied only in the absence of local rules, a *lex supplet*. However, the learned judges were generally free to local customs, and by throwing upon the party pleading a local rule the burden of proving its existence and to remove that did much to destroy local custom and obscure local rules.

Rejection of the Roman Law.—A reaction against the Roman law began to develop simultaneously with its complete reception. Codification of local customs was first demanded; later, under the influence of the "natural law" school (see Jurisprudence), there arose a general demand for modern rules adapted to modern conditions. The decisive factor in this new development, however, has been the desire for a new national law for divergent local and national laws. In many branches of the law (mainly in those of contract) the national codes of Europe are sub-

stantially Roman, and the non-Roman rules which have found acceptance are usually formulated in a manner which shows the influence of Roman ideas to be still dominant. In several countries in which the law-books of Justinian were never received a "scientific reception" of the Roman jurisprudence has taken place; as in Switzerland and in the Scandinavian countries.

Books and Literature.—For the older Roman legislation and jurisprudence, see Bruns and Mommsen, *Fontes Iuris Romani*, and Bruns, *Scriptores Iuris Romani*. The *Institutes* of Gaius have been translated into English by Poste and by Maitland—the *Rebus in Ulpian* by Maitland; the *Institutes* of Justinian by Meyle. The best edition of the *Corpus Iuris Civilis* is that of Mommsen and Krüger; the latest edition of the *Corpus Iuris Civilis* is that of Friedberg. Histories of the Roman law (Justinian) are numerous; the best in English is that of Maitland. The best brief exposition of the Roman law in English is the translation of *Justinian's Institutes*. For the medieval history of Roman law the best book is still that by Savigny. For the reception, see the works of Schmidt and Holdmann.

Romana, Giverni. See GIVERNI ROMANO.

Romanoff: the name of the family from which the present dynasty of Russia derives its origin. Michael Poularevich Romanoff, the descendant through his grandmother of the royal house of Rurik, was the first of the name to ascend the imperial throne, being chosen by the higher nobility and the clergy in 1613. His successors in the male line ruled till the death of Peter II. in 1760, when the succession reverted to the female line. Another change took place on the death of Elizabeth in 1762, when her nephew, the son of the Duke of Holstein-Gottorp, ascended the throne under the title of Peter III., founding the dynasty of Romanoff-Oldenburg, to which the present sovereign of Russia belongs. See RUSSIA and the articles on the Russian rulers.

Romansch, or Romansch: See RHAETO-ROMANCE DIALECTS.

Romans, Epistle of St. Paul to the: one of the most important of the Pauline books; probably written from Corinth. It affords so many fine examples of the noble and altogether peculiar style and reasoning of the great apostle that its authenticity has never been seriously called in question. Its contents are largely doctrinal, but it contains fine hortatory passages and directions for practical conduct. Its evangelical literature is extensive. The Epistle contains a thorough and comprehensive statement of the theology of Paul. He wrote the epistle to the Church at Rome, which had been already established, probably by some of his own disciples, in order to prepare the way for a visit which he was anxious to make to them (XV. 23). At the time of writing he was under the necessity of going to Jerusalem (XV. 25-27). He therefore stood at the point described in Acts XX. 3; that is, about the year 58. For literature see PAULINE EPISTLES, to which add the English translation of the work of Gieseler on the Pauline Epistles (Edinburgh and New York, 1894).

Revised by S. M. JACKSON.

Romanticism (deriv. of *romantic*, from O. Fr. *romantique*, romantic, deriv. of *romant*, romance): a term applied to a literary school or movement which is opposed to the methods and ideals of classicism.

Definitions.—The following are some of the definitions given by well-known writers. Heine: "The romantic school in Germany was simply the reawakening of the poetry of the Middle Ages." *Ann. de Saint*: "The name romantic was introduced in Germany to designate the poetry which was born of chivalry and Christianity." Walter Pater: "It is the addition of strangeness to beauty that constitutes the romantic character in art." Dr. P. H. Hodge: "The romantic feeling has its origin in wonder and mystery. It is the sense of something hidden, of imperfect revelation. . . . The peculiarity of the classic style is reserve, self-suppression of the writer. . . . The romantic is self-reflecting." Prof. Boyesen: "Romanticism is really on one side retrogressive, as it seeks to bring back the past, and on the other hand progressive, as it seeks to break up the traditional order of things." George Saintsbury: "The terms classic and romantic apply to treatment, not to subject, and the difference is that the treatment is classic when the idea is represented as directly and with as exact an adaptation of form as possible, while it is romantic when the idea is left to the reader's faculty of divination assisted only by suggestion and symbol." Victor Hugo: "Roman-

ticism, so many times badly defined, is simply liberalism in literature."

Essential Qualities.—All these definitions have something in common. There are evidently three essential qualities in romanticism: Subjectivity, love of the picturesque, and a reactionary spirit. By the first is meant that the aspiration and vague longing of the writer will be manifest in his literary production; by the second, that element of strangeness added to beauty, which Pater declares is fundamental; this may appear mildly, as where the writer is fond of ivy-mantled towers and moonlit water, or may turn into a passion for the unnatural and the horrible, as in tales of ghosts and of deeds of blood. By the third is meant that the romantic movement in any country will always be reactionary to what has immediately preceded; it may be gently and unconsciously reactionary, as in England, or proudly and fiercely rebellious, as in France.

Mediævalism.—Taking these three elements, subjectivity, picturesqueness, and reaction, it is easy to see why the romantic movement in Great Britain, in Germany, and in France, went for its inspiration back to the Middle Ages. In the Middle Ages lay just the material for which the romantic spirit yearned. Its religious, military, and social life can hardly be better characterized than by the word *picturesque*; and souls weary of form and finish, and of the monotony of rules, naturally sought the opposite of all this in the literature and thought of the Middle Ages. And as the classicists had neglected this period above all others, and treated it with contempt, the reactionists began with an attempt to revivify and brighten this mediæval life.

English Romanticism.—The most striking difference between the romantic movement in France and in Great Britain is that in the former the movement was conscious, while in the latter it was only instinctive. French romanticism had a definite programme, backed almost from the start by a critical school, and headed by one supreme creative genius. English romanticism was a totally different thing. Its beginnings are so faint and so far below the surface that many writers seem to believe that English romanticism began with the nineteenth century, and that in the "age of prose and reason" there was no such thing as a romantic movement at all. It is certainly impossible to name any author as the chief pioneer; for even at the height of Augustan taste there were feeble signs of reaction shown by such writers as Parnell, Croxall, Lady Winchelsea, William Hamilton of Bangour, and Allan Ramsay. The reaction in form, which resulted in the overthrow of the heroic couplet, was brought about by Thomson, Blair, Dyer, Young, Akenside, and others, who cultivated blank verse. The sonnet was revived by Thomas Edwards, Thomas Warton, Stillingfleet, and Mason. Perhaps the most marked change, both in thought and style, is indicated by the Spenserian revival—the renewed study of his poetry and the metrical imitations of his stanza. The latter began as early as 1706, with an ode by Prior, and the fad reached its highest popularity in the years 1735–55, when about forty poems by various writers appeared in Spenserian form. The influence of Milton's poems—especially his *Il Penseroso*—was very effective after 1750, giving to literature a dreamy, melancholy cast, which aided in developing the churchyard school. The Warton brothers, happily re-enforced by the lyrical genius of Collins, were the leaders of the Miltonic group, and became prominently identified with the romantic movement. Joseph Warton wrote blank verse and odes, but his most important contribution was his *Essay on Pope* (1756), in which he maintained that Pope, being deficient in the higher qualities of poetry, imagination, and passion, could not be classed in the first rank of British poets. Thomas Warton wrote sonnets and poems on romantic themes, and aided the Spenserian school by his *Observations on the Faery Queen* (1754). Following the influences just mentioned came the rage for mediævalism, shown in the revival of Gothic architecture, begun by the dilettante Horace Walpole. He did pioneer work by building a fantastic structure at Strawberry Hill (1750), and by writing the extravagant Gothic romance, *The Castle of Otranto* (1764). The love and study of chivalry, for which Thomas Warton made a strong plea in his *Observations*, was greatly aided by Hurd's *Letters on Chivalry and Romance* (1762). Meanwhile a taste for old ballads, which was created in 1723 by a very popular collection of old ballads (anonymous) and in 1724 by Ramsay's *Evergreen*, received a tremendous impetus by the publication of Percy's *Reliques* (1765). The love of mediævalism showed itself also in the opening of a new romantic storehouse—the Northern mythology. In

1755 Paul H. Mallet published the first part of his *Histoire de Dannemarck*, which treated of the religion, laws, and customs of the ancient Danes, and which gave a translation of a large portion of the Eddaic mythology. Percy and Gray became enthusiastic students of this, and made Odin nearly as familiar to readers as Jupiter. Old Welsh poetry was also cultivated; and everything old or wild or sentimental leaped into popularity by the publication of Macpherson's Ossianic poetry (1760–63), which ultimately was taken more seriously on the Continent than in Great Britain. It was fortunate for the movement that the greatest poet of the time, Gray, finally threw his whole influence in its favor. Beginning as a classicist and disciple of Dryden, Gray came strongly under the influence of the *Il Penseroso* group, and finally ended in downright romanticism. Gray was also the first man of note in the eighteenth century to appreciate natural scenery, and his *Journal in the Lakes*, written 1769, published 1775, is full of the Wordsworthian spirit. By 1770 the romantic movement was in full swing; Chatterton's poems were an important contribution, and two great sides of the movement—the taste for ballads and for chivalry—culminated in the poetry and prose of Walter Scott. Byron belongs to sentimentalism more strictly than to romanticism, but his influence on the romantic schools in France and Germany was enormous. Coleridge and Keats are identified with romanticism, and Wordsworth's methods and theories would certainly give him a place in the history of the movement. After 1830 romanticism in Great Britain became less pronounced, because everything in a sense was romantic; there was nothing to fight.

French.—Speaking generally of the literary history of the two countries, Great Britain has almost consistently stood for romanticism; France for classicism. The romantic movement in Great Britain in the eighteenth century was really the heart of the people asserting itself, timidly and instinctively at first, against the domination of a critical school; while the romantic movement of 1830 in France was a bitter, desperate fight between a band of young reformers and the national literary instinct. The beginnings of French romanticism may be seen in the writings of Chateaubriand and Madame de Staël, but it was with Victor Hugo that the school definitely began (and ended) its work. In the preface to *Cromwell* (1828) he laid down plainly and defiantly the romantic programme, which was fought for by the presentation of his *Hernani* in 1830, and the publication of his great romance *Notre Dame de Paris* (1831). A group of young writers followed enthusiastically in Hugo's wake; they and the movement are well set forth in Gautier's *Histoire du Romantisme*. The school directed its sharpest attacks against the classic French drama, and this reform was the most important literary result they accomplished. The emancipation proclaimed, and at last established, the movement naturally spent its force.

German.—The German romantic movement is not so easy to follow. Between the years 1770 and 1832 it flourished, drooped, and flourished again. Herder's enthusiastic interest in the past kindled a flame of mediævalism, which was re-enforced by Ossianic sentimentalism from Great Britain. Ossian's influence on Goethe's *Werther* is well known, and *Götz von Berlichingen* (1773) came from the heart of Goethe's youthful romanticism. Twenty years later, however, the interest in Greek antiquity put mediævalism in the shade, and classicism became supreme. Then in the early years of the nineteenth century the romantic school asserted itself with renewed force, and a younger generation of poets took up eagerly the cultivation of old patriotic German literature. The Schlegel brothers, Tieck and Novalis, were the leaders of the romantic school proper; the younger, or new romantics, were represented by Uhland, Brentano, the Grimm brothers, Arnim, and others.

WM. LYON PHELPS.

Romany Language: the language of the GYPSIES (q. v.).

Rome [from Lat. *Rōma* (whence Gr. *Ῥώμη*) > Ital. *Roma* : Fr. *Rome* : Span. *Roma*]: the chief city of ancient Italy, giving its name also to a great republic and empire; the capital of the modern kingdom of Italy.

I. ROME FROM 753 B. C. TO 476 A. D.

THE EPOCH OF THE KINGS (*Legendary Dates, 753–509 B. C.*).—According to the legends current during the later republic, the city was founded in 753 B. C. by a settlement from Alba Longa led by ROMULUS (q. v.). The earliest ac-

temple on the Palatine Hill gave by the addition of another hundred, who were welcomed to an asylum on the Tiber, surrounded by men with the neighboring Sabines, whose king, Titus Tatius, was associated with Romulus in the government. Romulus was the founder of the political and religious institutions of the Romans, as his successor, Numa Pompilius, was the organizer of their religious institutions. After the reign of Tullus Hostilius, the conqueror and destroyer of Alba Longa, and the peace-loving Ancus Marcius, an Etruscan dynasty gained possession of Rome. Under the three kings of this house—Lucius Tarquinius Superbus, Servius Tullius, and Tarquinius Superbus—Rome grew rapidly in power, but the rule of the last Tarquinius became so oppressive and brutal that the people drove him out and established a republic in 509.

Rome subjected to systematic criticism early in the nineteenth century by Niebuhr; the legends of the regal period are no longer accepted by competent scholars as a true account of the early history of Rome. They rest upon no contemporary authority. The earliest historians of Rome write in the line of the Poenian wars, and tend to depend almost entirely on oral tradition, since the greater part of the events of this early had been hushed when Rome was taken by the Gauls in 387 B.C. Moreover the legendary narrative contains many inconsistencies and chronological impossibilities, much that would appear improbable even if supported by the best of evidence, and much that is obviously impossible of invention. No confidence can be placed in the detailed history of the regal period, but it is still possible to reconstruct the broad features of the development of the early Roman state when studied in the light of the later history of the city, the archaeology and topography, and the comparative history of institutions. The tradition gains value as we approach the end of the regal period, and becomes fairly trustworthy soon after the establishment of the republic.

However and whenever founded—and it may well be doubted that the foundation of Rome was due to the influence of some dominant leader—the earliest Rome was a small Latin town on the Palatine and the small adjacent hills, an early settlement into whose position on the Tiber gave it important commercial advantages. The history of the Roman state begins with a community of three tribes—the Ramnes of the Palatine and their neighbors whom they had absorbed, the Lucian Tribes on the Quirinal, and the Luperans on the Esquian. Each tribe was divided into ten *curiae*, and these again into several *clans* or *gentes*. The members of the gentes—the patricians—alone had political rights. The government consisted of a king, who was chief priest, judge, and commander in war; of a senate of 100 heads of families who gave counsel to the king and took charge of the government in case of an interregnum; and of a popular assembly (*comitia curiata*), composed of all patricians capable of bearing arms. Besides the fully qualified citizens there were three other social classes which in time melted into the class of plebeians—the clients or serfs of the class, a number of resident foreigners engaged in trade, and the rural plebeians or inhabitants of conquered Latin towns who had not been admitted to citizenship. That the knowledge of Rome belonged to an Etruscan dynasty there was good reason to doubt, although it is not likely that any accurate has been correctly handed down. Under their rule the walls were built and important public works made, and the Roman territory, which had previously extended among the Tiber and in the direction of Alba Longa, came to include the greater part of Latium. Closer relations with various nations were established, resulting in the absorption of new elements of culture. To this period probably belong the important constitutional changes which ancient writers ascribe to Servius Tullius. As a means of strengthening the army, *hastati* composed only of patricians, the people were grouped into five classes on the basis of landed property, so that every possessor of land bore a share of the public burdens proportionate to his ability. The organization soon acquired political importance, and the 100 military divisions or centuries into which the plebs was divided became the basis of the *comitia centuries*, a popular assembly which soon revealed and finally superseded the older *comitia curiata* in its most important political functions.

The struggle of Patricians and Plebeians (c. 500-300).—After the expulsion of the last Tarquinius from Rome, a republic was established under the presidency of two consuls chosen only from the patricians and invested, except in re-

ligious matters, with the full authority of the kings. From their decision an appeal lay to the popular assembly; in time of great public danger a dictator was given sovereign power for a term not to exceed six months. Although the plebeians had joined with the nobles in the movement which put an end to the rule of the kings, dissensions between the orders broke out almost immediately. If the plebeians were excluded from the magistracies, and, while all who possessed land had a vote in the *comitia centuries*, the assembly was so organized that the wealthy members of the first class were able to control it. The condition of the poor was rendered particularly hard by the oppressive burden of military service and the harsh law of debt, which gave the creditor absolute power over the person of the debtor. Matters came to a head in the year 494 when the plebeians marched in a body to the Sacred Mount, and were only induced to return by measures of relief from debt and by the institution of tribunes of the people, elected by the plebeians and empowered to veto the acts of any magistrate. Shortly afterward (486) Spurius Cassius made an unsuccessful attempt to break the patrician monopoly of the public land by proposing a division of newly acquired territory among the plebeians. Centering at first about the agrarian law, the struggle between the orders continued with great bitterness. The plebeians organized a tribal assembly of their own, the *comitia tributa plebis*, which sought to make its decrees binding upon the whole body of citizens, and the tribunes usurped the power of banishing or even condemning to death those who opposed their policy. The plebeians protested especially against the exclusive knowledge and administration of the law by the patricians, and after repeated demands for a code which should introduce equality and certainly into the legal system, it was agreed in 451 to elect a board of ten commissioners (*decemviri*) with power to revise and codify the laws. Their work was continued by a second commission appointed in the following year, and the results of the decemviral legislation, called from the twelve tablets on which they were engraved the Laws of the Twelve Tables, became the foundation of the whole legal system of Rome. The civil equality of the patricians and plebeians was completed in 445 by the Canuleian law, which legalized intermarriage between the two orders. The same year marks an important landmark in the struggle of the plebeians for political rights. Instead of throwing open to them the consulship, which conferred membership in the senate and important social privileges on those who had held it, the patricians agreed that each year the people might determine to elect, in place of the consuls, military tribunes with consular power, chosen indifferently from the two orders. Two years later, with the purpose of reducing this concession as much as possible, the office of censor was created and invested with the powers which the consuls had exercised in taking the census and making up the list of citizens. Unimportant as the institution of military tribunes proved to the plebeians—no plebeian was chosen to the office until 400—it seemed to quiet their demands, and it was not until 367 that the patricians were finally forced to admit them to the consulship. In that year the Licinian laws abolished the military tribunate and provided that at least one of the consuls should be a plebeian, while they also made the plebeians eligible to the body of priests who had charge of the Sibylline books. These laws also made an ineffectual attempt to remedy economic evils by reducing debts and limiting to 500 *jugera* the amount of public land that could be held by one individual. In political matters, however, the laws mark the end of the long struggle between the orders. It is true that in the same year all judicial functions were taken from the consuls and conferred upon the newly created patrician office of praetor, and that the "sulking patricianism" yielded slowly and sought to destroy the effect of its concessions as far as possible; but with the consulship once granted to the plebeians, eligibility to the other magistracies was sure to follow. A plebeian held the office of dictator in 356, of censor in 351, and of praetor in 337. The quaestors, who had charge of the public treasury, had been elected from both orders since 421, and the priest-holds were divided between the orders in 380. With all the magistracies in the state thus open to them, the plebeians also gained influence in the popular assemblies. The decrees of their own assembly, the *concilium plebis*, first organized in 471, were by the Publilian law of 339 and the Hortensian law of 286 given legal force and made binding on the whole people. The *comitia curiata* lost all importance in the state; its earlier

functions passed to the *comitia centuriata*, reorganized on a democratic basis at some time in the third century, and to the *comitia tributa*, in which the whole people met in their tribal divisions. "As a righteous retribution for their perverse and stubborn resistance," the patricians saw "their former privileges converted into so many disabilities," since they were forced to share these privileges with the plebeians, and were excluded from election to the tribunate and from membership in the special plebeian assembly.

While the popular assemblies thus "acquired the semblance, the senate acquired the substance of power." The assemblies were unwieldy, the power of the magistrates was weakened by division and by the shortness of their terms; the senate alone had a continuous policy, and it drew to itself the control of elections and legislation and the general direction of the policy of the state. On the ruins of the old nobility of birth arose a new patricianism based upon wealth and possession of office.

The Conquest of Italy (509-275 B. C.).—The same generation that saw the formal completion of plebeian rights by the Hortensian law witnessed the establishment of Roman supremacy in Italy. The wars that followed the expulsion of Tarquinius Superbus deprived Rome of her hegemony over Latium and reduced her almost to her original limits, so that for a time the very existence of the state was threatened. The chief enemies of Rome in this period were the Volscians, situated to the southeast, the Sabine and Æquian mountaineers to the east and northeast, and the powerful Etruscan confederacy across the Tiber. Against these, in 498, an alliance was formed between Rome and the towns of the Latin confederacy, and in 486 this league was joined by the neighboring Hernicans. The long and doubtful wars which followed, embellished by Roman annalists with poetic details and the half-fabulous stories of Coriolanus and Cincinnatus, brought little advantage to Rome. The state was weakened by civil dissensions, and only after these were temporarily healed by the decemviral legislation and the reforms which immediately followed it, did the Romans begin the steady advance which brought them in 406 before the gates of the important Etruscan city of Veii. The capture of Veii, after a ten years' siege, was an event of great importance in the territorial growth of Rome, since it removed the most serious obstacle to the advance of Roman power. In the year 390 Rome was taken and burned by the Gauls, a Celtic people from the north of Italy. In spite of the immediate loss, the Gallic invasion, seems in the end to have favored the growth of the Roman power, by weakening Rome's great rival, the Etruscans, and putting Rome into the position of a defender of the rest of Italy against the foreigner. A war with the Latins ended in 338 in the dissolution of the Latin league and the incorporation of most of its members into the Roman state. In 306 the Hernican confederacy met a similar fate. The overthrow of the powerful tribe of the Samnites in 290, after a struggle which had lasted with little intermission for more than fifty years, led to the subjection of their Etruscan and Umbrian allies, and the defeat of Pyrrhus at Beneventum in 275 put an end to the independence of the Greek cities in the south, and left Rome mistress of Italy. The Roman territory (*ager Romanus*) received considerable additions, but Roman supremacy was most effectively secured by the founding of colonies, by the building of military roads, and by the grant of municipal rights and the establishment of treaties of alliance with the conquered cities.

The Establishment of Roman Supremacy in the Mediterranean (264-133 B. C.).—Rome's attempt to extend her dominion beyond Italy brought her at once into conflict with Carthage, the leading power in the western Mediterranean. The immediate occasion of the first Punic war was the interference of Rome in the affairs of Sicily, which was then in dispute between the Carthaginians and the city of Syracuse. The war lasted from 264 to 241, and resulted in the victory of Rome only after she had created a navy and learned to compete with the Carthaginians on the sea. Shortly after the conclusion of peace, Rome took advantage of the mutiny of the Carthaginian mercenaries to annex the possessions of Carthage in Sardinia and Corsica. While Rome was engaged in subduing the Gallic tribes in the valley of the Po, Hamilcar Barca conquered Spain for Carthage. His son Hannibal began the second Punic war in 218 by leading his army over the Alps into Italy. Important victories on the Trebia, at Lake Trasimene, and at Cannæ, gave him control of the Po valley and the southern part of the peninsula, but he was unable to attack successfully the city of Rome or to shake

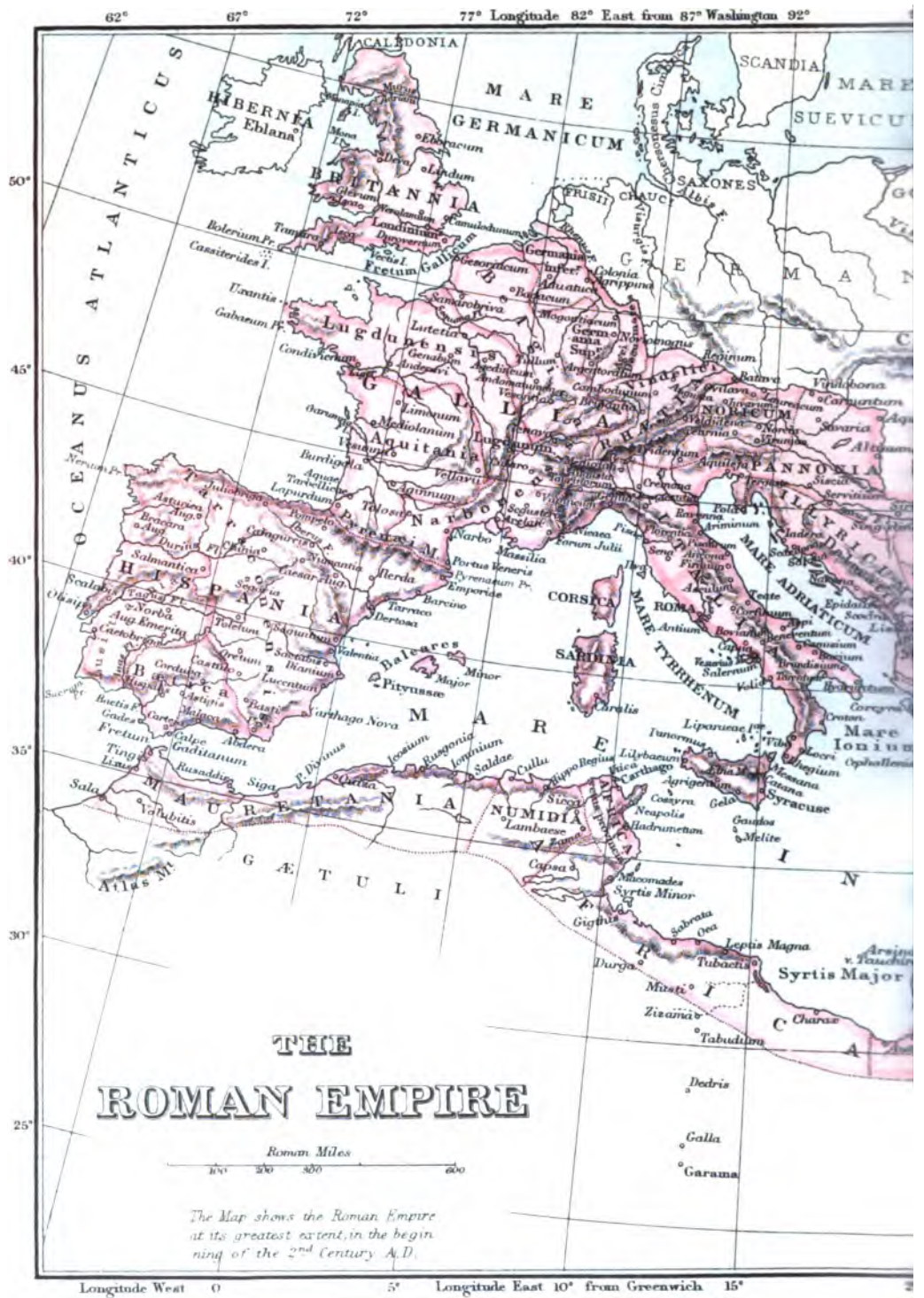
the loyalty of the peoples of Central Italy. The defeat of his brother Hasdrubal on the Metaurus destroyed Hannibal's hope of re-enforcements, and he was compelled to return to Africa, where the victory of the Roman general Scipio at the battle of Zama put an end to the war. Spain was ceded to Rome, and the political and commercial supremacy of Carthage was at an end.

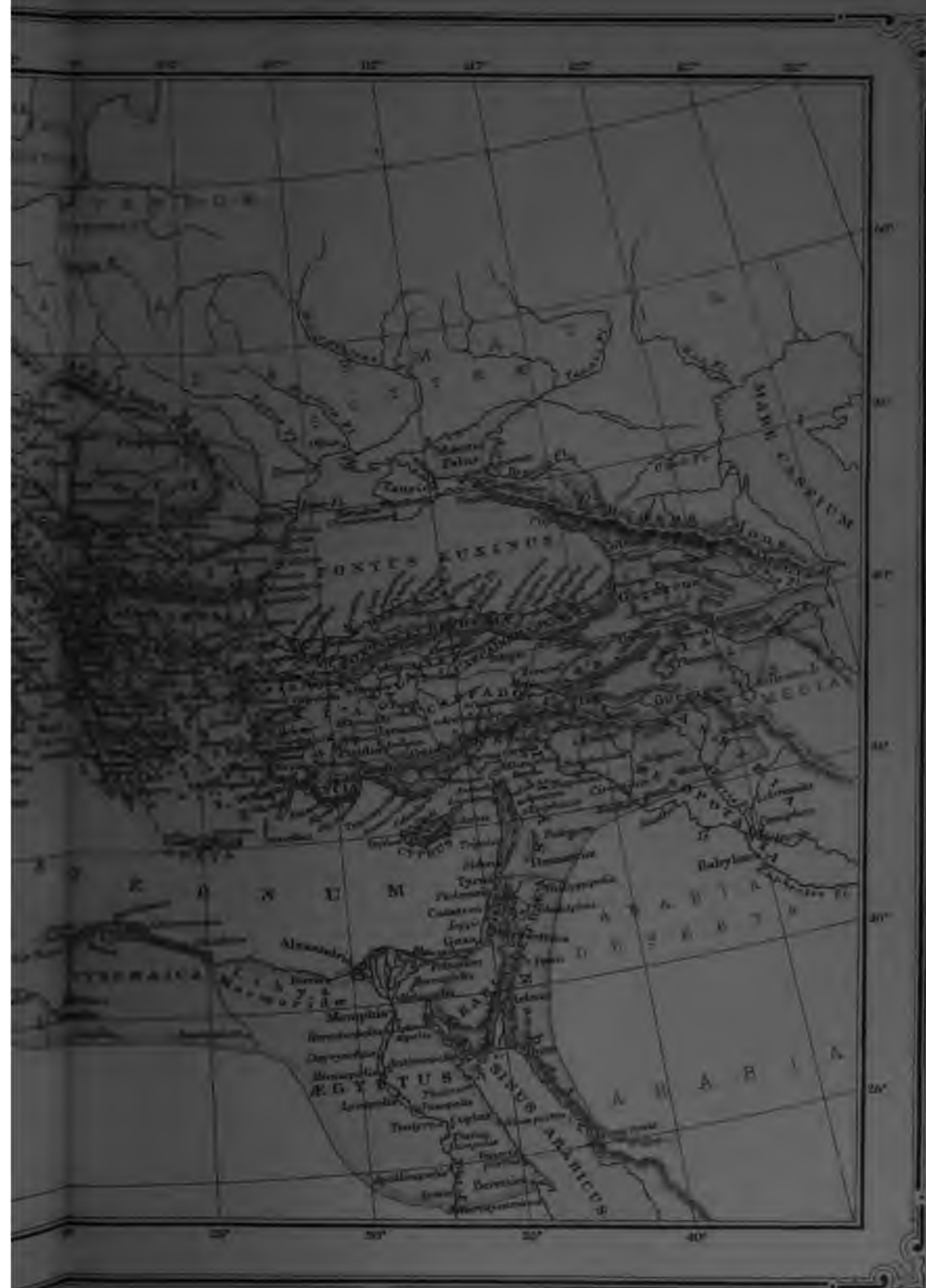
The alliance of Philip of Macedon with Hannibal gave Rome a pretext for interference in the East, and the second Macedonian war resulted (197) in the destruction of the Macedonian supremacy in Greece and the independence of the Greek states. In 190 Antiochus of Syria was defeated at Magnesia and compelled to surrender Asia Minor, which went to increase the territories of Rome's allies. Illyricum became a Roman province in 167. The third Macedonian war ended in 168 in the division of the Macedonian kingdom into four republics under Roman supremacy. In 146 these republics became the Roman province of Achaia, and in the same year a desperate revolt led to the destruction of Carthage and the formation of the Roman province of Africa. In 133 Attalus, King of Pergamus, bequeathed his dominions in Asia Minor to Rome.

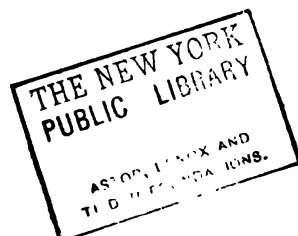
This rapid extension of territory was accompanied by far-reaching changes in Roman society. The increase of slavery and the growth of large estates in Italy hastened the decline of the class of small proprietors, who formed the backbone of the old Roman state. Foreigners and dispossessed farmers flocked to the capital, where they formed an idle and dangerous proletariat. In spite of the efforts of such men as Cato, the simple and austere life of earlier times gave way before the spread of a cosmopolitan Hellenism. Political institutions had not adjusted themselves to the changed conditions; Rome was trying to govern an empire with the constitution of a city. The provinces had no share in the government, and were considered a legitimate source of plunder by the governors and tax-gatherers. The senate sank "from its original high position, as the aggregate of those in the community who were most experienced in counsel and action, into an order of lords filling up its ranks by hereditary succession, and exercising collegiate misrule." Reform was imperatively needed.

The Decline of the Republic (B. C. 133-27).—The last century of the republic is a period of civil struggles, under the strain of which the republican constitution broke down and gave way to the empire. "It is a sign of the decay of genuine republicanism at Rome, and the approach of autocratic government, that from this time on its history centers about the names of individuals." Controversy first arose over the efforts of Tiberius Gracchus to remedy the evil growing out of the Roman land system. Elected tribune of the people in 133, Gracchus at once proposed an agrarian law which provided for the enforcement of the act of Licinius, limiting the amount of public land which any citizen could possess. Land thus held in excess of the legal amount was to be parceled out among the citizens and Italians in inalienable holdings of thirty *jugera*. The measure was only carried after the deposition of a tribune who interposed his veto; and in seeking re-election the following year Gracchus was killed by his political opponents. In 123 Gaius Gracchus brought forward a more comprehensive scheme of reform. Besides re-enacting the agrarian law of his brother, the execution of which had been suspended after farms had been given to 80,000 citizens, he struck directly at the power of the senate by restricting its control over the government of the provinces. As a counterpoise to the senate, he sought to strengthen the influence of the equestrian order, a class of wealthy capitalists to whom the collection of the provincial taxes was let. The people were won over by public sales of grain at a reduced price. Gracchus hoped to direct the policy of the state by securing his regular re-election to the tribunate, but he was defeated in 122 and soon afterward murdered. After the death of Gracchus the selfish policy of the nobles ruled supreme. The occupied public land was granted to the possessors as absolute private property, and the condition of Italy and the provinces grew steadily worse. The crowning example of aristocratic misrule is seen in the war with Jugurtha, King of Numidia, who bribed one after another of the inefficient generals sent against him. The war was finally brought to an end by Gaius Marius, a man of humble origin, whose further success in repelling the invasion of the Cimbri and Teutones made him the leading man at Rome. Marius was the first of the line of military heroes under whom the republic went out and the empire came in. He lengthened the term of enlistment and abolished the









to be granted the service in the army, so that military service became a popular profession, and the interests of the soldiers were bound up with those of the general. At the same time, a Italian ally, while they possessed the promise of citizenship, still had no the suffrage, and was largely as the party of the Roman magistrates in Rome was. Repelled in their demands, they were in revolt in 91, establishing an independent state under the name of Italia, and were only subdued after the rights of citizenship had been extended to all of Italy south of the Po. Rome was driven out on the social war, as the war was called, when an important war broke out between Rome and the Italian allies of the Latins. The command was entrusted to Sulla, a brilliant member of the aristocratic party, who had already distinguished himself against the Gauls in the Social war. While Sulla was absent in the East, Marius, Cinna, and Cetheg, the leaders of the popular party, raised a revolt in Rome and put to death many of their opponents. On Sulla's return in 83 a civil war ensued, and Sulla's victory resulted in a series of cruel prosecutions, with several thousand citizens perished. Marius, however, Sulla devoted his attention to restoring the senatorial government. He re-established the power of the senate and took away those functions of the tribunate which he considered ineffective, an engine of revolution under the republic. At the same time the system of provincial government was reorganized, and important reforms were made in the laws of law.

Such as was the Italian revolution in restoring orderly government, it could not stand the strain of the age that followed. The people were divided into two opposing factions, between the other and struggling to secure its own advantage, while the foreign difficulties of the period made necessary the creation of extraordinary commands, wholly inconsistent with the republican constitution. After the death of Sulla, Pompey was the leading general of Rome, because he was the conqueror of the Marian party in Spain, through the Mediterranean of pirates, put an end to the pirate Mithridates, and attacked Syria as a Roman province. While Pompey was absent in the East, the dangerous supremacy of Clodius was suppressed by the prompt action of the consul Cicerus. On Pompey's return to Rome he was soon involved in the senate, and formed a coalition with Crassus to oppose the leaders of the popular party—the so-called First Triumvirate—B. C. 60. The death of Crassus in a campaign against the Parthians (B. C. 53) left Cicerus and Pompey at odds for the leadership of Roman affairs. While Cicerus was engaged in conquering Gaul and thus establishing Roman colonies in the heart of Western Europe, Pompey remained in Rome, where the course of events brought him into close alliance with the senatorial party. War broke out over the expiration of Cicerus's command in Gaul, and Pompey was defeated at Pharsalus in 48, and shortly after executed. After the overthrow of the Pompeian party in the battles of Thapsus and Munda, Caesar was created perpetual dictator, with the title of Imperator. He began a series of important reforms which were cut short by his assassination in B. C. 44. Caesar's murderers, led by Brutus and Cassius, were vanquished at Philippi, and the defeat of a civil war, Antony, at Actium left Caesar's nephew Octavian master of Rome (B. C. 31).

The Early Empire (B. C. 27—A. D. 180).—While the extraordinary commands of the last century of the republic had weakened the people in imperial methods, and while the authority conferred upon Caesar had been essentially inherited by Octavian, the formal establishment of the Roman Empire is usually dated from the year 27 B. C., when Octavian had secured his exceptional powers and took the title of Augustus. More cautious than Caesar, Augustus was careful to preserve the form of the republican constitution. The magistracies were still elected, although their powers were by successive acts conferred upon the emperor; the chief was given a share in the government, and regularly elected; and the real authority lay in the hands of the emperor, who alone controlled the army. Under Augustus the empire was pushed north and east to the Danube, but in the west the Romans were compelled to withdraw from Gaul after a disastrous defeat in the Teutoburg forest in 9 A. D. Augustus's stepson and successor, Tiberius, was made administrator, but grew morose, and disfigured his reign by many acts of cruelty. He was followed by three more emperors of the Julio-Claudian house—Caligula, Claudius, and Nero. Claudius was made a Roman province under Claudius. Under Nero the burning of Rome was followed by a

armed persecution of the Christians. After a year of revolutions marked by the brief reigns of Galba, Otho, and Vitellius, the imperial authority was restored by Vespasian, whose sons, Titus and Domitian, were the last of the so-called Twelve Caesars.

The reigns of the "Five good emperors"—Nerva, Trajan, Hadrian, Antoninus Pius, and Marcus Aurelius—who ruled from 96 to 193, constituted a period of peace and prosperity. The emperors were in themselves great rulers, and they were not thwarted by the opposition of the republican faction, which had been a serious obstacle in previous reigns. The reorganization of the provinces and the consequent unification of the various parts of the empire went on rapidly; men from the provinces even supplied the imperial dignity. The conquests of Trajan in Dacia and the East extended the Roman empire to its widest limits; but Hadrian gave up the newly acquired province of Mesopotamia, and the wars of Marcus Aurelius with the Marcomanni began the long conflict with the Germanic invaders. See map of Europe under the Romans.

The Age of Transition (A. D. 180—313).—The century which followed the death of Marcus Aurelius marks the transition from the early empire to the absolute monarchy of Diocletian and Constantine. The practice of appointing a capable administrator as colleague and prospective emperor came to an end with the accession of Commodus, son of Marcus Aurelius, and no final rule of succession took its place. The reigns which followed were generally short and troubled; of the twenty-three emperors who actually held the throne between the years 180 and 284, excluding claimants and the so-called Thirty Tyrants, all except three met a violent death. The "barrack emperors" of this period were mostly soldiers who rode rough-shod over the forms of the older constitution, and devoted their energies to defending the frontier against the Germans in the North and the rising power of the Sassanids in the East. The Franks and Alamanni crossed the Rhine, the Goths plundered the eastern provinces and settled in Dacia. The assimilation of Italy and the provinces, hastened by the edicts of Caracalla, which conferred citizenship on all free inhabitants of the empire (212), was accompanied by a decline in patriotism and public spirit. The free Roman population steadily decreased, and large numbers of Germans entered the empire as soldiers or as colonists. The empire was rapidly falling to pieces.

The Later Empire (A. D. 284—476).—The reign of Diocletian (284—305) began a new era in the history of Rome. A series of reforms inaugurated by him and carried out by Constantine checked the disintegration of the empire and enabled it to hold out for two centuries longer. In order to counteract the tendency of the various parts of the empire to split off into independent kingdoms, the provinces were grouped into thirteen dioceses, and these again into the four prefectures of Gaul, Italy, Illyricum, and the East. Over each of these divisions were placed separate civil and military heads directly responsible to the emperor, in whom the official hierarchy culminated. Italy took its place in the new organization on a footing of complete equality with the rest of the empire, and Rome ceased to be the capital. The senate lost all importance, and the emperor became an absolute despot surrounded by an Oriental court. At the same time the government attempted to check the dissolution of society by encouraging the formation of fixed social classes, each with its own legal privileges and disabilities. Effective as was the new political machinery in certain directions, the growth of the imperial bureaucracy destroyed what still remained of local independence in the cities of the empire, and increased the financial burdens which fell with crushing weight upon the local units. Besides completing the political reorganization begun by Diocletian, Constantine founded a new capital at Constantinople and issued an edict granting toleration to Christianity, which soon became the official religion of the state.

After the death of the Emperor Theodosius in 395 the empire was administered by his sons Honorius and Arcadius, ruling respectively at Milan and Constantinople. In law there was still one empire, but the two administrative divisions corresponded to deep-seated differences of civilization, and were never again united except in name. While the East remained Greek, the western provinces fell away to the Germanic invaders who poured into the empire. Rome was sacked by the Visigoths in 410 and by the Vandals in 455. The Visigoths founded a permanent kingdom in Southern France and Spain, the Vandals took possession of Africa, and the Huns occupied the valley of the

Rhone. With scarcely an exception the emperors of this period were weak and incompetent; control passed more and more into the hands of German leaders, until in 476 Odoacer deposed the Emperor Romulus Augustulus and ruled Italy as a German king. The sovereignty of the emperor at Constantinople was nominally recognized in the West, but the real power was in the hands of the kings of the German tribes.

AUTHORITIES.—The best general history of the Roman republic is that of Mommsen. Use should be made of Ihne's *History of Rome* and Nitzsch's *Geschichte der römischen Republik*. For modern views on early Roman history, Niebuhr's *History of Rome*, Schwegler's *Römische Geschichte*, and Lewis's *Credibility of Early Roman History* should be consulted. Arnold's *History of Rome* follows Niebuhr on the earlier period; it is most useful for the Punic wars (to 206). Long's *Decline of the Roman Republic* is a careful narrative of the last century of the republic. Drumann's *Geschichte Roms* treats the same period biographically.

There is no work on the empire equal to Mommsen's on the republic. Merivale's *History of the Romans under the Empire* extends to the death of Marcus Aurelius, where the narrative of Gibbon's *Decline and Fall of the Roman Empire* begins. Schiller's *Geschichte der römischen Kaiserzeit* covers the period to the death of Theodosius. Duruy's *History of Rome* contains a fairly complete account of the empire. The work is particularly useful because of its illustrations. Bury's *History of the Roman Empire* covers briefly the same period as Merivale. Clinton's *Fasts Romani* is of value to the student of the chronology of the empire. Hertzberg's *Geschichte des römischen Kaiserreichs* is valuable, as are also the volumes of Ranke's *Weltgeschichte* which treat of the empire. Mommsen's *Provinces of the Roman Empire* describes an important phase of imperial history. For the years after the death of Theodosius, see Kuhn's *Städtische und bürgerliche Verfassung des römischen Reichs*, Bury's *History of the Later Roman Empire*, and Hodgkin's *Italy and her Invaders*. Among the accounts of particular periods, Gardthausen's *Augustus und seine Zeit* and Burckhardt's *Die Zeit Constantins des Grossen* should be mentioned. Representative works on the social history of the period are Friedländer's *Sittengeschichte Roms* and Schultze's *Geschichte des Untergangs des griechisch-römischen Heidenthums*.

Roman institutions are most completely presented in the great work of Marquardt and Mommsen, *Die römischen Staatsalterthümer*. Good briefer works are Mommsen's *Abriss des römischen Staatsrechts*, Schiller's *Römische Staats- und Rechtsalterthümer* (in Müller's *Handbuch der klassischen Alterthumswissenschaft*), Madvig's *Verfassung und Verwaltung des römischen Staates*, Willem's *Droit Public Romain*, and Bouché-Leclercq's *Manuel des Institutions Romaines*. Herzog's *Geschichte und System der römischen Staatsverfassung* is a valuable work which treats the Roman constitution historically as well as descriptively.

For a study of the original sources of Roman history, Schäfer's *Abriss der Quellenkunde der römischen Geschichte* gives useful material.

CHARLES H. HASKINS.

II. ROME FROM 476 TO 1870.

Upon the ruins of the ancient Roman empire, which fell in 476, there arose gradually a new empire, which soon became all the more powerful as it claimed control over the souls of men as well as over their bodies. Rome became, after a short interregnum, once more the seat of the central power in Europe, and thus earned its historic name of the Eternal City. It owed this supremacy to the gradual development of Christianity. The full supremacy of Rome as the capital of the new Church-empire may be referred to the time of Pope Gregory I. (590-604), through whose energy and political wisdom the authority of the Church was everywhere established.

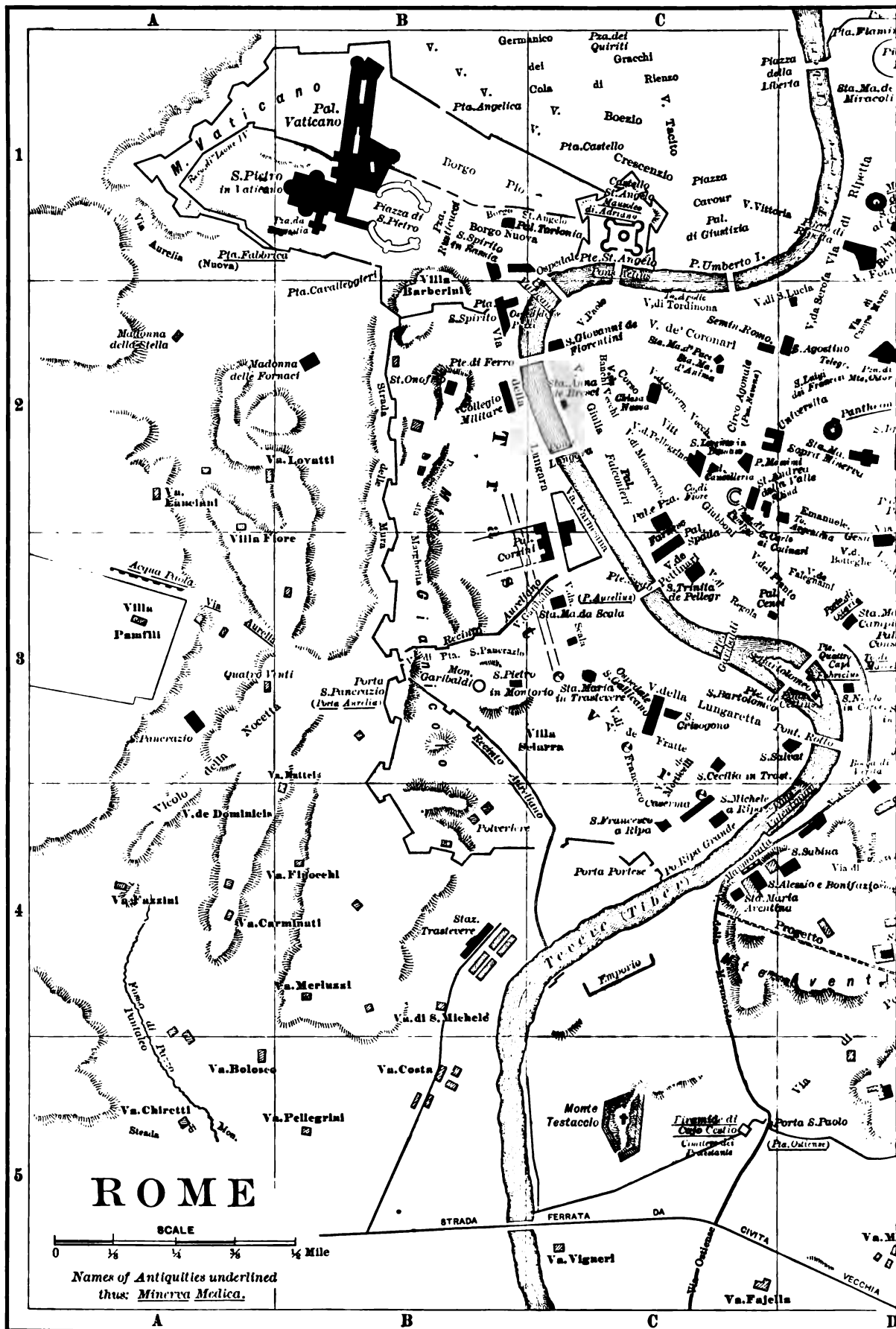
Rome itself—and with Rome the whole of Italy—had in the meantime been the easy prey of the new races which at that time broke forth from their unknown home in the East, overran the whole of Europe, and gradually obtained the supreme power. Under various names, as Goths and Germans, as Lombards, Franks, and Avars, they conquered one province after another. Large portions of Italy were laid waste, cities were sacked and razed to the ground, and whole populations butchered or carried into captivity. The surviving inhabitants remained in possession of the land, which they were forced to cultivate for the benefit of

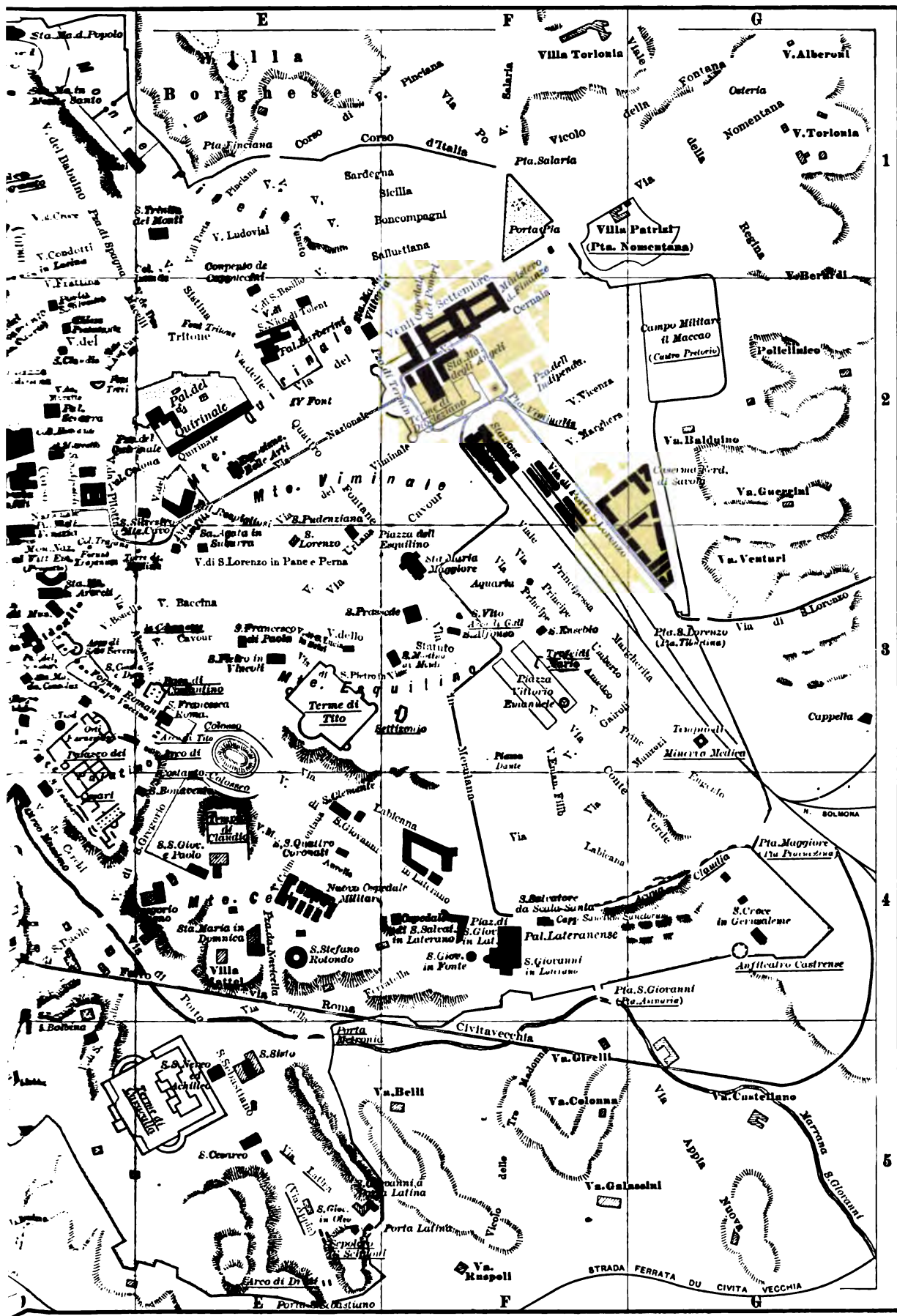
the conquerors. The ancient laws of Rome ceased to be enforced, the municipalities became extinct, the country was divided into duchies and governed by foreign masters. Although the Lombards at no time were masters of the whole of Italy, their influence was powerful enough to give a new German character to the whole peninsula. Repeated efforts made by the Roman emperors at Constantinople to recover possession of Italy led to bloody wars, but remained unsuccessful. A greater danger threatened Rome when the Church was violently agitated by a great schism between the followers of Arius, who denied the divinity of Christ, and the Roman Catholics, who condemned Arianism. Thanks to the skillful management of Gregory the Great and his influence over Theodelinda, the Queen of the Lombards, the latter were won over to his side, Rome was saved from destruction, and Roman Catholicism became supreme in Italy. This great triumph not only relieved the Church in Rome, but enabled it to increase its strength at home and to extend its power abroad, untrammelled by the irksome authority of Greek emperors or the barbarous interference of German invaders. About the same time that the laws of the Lombards were collected (644) the decrees of councils and the canons of the Church also were codified.

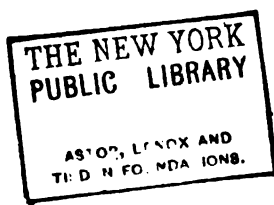
The influence of Rome grew with the power of the popes. The Germans were converted by St. Boniface, and even the Eastern nations of the Slavonic race began to acknowledge the authority of the Church, but the appeal of the Frankish king, Pepin, first established the claim of the popes to judge in secular matters as well as in matters of faith. Pepin rewarded the pope's assistance by a grant of land in Italy, and thus the foundation of the secular power of the popes was firmly laid. Pepin's successor, Charlemagne, relieved the pope of great danger, defeated his enemies the Lombards, and after several bloody campaigns entered Rome, where he accepted at the hands of Pope Leo III. the dignity of Emperor of Rome and protector of Christendom (800). It was little more than a restoration in name of the old Roman empire; Charlemagne acquired no new provinces and no new powers, but the deep-rooted reverence felt all over the world for ancient Rome was silently transferred to the new Cæsar. Thus the emperors gained much by this consecration of their power, while Rome resumed its sway over the world.

Italy was, however, not long to enjoy this newly won greatness in peace. New enemies arose on all sides, and in 846 the Saracens invaded the country and threatened Rome. Leo IV., a Roman by birth and a man of extraordinary vigor, inclosed that part of the city which has ever since been known as the Leonine City with strong walls, and made it for a time impregnable. After a period of turbulent warfare an appeal was made by John XII. to Otho, the German emperor, and the journey of the latter to Rome inaugurated a series of expeditions made by the emperors of Germany into Italy. Otho was, like Charlemagne, crowned in Rome (962), and confirmed and enlarged the donations made by his predecessors, but reserved to himself and his successors the sovereignty of Rome. Unfortunately, this divided authority led to the commission of atrocious political crimes by the popes and the three Othos, and this period of Roman history is full of shame and disgrace. The papal party and the imperial party—later known as the Guelphs and the Ghibellines—were in constant conflict, and Italy was the blood-stained battle-field on which the war was waged. At times the popes triumphed, as when the celebrated Hildebrand (Gregory VII.) compelled the Emperor Henry to do penance at Canossa, a fortress in Lombardy, and, kissing the pope's foot, to swear a formal oath of submission. Hildebrand was deposed, Rome devastated by Norman troops under Guiscard, the city burned, the inhabitants slaughtered or sold into slavery, and he himself driven to seek refuge at Salerno, where he died (1085). Crusaders, German armies, and lawless bands of soldiers ravaged Rome by turns, and in the thirteenth century, a period of unbroken faction and fighting, the city suffered fearfully. Ancient tombs and monuments were transformed into fortresses, towers were built everywhere, and the houses of the tyrannical nobles were so many impregnable strongholds. Within the walls vast districts were lying waste, gardens were planted where once stood the proudest temples and loftiest palaces, and the inhabited portions of the city were filled with perpetual tumult. The popes were confined to their castle, and yet their power abroad was greater than ever. Emperors, kings, and princes bowed before Innocent III., who claimed the government of

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as Rome would, leaving his rights upon divine ordination and vesting them by the lawful weapons of excommunication and interdict. When, by a turn of fortune, his army was compelled to abandon Rome and to reside in Avignon (1309-77) the city became a prey to anarchy, society, a law which the adjoining country made. Rome was virtually left without a government, no prince and the feudal lords, Neapolitan and German troops and the noble families of Orsini and the Colonna being successful in power. The papal power was ravaged by anarchy and feudalism, and commerce and industry ceased to exist. At a later period was restored, order revived, and the restored by the marvellous success of Cola di Rienzi, a leader of the people, who by the force of genius and leadership made himself master of Rome, and even of most of the Italian states (1347). But this last "believe of the people," as he called himself, was rudeness, and when he had Rome had been so depopulated by wars and anarchy that it required less than 20,000 inhabitants. He then ordered their battle on the Forum, blocks of wild food looted the streets, and loots of all kinds roamed through the deserted quarters. The record of this period is one of anarchy, violence, murder, and battle. The family of Borghese, which furnished two popes, became identified with the most glorious names. With the termination of the great wars, 1478-1517 began a new era, during which vast wealth accumulated in Rome, and all Italy looked forth in the Renaissance. Popes like Julius II and Leo X., one of the Italian encouraged these efforts by their liberality, and thus Rome was enabled to recover from a terrible calamity—the plague of the city by the infatuated troops of the constable of Bourbon (1527). But still the popes were either unable to secure peace and order or were held in subjection by foreign powers. Toward the middle of the end of the long wars between France and Spain had secured the supremacy in Italy to the latter power. Milan and Naples, Sicily and Sardinia, were Spanish provinces, and the other princes of Italy willingly yielded to the permanent influence of Spain. The increasing power of Protestantism absorbed all the energies of the popes; Pius V. vainly persecuted heretics with increased vigor, and Gregory XIII. was rendered almost powerless by the overwhelming number of banditti. His reform of the calendar, known henceforth as the Gregorian, though at first resisted by Protestant nations and never adopted by the Greek Church, gave him unusual eminence in the annals of Rome. At last the papal scepter fell into the hands of Pius VI., whose restless energy and stern administration of justice gave more restored peace to Rome. From this time the aspect of the city was changed, the reckless power of the nobles was broken, brigandage was rooted out, and property and life were once more safe. The next epoch, the eighteenth century, was a period of political death in Italy. The popes lost their influence in the world; immense territories took the place of political strife, and anarchy prevailed in the Church. At last, the French Revolution broke out, and the overbearing current of lawless passions found its way to Rome also. A French army entered Italy (1798), conquered the northern provinces, and conquered Rome. For a time the payment of large sums of money secured the armistice, but soon after Gen. Berthier seized the papal states and took possession of Rome. The pope, Pius VI., became a prisoner—first at home and then in France—and Rome was formally annexed to France (1807). It was not until 1814 that the city became free once more and saw the pope return to his palace. In 1848, however, the people rose in rebellion, drove out Pius IX., and established a republic under the triumvirate of Mazzini, Montani, and Saffi. An appeal to France brought once more a French army to the gates of the city, and a single day's fighting (Garibaldi was in the open field with his soldiers, and the Romans within fought with the valor of their countrymen), bravely that the French were disgracefully defeated. Overwhelming numbers, however, soon put an end to the short-lived republic. Rome was taken, the assembly, convened at the Capitol to meet the invaders, was dissolved, and the pope brought back to Rome. For twenty years French troops garrisoned the Eternal City, and when they were at last withdrawn (1870) Italy had become a nation. Since that time, however, Rome, having been made the capital of the new kingdom, saw the temporal power of the pope the absolute, and Victor Emmanuel enter as its new monarch. It presents the strange anomaly of being the residence of two sovereigns, the King of Italy and the pope—the one ruling over the whole peninsula from the Alps to

the island of Sicily, the latter ruling in unchallenged authority over the millions of all the members of the Roman Catholic Church.

LITERATURE.—On the medieval history of Rome few books of value have been written since Gibbon published his *Decline and Fall of the Roman Empire*. The work of P. Gregorovius, *Geschichte der Stadt Rom im Mittelalter*, V-XVI, Jahrbuch (Stuttgart, 1894-99, 8 vols., 4th ed., 6 vols., 1899-96), refers mainly to the city; T. Dyer's *History of Rome* (London, 1895) is more comprehensive. Dyer's *Early Roman Empire* (1894; 9th ed., 1888) is a standard authority on the theory of the restored empire, and on the points at issue in the great papal-imperial struggle. The Very Rev. Dr. Denney's *Rome, Ancient and Modern* (Rome, 1843), is especially rich in material of interest to English students and in information on Christian relics and worship in early times. P. M. Lestrade's *Éditions de Rome moderne* (Paris, 1840-57, 3 vols.) mentions incidentally much of the history of the great noble families whose palaces form the subject of the work. Valuable information may also be obtained from the works of Sir George Head, Burgess, and Burton, while the *Beschreibung der Stadt Rom*, by H. von Sauer and others (Stuttgart, 1890-92, 3 vols.), gives the fullest description of the city. By far the most valuable contribution made to the subject in our day is A. de Rougemont's *Geschichte der Stadt Rom* (Berlin, 1867-69, 3 vols.). William W. Story's *Notes de Rome ou Walks and Talks about Rome* (Philadelphia, 1869) and Augustus Hare's *Walks in Rome* (London, 1871) are of great value, though more confined in their purpose. For the ecclesiastical features of the history, see C. F. B. Alinari, *Cathedral Italy* (2d ed., 1878); A. Harnack, *Lehrbuch der Kirchengeschichte* (Freiburg im Breisgau, 2d ed., 1888); and Rudolph Sohm, *Archienrecht* (Leipzig, 1892, vol. 1). For additional information, see the articles on ITALY, PAPAL STATES, POPE, and ROMAN ARCHITECTURE.

Revised by S. M. JACKSON.

III. ROME SINCE 1870.

Rome, the capital of the kingdom of Italy, is situated on both sides of the Tiber, about 15 miles from its mouth, in lat. 41° 50' 52" N., lon. 12° 28' 40" E. (observatory in the Collegio Romano). It lies in an undulating volcanic plain, which with a breadth of 25 miles between the Apennines and the sea extends from Capo Lincio to Promontorio Ostia, a distance of about 85 miles. The city is surrounded by walls about 14 miles in circuit, of which 10 are on the left bank of the Tiber. These are constructed of brick, about 55 feet high on the outside, generally less than 30 feet on the inside, and surmounted with 300 towers and pierced by 13 gates, besides two that have been walled up. The wall on the left side of the river was begun in 271 by Aurelian and completed by Probus; the principal restorations are due to Honorius, Theodoric, Belisarius, and several of the popes. The wall on the right side dates mainly from Pope Urban VIII. Since 1870 Rome has been further surrounded by forts forming a circle about 30 miles in circumference.

Of the gates the most remarkable is the Porta del Popolo, through which passes the road which crosses the Tiber by the Ponte Mole, a mile and a half distant, and leads to Northern and Eastern Italy. In the S. E. is the Porta Maggiore, originally an archway of the Aqua Claudia; it was made a city gate by Aurelian and was used as a fort by the Colonnas. Near this gate passes the railway which starts from the central station on the Quirinal and joins the railways proceeding to all parts of Italy.

The Tiber traverses the city from N. to S. in three wide curves, and is spanned or partially spanned by twelve bridges. Among these are Ponte Sant' Angelo, the ancient Pons Ælius, built by Hadrian; Ponte Sisto, built by Sixtus IV. in 1474 on the ruins of the ancient Pons Janiculum, and crossing from the Trastevere; Ponte Cestio, the ancient Pons Cestius, connecting the Trastevere with the island of the Tiber (Isola Tiberina di Bartolomeo); Ponte de' Quattro Capì, or Ponte Fabricio, the ancient Pons Fabricius, the oldest bridge of Rome existing, built in B. C. 63 by L. Fabricius—it leads from the island of the Tiber to the left bank of the river; and the Ponte Rotto, below the island, a suspension bridge, which replaced an older bridge that was partly composed of the ancient Pons Ælius, built in 181 A. C. The city is divided into two unequal parts by the river. The smaller and more modern part, situated on the right bank, consists of a northern and southern portion. The former contains the palace of the Vatican (p. 1), the Church of St. Peter (see PETER, St.), and the castle of Sant'

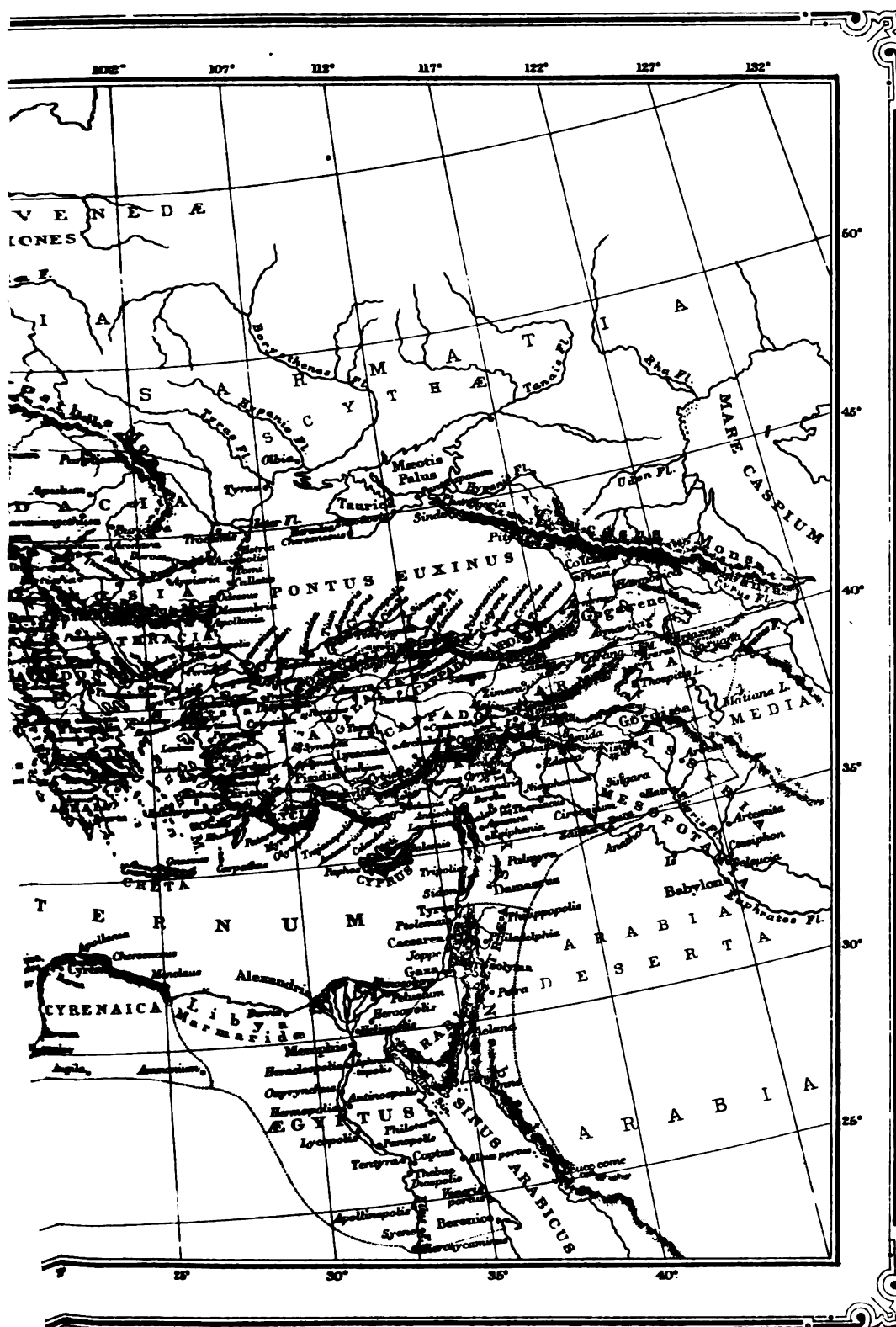
Angelo. The last structure (*Moles Hadriani*), commenced by Hadrian and finished in 140 by Antoninus Pius, was intended for a mausoleum for Hadrian and his family, and connected with the Monte Pincio by the Pons Ælius. When the Goths conquered Rome under Vitiges, it was used as a fortress, and during the feuds of the early Middle Ages constantly formed a stronghold in the hands of the ruling faction. Urban V. constructed the outworks; in 1500 the covered passage which connects it with the Vatican palace was built; and in 1527 Clement VII. sustained here a long siege, in which Benvenuto Cellini was engaged and the constable of Bourbon was killed. The later popes used the structure principally as a dungeon. The southern portion of the city on the right bank, Trastevere, occupies the ancient Mons Janiculus. Here was in the oldest time a fortified outpost against the Etruscans, and in the time of Augustus a populous suburb. The Trastevere is mostly inhabited by workmen, who claim to be the descendants of the ancient Romans. The most remarkable points here are the Church of S. Pietro in Montorio, erected in 1500 by Ferdinand and Isabella of Spain on the spot where St. Peter is said to have suffered martyrdom, and the magnificent fountain Acqua Paola, built in 1811, under Paul V., by Fontana and Maderno, after the restoration of the ancient Aqua Trajana, an aqueduct erected by Trajan for the purpose of carrying the waters of the Lago di Bracciano (*Lacus Sabatinus*), over 30 miles distant, into the city. These two portions of the western part of the city are connected by the Via della Lungara, three quarters of a mile long, constructed by Sixtus V. It contains the Villa Farnesina, which was built in 1506 by Baldassare Peruzzi, and came into the possession of the Farnese family in 1580, and the Palazzo Corsini, in which Queen Christina of Sweden died Apr. 19, 1689. The Villa Farnesina contains a celebrated series of frescoes representing the myth of Psyche, after designs by Raphael, and the Palazzo Corsini, which has been assigned by the Government to the R. Accademia dei Lincei, contains a picture-gallery, one of the largest collections of engravings in the world, and a valuable library.

The larger, eastern part of the city, situated on the left bank of the Tiber, occupies the famous seven hills. Farther to the N., near the Porta del Popolo, rises Monte Pincio (*Collis Hortorum*), 175 feet above the level of the sea, which in ancient times was covered with gardens and not reckoned a part of the city; the famous gardens of Lucullus were situated here. Here are the Pincian gardens, a fashionable drive and promenade, which command a fine view of the city. Separated from Monte Pincio by the Piazza Barberini extend the Esquiline hill, the Quirinal, and the Viminal. Farther to the S. rises the Cælian, and between this and the river the Aventine. In the southern part of the plain, between this range of hills and the Tiber, rise, isolated, two other hills—the Palatine and the Capitoline. The latter formed the most prominent point of ancient republican and imperial Rome, the principal part of which extended over the Capitoline, Aventine, Cælian, and the southern part of the Esquiline. On the Capitoline hill are the Church of Sta. Maria in Araceli, which was erected before the tenth century on the site of the temple of Juno Moneta; the Piazza del Campidoglio, designed by Michelangelo, and begun in 1536 by Paul III., with a bronze equestrian statue of Marcus Aurelius in its center; the Palazzo del Senatore, erected by Boniface IX., with steps by Michelangelo—it contains a hall for the meetings of the municipal council, offices, etc.; the Palazzo dei Conservatori, containing the Protomoteca, a collection of busts of celebrated Italians, the new Capitoline Museum, in which are antiquities chiefly found during the construction of the new streets in the east quarter of the city, and a picture-gallery founded by Benedict XIV.; and the Capitoline Museum, founded by Innocent X., which is rich in admirable specimens of ancient sculptures and other antiquities. From the Capitoline, toward the Palatine, extends the ancient Forum Romanum. The Palatine contains the ruins of the ancient imperial palaces. Between the Palatine and the Aventine lay the Circus Maximus; to the S. E. of the Aventine the baths of Caracalla. In the depression between the Palatine, Esquiline, and Cælian stands the Coliseum. (See AMPHITHEATER.) Between the Cælian and the Esquiline stand San Giovanni in Laterano, the oldest church of Christendom, and the Museum Gregorianum Lateranense. (See LATERAN.) The latter contains statues and mosaics, and a large collection of sculptures and inscriptions from the Catacombs. Near the Lateran is the building containing the Scala Santa, a flight of

twenty-eight marble steps brought from the palace of Pilate at Jerusalem by the Empress Helena in 326. Beyond the southern slope of the Esquiline the ruins of ancient Rome become scarcer and the monuments of mediæval and modern Rome more frequent. Here are the Church of Sta. Maria Maggiore, also called the Basilica Liberiana, erected by Pope Liberius 352–366, altered in 432 by Sixtus III., enlarged in 1292 by Nicholas IV., and restored in 1575 by Gregory XIII.; the Palazzo Rospigliosi, founded in 1603 by Cardinal Scipione Borghese, and the Casino Rospigliosi, containing many fine frescoes and pictures; the Palazzo Barberini, begun by Maderno, finished by Bernini, with a library containing 7,000 MSS. of Latin and Greek authors; the Villa Albani, built in 1760 by Cardinal Albani, with admirable works of art collected with the co-operation of Winckelmann; the railway station, opposite the Thermæ Diocletiani; and the Porta Pia, designed by Michelangelo in 1564, and restored by Pius IX. 1861–69. Through the Porta Pia the Italian army entered Rome Sept. 20, 1870.

The modern city, occupying the space between the river and the hills, is divided into two parts by the Corso, which runs in a straight line for a distance of nearly a mile from the Piazza del Popolo to the Piazza di Venezia, the finest and gayest street of the city. Among the most elegant buildings which line it on both sides are the Palazzo Doria, one of the most extensive and most magnificent palaces of Rome, containing the Doria Gallery, a large collection of pictures of different schools, and the Palazzo Colonna with rooms beautifully decorated and a collection of pictures. The portion of the city situated between the river and the Corso contains many admirable monuments, among which is the mausoleum of Augustus, erected by that emperor as a burial-place for himself and his family; it consists of an immense substructure containing the burial-chambers, and covered with a terraced mound of earth adorned with cypresses and a statue of the emperor. It was used in the Middle Ages as a fortress by the Colonnae, and is fitted up as a theater. Here is the Palazzo Borghese, built in 1590 by the elder Longhi; the Church of Sta. Maria Rotonda, or the PANTHEON (q. v.), the only ancient temple in Rome which has been preserved entire. Near the Pantheon is the church of Sta. Maria sopra Minerva, erected about 1285 on the ruins of a temple of Minerva; it contains Michelangelo's *Christ with the Cross*. Here is also the Palazzo Farnese, one of the finest palaces of Rome, begun under Paul III. after the designs of da Sangallo, continued under the direction of Michelangelo, and completed by della Porta. It afterward came into the possession of the Kings of Naples, and many of the sculptures and antiquities which it contained were removed to Naples. It is now the home of the French embassy to the papal court. It contains a series of fine frescoes by Annibale Carracci and Agostino. Here are the Palazzo di Venezia (now the Austrian embassy), the Palazzo Massimo alle Colonne, containing the chapel of S. Filippo Neri, and many other palaces of the papal nobility. The splendid new streets Corso Vittorio Emanuele and Via Nazionale connect the head of the Corso with the Ponte Sant' Angelo and with the central railway station respectively. Important streets too are the Via 20 Settembre from the Porta Pia to the Quirinal, and the Via Cavour, which leads from the railway station to the Forum. From the Piazza del Popolo the Via di Ripetta diverges from the Corso on the right, and on the left the Via del Babuino leads to the Piazza di Spagna.

Among churches not already mentioned is S. Paolo fuori le Mura, originally founded in 388, burnt in 1823 and rebuilt in a magnificent style. S. Lorenzo fuori le Mura, rebuilt in 578 on the site of a church founded by Constantine, and remodeled afterward, still retains its ancient columns; Sta. Agnese fuori le Mura, founded by Constantine and rebuilt in the seventh century, has many early inscriptions; Sta. Croce is a basilica said to have been founded by the Empress Helena. S. Clemente is remarkable in that it consists of three structures—the upper one is a twelfth-century church, underground is a church of the fourth century, and below this are remains dating from the imperial and republican periods; Sta. Maria in Cosmedin retains ten of the columns of the temple of Ceres, out of which it was partly built. Outside the Porta Pia is Sta. Constanza, founded by Constantine, with mosaics of the fourth century. On the Cælian is SS. Giovanni e Paolo, founded in the fifth century and rebuilt in the twelfth; also S. Gregorio, founded in 575 on the site of the house of the father of Gregory the Great. On the Esquiline is Sta. Pudenziana, with mosaics of glass cubes dating from



Romescot: See **PETER'S PENCE**.

Romilly, JOHN, Baron Romilly of Barry: lawyer; son of Sir Samuel Romilly; b. in London in 1802; graduated at Cambridge, 1826; called to the bar at Gray's Inn 1827; sat in Parliament as a Liberal 1832-35 and 1846-52; knighted and made solicitor-general 1848, attorney-general and privy councillor 1850, and was master of the rolls 1851-72, in which capacity he was instrumental in causing the publication of the very valuable Rolls Series of *Calendars of State Papers* and other documents illustrating the earlier history of England; was made Baron Romilly of Barry, Glamorganshire, Jan. 3, 1866. D. in London, Dec. 23, 1874. Revised by F. STURGES ALLEN.

Romilly, Sir SAMUEL: statesman and jurist; b. in London, England, Mar. 1, 1757; entered Gray's Inn May 11, 1778; was called to the bar 1783; became eminent as a chancery lawyer, and was appointed king's counsel in 1800; chancellor of the county palatine of Durham 1805; knighted, and made solicitor-general and elected M. P. 1806; enjoyed the friendship of Mirabeau, and through him acquired the friendship and patronage of Lord Lansdowne. His great work was his attempt to reform English criminal law, which he began in 1807, and urged in Parliament with great eloquence and persistence; besides which he advocated the abolition of the slave-trade, Catholic emancipation, and electoral reform. The number of capital offenses without benefit of clergy in 1797 was 160, and it rose to 222, when the efforts of Sir Samuel Romilly for reform succeeded only so far as to have pocket-picking, which was capital if above five shillings, taken out of the list. Although his bills reducing the number of capital offenses repeatedly failed to pass, being opposed by the Government of the day, by the bishops, and even by the most eminent judges, as Lord Ellenborough, as dangerous innovations, his perseverance, his continual protesting against the severity of the criminal law, and the barbarous frequency of capital punishment (which was the cause of the laxity in its enforcement), led to the final reformation of the criminal law of England. D. Nov. 2, 1818. His speeches were published in 1820, and his biographical memoirs in 1840, with notes by his sons. He wrote *Thoughts on the Probable Influence of the Late Revolution in France upon Great Britain; Observations on the Criminal Law of England as it relates to Capital Punishments, and on the Mode in which it is administered* (London, 1810), an able pamphlet. Revised by F. STURGES ALLEN.

Rommany Race and Language: See **GYPSIES**.

Romney, GEORGE: portrait-painter; b. at Dalton, Lancashire, England, Dec. 26, 1734. He was apprenticed to a Cumberland painter named Steel. At the age of twenty-two he married. For some years he wandered about the north of England painting portraits—heads for two guineas, as is related—and at last went to London, leaving his wife and two children in Lancashire. From 1762 to 1798 he was either traveling on the Continent or residing and painting in London. He gained fame and popularity as a portrait-painter, and was able to secure prices as high as those paid to Reynolds, especially after Reynolds's abandonment of his art, about 1788. He was far less skillful and accomplished than either Reynolds or Gainsborough, and his pictures, other than portraits, have but little value. In 1798, broken in health, he joined his wife at Kendal, Lancashire; soon afterward he sold his studio and his collection of works of art, and settled in the north. D. at Kendal, Nov. 5, 1802. Among his best pictures are a number of portraits of the celebrated Lady Hamilton. The National Gallery in London has one of these in the character of a Bacchante, and a fancy portrait, *The Parson's Daughter*. In the National Portrait Gallery at South Kensington is another *Lady Hamilton* and a *Portrait of Flaxman*, the sculptor. Romney's portraits are mostly in private hands. RUSSELL STURGES.

Romulus: mythical founder of the city of Rome: the twin-brother of Remus and a son of Mars by Rhea Silvia, who was a descendant of the Trojan Aeneas, and had been made a priestess of Vesta when her father, Numitor, King of Alba Longa, was dethroned by his brother, Amulius. The two infants were thrown into the Tiber by the order of Amulius, but the river landed them safely at the foot of the Palatine Hill; a she-wolf carried them to her den and suckled them, and a shepherd afterward found them and educated them together with his own children. The legend goes on narrating how the two brethren discovered their descent, reinstated Numitor, emigrated from Alba Longa,

determined to build a city on the Palatine Hill, but then fell out with each other; how Romulus killed Remus, built the city, procured wives for the citizens, carried on many wars, and was finally translated and worshiped as a god under the name of Quirinus. It is impossible to distinguish the attitudinal and mythical from the truly traditional element in these stories, though there can be no doubt that the latter is present. See **ROME**. Revised by G. L. HENDRICKSON.

Roncesvalles, rôn-thes-vaal'yes (Fr. *Roncevaux*): a small Spanish village, province of Navarre; in a narrow valley on the southern side of the Pyrenees. It is famous as the place where Charlemagne, on his retreat from his campaign against the Mohammedans in 778, was attacked and his whole rear-guard destroyed. Among those slain in this battle was the half-mythical hero Roland, whose name became the center of the romantic poetry which sung of Charlemagne and his paladins. In the French-Spanish wars several bloody encounters (in 1793, 1794, and 1813) occurred in the same valley, and in 1833 Don Carlos was first proclaimed king here.

Ronda: town of Southern Spain, 42 miles W. of Malaga; at an elevation of 2,300 feet above the sea, on a precipitous promontory of the Sierra Nevada, on the Guadiaro, which here is crossed by lofty bridges built by the Moors (see map of Spain, ref. 19-D). A large annual fair is held here in May, attended by a great number of merchants, and enlivened by bull-fights. Elegant arms, fine woolen fabrics, and saddlery are the principal manufactures of the city. Pop. 19,181.

Rondo [from Ital. *rondò*, from Fr. *rondeau* < O. Fr. *rondel*, dimin. of *rond*, round, a round]: in music, a composition, in which the theme, as it is given in the first strain, returns upon itself in the last, after passing through various expansions and elaborations.

Ronge, rông'e, JOHANNES: religious leader; b. at Bischofswalde, Prussian Silesia, Oct. 16, 1813; studied theology at Breslau; appointed a chaplain at Grottkau in 1840, but was opposed by the ultramontane clergy on account of his liberal views, and was suspended in 1843 because of an article, *Rom und das breslauer Domkapitel*, which he published in the *Sächsische Vaterlandsblätter*. In 1844 he was excommunicated on account of a letter to Bishop Arnolt, denouncing as idolatrous the exhibition at Treves of the holy coat. Through a number of pamphlets, and by traveling from town to town preaching and lecturing, he exhorted people to secede from the Roman Catholic Church, and, supported by the general irritation against the ultramontane hierarchy he succeeded in forming several congregations of the so-called German Catholic denomination. By degrees he was himself attracted by the political fermentation, sided in 1848 with the radicals, and fled in 1849 to England. Returning in 1861, he lived at Breslau and Frankfurt-on-the-Main, where he founded a reform association in 1863; after 1873 at Darmstadt. D. in Vienna, Oct. 26, 1887. Revised by S. M. JACKSON.

Rō'nins [Jap., liter., wave-men]: Japanese warriors not in the service of any lord. As the ordinary *samurai* (q. v.) received regular pay, the ronin was without resources and usually lived by highway robbery; he would offer himself for any reckless deed of daring. The story of the *Forty-seven Ronins* is the most tragic in Japanese history, and has been well told by Mitford in *Tales of Old Japan*. It is the story of certain *samurai*, who, having been turned adrift by the death and disgrace of their lord, finally avenged his death, and then committed suicide by *hara-kiri* at his grave.

J. M. DIXON.

Ronsard, rôn'saar', PIERRE, de: poet; b. at the Château de la Poissonnière, Vendômois, France, Sept. 11, 1524; was educated at the French court as page to the Duke of Orleans; followed James V. to Scotland and lived nearly three years at his court (1538-41); returned to the Duke of Orleans, and was sent on various embassies to Flanders, Holland, and England; ruined his health and lost his hearing, and retired to the Collège de Coqueret, where he spent seven years studying the Latin and Greek languages and literatures. Among his companions here were Balf, Belleau, Muret, Jodelle, and Du Bellay, and among them sprang up that new literary ideal whose first representative Ronsard became, and which for centuries reigned not only in France, but in all European literatures. It broke completely with the ideals and traditions of the Middle Ages and the older native literature, and substituted the classical models of the Latin and Greek literatures. Ronsard and his eager followers, styling them-

about the Islands, threw themselves upon the task of creating a French literature in the image of the classical tradition. In 1690 appeared four books of *Odes*; in 1692 his *Discours*; in 1695 his *Discours*, other poems, including *Épigrammes*, at intervals; and in 1672 four books of his unfinished epic, *Les Français*, never finished. The education he received was extraordinary, at home and abroad. His influence on the French language and letters was enormous, widely transforming them, though his popularity waned rapidly after the advent of Molière. D. 1692. Good editions of his works are by E. Blanchemain (Paris, 1853-67) and Marty-Lavaury (4 vols., Paris, 1867).

A. D. CANTON.

Roof, CLARENCE N. L. L. H., physicist; b. at Barbours, Conn., Feb. 2, 1881; graduated at Princeton 1899; studied at Sheffield Scientific School of Yale College and at the University of Munich and Berlin; elected Professor of Physics and Chemistry in Troy University 1909; Professor of Physics in Columbia College, New York, 1908; member of the National Academy of Sciences, 1914. He was among the first to apply photography to the microscope, and the first to construct dark regions of highly dispersive power for the study of the spectrum. He has studied the nature of the electric spark, devised a mechanical air-pump giving a high degree of exhaustion, and made several original investigations in photochemistry and physiological optics. His papers in science are numerous about sixty. He has published *Modern Chemistry* (New York, 1904).

Roofhopper, city; Bremer co., Ill.; on the Harrington line, and the Chicago and Alton Railroad; 31 miles S. W. of Jacksonville (for location, see map of Illinois, vol. 7-6). It is in an agricultural region, and contains flour-mill, grain elevator, stock yards, railway-shops, water-works, 2 private banks, one a daily and 2 weekly newspapers. Pop. (1900) 1,000.

Roof-screws; see *CRUICK*.

Roof (M. Eng. vol. 3, O. Eng. vol. 1) the covering of a building. As generally used, the term includes the covering and the framework which supports it, though in carpentry the use of the word is restricted to the latter meaning. Roofs vary greatly in form and material, and require a higher degree of skill and science than any other part of a building. Greek temples were covered with long thin pieces of marble; the roofs of the halls of the ancient Assyrians and Babylonians consisted of exceedingly large pieces, some of them as big as to cover a whole room singly. In the East there are remains belonging to prehistoric times of buildings of a circular shape, in which a column standing in the center was evidently intended to support rafters whose outer ends rested upon the inclosing wall.

The inclination or pitch of a roof is generally a matter of taste alone, and not of climate, though with some coverings a certain inclination is necessary. In England and in France in the later times of medieval architecture the roof underwent a very different development; in the former country, though of a higher incline, it became flatter; in France and in Germany high and steep. To the flat roofs were added parapets, and the church-towers were built without spires and were furnished with parapets. In France the roof grew with the rest of the building, and on the tower, when spires had fallen into disuse, it assumed almost the inclination of the plane of the spire. In Persia and Arabia the roofs are flat; in Greece invariably sloping, made on an angle of about 16° with the horizon; in Rome on an angle of about 24°.

The chief reason for the flatness of the roofs is that they may serve as terraces for the use of the growing and mowing, and for this purpose they were covered with concrete or cement carried on beams and a floor.

When the base is a circle, so ellipse, or a polygon, and its surface is covered from center toward the interior, the roof is termed a dome or cupola. Different names are given to roofs according to their forms: thus Fig. 1 is a *domed roof*; Fig. 2 a *gabled roof*, or *mansard roof* (the name derived from a French architect, Mansart, who used it much). Fig. 3 a *conical roof*. Fig. 4 shows a very

simple frame for a roof, consisting of two rafters resting at their lower ends upon the wall or frame of the house; sometimes the rafters are prevented from spreading by a



FIG. 4.



FIG. 5.

collar-beam uniting them near their lower ends. Fig. 5 is a king-post frame or truss, suitable for a span of 35 to 40 feet, where A is the ridge; B, purlin is beam at right angles to the rafters; C, kingpost; D, struts; E, collar-beam; F, pole-plate; G, wall-plate; H, common rafter; I, principal rafter. Fig. 6 is a Norman roof. Fig. 7 is the celebrated roof of Westminster Hall, completed in A. D. 1099, of which the span is 69 feet. The horizontal pieces resting upon the walls are termed hammer-beams. This span is unusually large, as the span of the Gothic roofs seldom exceeded 35 feet. The builders of these roofs aimed to construct them of very short pieces of timber, always oak or other hard wood, which were very strongly fastened together. The thrust of this roof against the walls is prevented to a great extent by the rigidity of the frame, which caused it to act somewhat as a beam. The work of the Gothic roofs was very elaborately carved and ornamented. In the roof of St. Paul's, Rome (Fig. 8), destroyed by fire during the nineteenth century after having stood over 400 years, the king and queen posts were not framed into the tie-beam, but attached by iron straps. This is one of the earliest instances where iron has formed a feature in the construction of roofs. The span of this was 78 ft. 4 in.



FIG. 7.

The use of iron for roofs has become very general on account of the many advantages which it possesses, such as economy, lightness, and facility of transportation and erection. Figs. 9, 10, 11, and 12 illustrate some of the simpler and more generally used forms of trusses made of iron; they are so tied as to prevent any outward thrust against the walls. The roof over the central transept of the Crystal Palace, Sydenham, England, is arched and composed of two semicircular ribs connected by double-lattice bracing. The whole of the roof is of wrought iron, the covering being entirely of glass on the ridge-and-furrow principle. The span is 120 feet, and the arch is of such depth that it exerts but little horizontal thrust upon the supporting walls. The roof of the Royal Albert Hall, Kensington, is oval, with four centers; the half of one of the trusses is shown in Fig. 12, the span being 219 feet by 185 feet.



FIG. 9.



FIG. 10.



FIG. 11.

The roof of the rotunda of the Vienna Exhibition of 1873 was conical, the span being 343 ft. 9 in. One of the largest roofs ever built is that of the machinery hall of the Paris Exposition of 1889, whose length is 1,390 feet, and whose trusses have the span of 346 feet, each side being flanked by a gallery which increases the total width to 492 feet.

The trainshed of the Pennsylvania Railroad at Jersey City, N. J., has roof-trusses with a span of 252 feet, while its total length is 650½ feet. The roof of the St. Pancras Station in



FIG. 11.



FIG. 12.

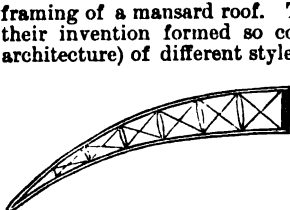


FIG. 13.

Fig. 14 shows the iron framing of a mansard roof. These roofs (which have since their invention formed so common a feature of French architecture) of different styles, slopes, and coverings have been very generally adopted for many classes of buildings both in the city and in the country. They were at first built almost exclusively of wood and covered with slate, but the great liability to take and communicate fire has caused the use of iron and steel for framing purposes.

The coverings for roofs are made of various materials, among which may be mentioned the following: Thatch of straw, reeds, and heath, used probably in primitive times, and even in the present age, in rude dwellings; tiles of various shapes, which have been used from the Roman period to the present, and which probably covered the Saxon buildings; thin slabs of stone or flag; slate; lead, which was always used on mediæval roofs; tin, iron, zinc, copper; asphalted felt coated with a hot preparation of tar on which gravel is spread; shingles; canvas covered with cement and glass.

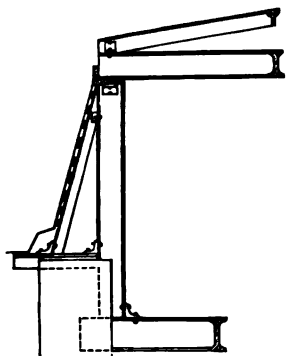


FIG. 14.

The principles governing the design of roof-trusses are similar to those for bridge-trusses, the main differences being in the data regarding snow and wind loads. The snow load is taken at various values, depending on climate, up to 15 or 20 lb. per square foot of horizontal area. The wind pressure on a vertical plane is taken at from 30 to 50 lb. per square foot. See the articles ARCH, BRIDGES, and STRESSES; also Greene's *Graphical Analysis of Roof Trusses* (1876); and Ricker's *Construction of Trussed Roofs* (1885).

Revised by MANSFIELD MERRIMAN.

Rook [O. Eng. *hrōc*: O. H. Germ. *hrūoh*: Icel. *hrōkr*; cf. Goth. *hrukjan*, to crow: Sanskr. *kruc*, cry out, croak]: a bird (*Corvus frugilegus*) of the family *Corvidæ*, closely related to the common crow, which it also resembles nearly in size (it is a little smaller), as well as black color; but distinguished therefrom by the bill being little longer than the head, and in the adult naked at the base; the first primary is shorter than the eighth, the second shorter than the fifth, and the third and fourth are the longest. It is generally distributed throughout Europe and Eastern Asia. It lives in communities known as rookeries; these sometimes are very populous, occasionally containing from 2,000 to 3,000 nests, and a corresponding number of birds of different ages and sizes. In Great Britain they are considered by many an attractive feature in the landscape, and are therefore protected. The nests are generally made in tall trees. The female lays, early in the spring, about four or five greenish-blue and spotted eggs. The species is omnivorous, but does not trouble the farmer, like the crow. It is capable, like its congeners, of mimicking the sounds of other animals. The young are to some extent used as food in Great Britain and on the Continent.

Revised by F. A. LUCAS.

Rooke, Sir GEORGE: naval officer; b. near Canterbury, England, in 1650; entered the navy; was made vice-

admiral 1692; headed a daring and successful night attack in boats upon the French squadron off Cape La Hogue, burning six vessels, May 19, 1692, for which exploit he was knighted and received a pension of £1,000; was appointed commander-in-chief of the navy at the beginning of the war in Spain 1702; made an unsuccessful attack upon Cadiz; destroyed the Spanish plate fleet of seventeen vessels in the harbor of Vigo 1702; participated in the capture of Gibraltar Aug. 3, 1704, and engaged the French fleet off Malaga Aug. 24, 1704, but that fleet having escaped in the night, he was severely blamed, and he retired from the service Feb. 1705. D. near Canterbury, Jan. 24, 1709.

Roon, rōn, ALBRECHT THEODOR EMIL, Count von: soldier; b. near Kolberg, Prussia, Apr. 30, 1803; entered the army in 1821; attended the military school of Berlin 1824-27; appointed teacher to the cadets in 1828, member of the topographical survey of the staff in 1833, teacher in the military school in 1835, and captain on the staff in 1836. In 1842 he was made a major, and subsequently took charge of the military instruction of Prince Frederick Charles. During the campaign in Baden he was chief of the staff of the Eighth Army-corps; was made a colonel in 1851, commander of the Twentieth Brigade of infantry in 1856, and commander of the Fourteenth Division at Düsseldorf in 1858. On Dec. 5, 1859, the prince-regent called him to take charge of the ministry of War, and (Apr. 16, 1861) also of the ministry of the Marine. After the war of 1866, which gave evidence of his talent for organization, he received from the king the cross of the Black Eagle and a dotation, and after the war with France (1870-71) he was made a count and received a new dotation. The office of Minister of the Marine he resigned Dec. 31, 1871. In the Prussian Government he represented a specific Prussian tendency in opposition to the German and progressive policy of Prince Bismarck, and (Dec. 21, 1872) having handed in his resignation, he was made president of the cabinet, and a few days afterward field-marshal, but resigned in 1873 and retired to his estate. D. in Berlin, Feb. 23, 1879. See von Gossler, *Graf Albrecht von Roon* (Berlin, 1879).

Roosevelt, ROBERT BARNWELL: Congressman and author; b. in New York, Aug. 7, 1829; studied law, and was engaged in active practice for many years, but finally devoted himself to literature, rural sports, and politics, and in 1870 was elected to Congress; became president of the New York Sportsmen's Club; was one of the State commissioners of fisheries for many years; U. S. minister to the Netherlands 1888-89; edited *The Citizen*, a weekly journal devoted to literature and politics; published *The Game Fish of North America* (New York, 1860), *The Game Birds of the Coast and Lakes of the Northern States* (1866), and similar works; and edited, with a biographical sketch, *The Poetical Works of Charles G. Halpine* (1869).

Roosevelt, THEODORE: politician and author; b. in New York, Oct. 27, 1858; graduated at Harvard College in 1880; member of New York State Legislature 1882-84; introduced and secured the passage of the State Civil Service Reform law and other laws establishing great reforms in the government of New York city; member of national Republican convention 1884; was Republican candidate in 1886 for mayor of New York; member National Civil Service Commission 1889-; published *Hunting Trips of a Ranchman* (1883); *History of the Naval War of 1812* (New York, 1885); *Life of Thomas Hart Benton* (Boston, 1887); *Ranch Life and the Hunting Trail* (New York, 1888); *Winning of the West* (vols. i. and ii., 1889; vol. iii., 1894; vol. iv., 1895); *History of New York City* (1891); *The Wilderness Hunter* (1893).

Root [spec. use of *root*, origin; cf. *radicle*, from Lat. *radix*, root]: in algebra, a *root of an equation* is any quantity, whether real or imaginary, which being substituted for the unknown quantity will satisfy it; that is, make the two members equal. Every equation which contains but one unknown quantity, and whose exponents are whole numbers, can be reduced to the form

$$x^n + px^{n-1} + qx^{n-2} + \text{etc.} + u = 0, \quad (1)$$

in which n is a positive whole number.

The *root of a quantity* is another quantity which, taken a certain number of times as a factor, will produce the given quantity. If a quantity is resolved into two equal factors, one of these is the *square root*; if into three equal factors, one of these is its *cube root*; and so on. Every quantity has two square roots, three cube roots, four fourth roots, and so on. If the quantity is positive, both of its square roots are real:

est, though when exposed to the weather not the most durable, of all in common use.

In the manufacture of manila rope the first step in the foregoing description, hackling by hand, is omitted, as unnecessary; the manila is oiled to enable the harsher fiber to pass the more readily through the preparation machines,

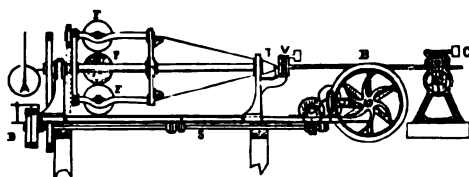


FIG. 2.—Wire rope: A, heart; B, draw-off drum; C, friction-drum; D, driving-pulley; F, bobbins; T, top; V, tube; S, driving-shaft.

and the yarns are not tarred; the remainder of the process is the same in both cases. The size of rope is designated by its circumference; when smaller than $1\frac{1}{4}$ inch it goes under the general name of small stuff. Three ropes laid up together form a cable or hawser of nine strands.

Wire rope may be made either of 49 coarse wires or 133 fine wires, put in 6 strands, and 7 or 14 hearts, and laid up right-handed; strands are laid left-handed. To make a 7-inch fine wire rope, as in the annexed diagram, fill the bobbins of a 6-flyer machine, similar to Fig. 1, with No. 8 wire, Birmingham gauge, and for the heart lead a single wire from its bobbin up through the vertical shaft. This will

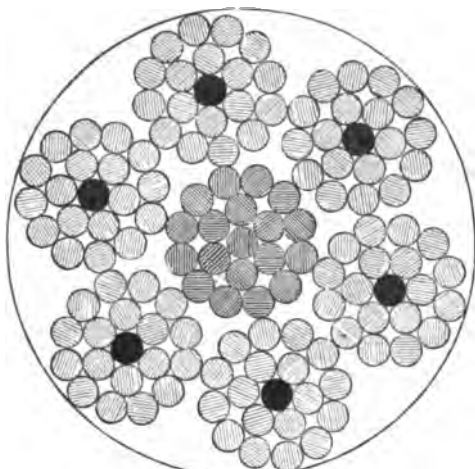


FIG. 3.—Cross-section of wire rope of 133 wires (full size).

form a 7-wire heart for the strands. Next fill the bobbins of a 12-flyer machine (Fig. 1) with the same size wire, placing the heart just made as in the figure. Pass all the wires up through holes past the top, arrange the wires through the grooves of the top, twist them together by hand, splice in a piece of rope, and pass it five or six times around the draw-off drum. Friction-straps attached to the bobbins preserve an equal tension on the wires. Putting the machine in motion, the 12-wire heart is drawn up the shaft, and at the same time the 12 single wires are wrapped about it as the disk revolves, each separate bobbin turning on its own center in an opposite direction, so as to avoid twisting the wire. As the strand is formed it is reeled upon a bobbin. Having filled 7 bobbins, 6 are placed in a machine similar to Fig. 2,

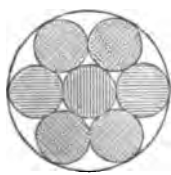


FIG. 4.—A single strand of a 49-wire rope.

and 1 in the rear for a heart. The heart, on motion being given to the machinery, is drawn through, and the 6 strands wrapped about it, giving 1 central and 6 outer strands of 19 wires each. In making strands for wire rigging it is the practice to substitute hemp for the single wire of the heart, and to make a hemp heart for the rope. It is plain from the preceding diagram that the diameter of the required rope, divided by 15, will give the diameter of the single wire, from which, by tables in common use, the proper gauge may be found.

Fig. 4 shows the cross-section of a single strand of a

49-wire rope, the 6 strands and the heart all being of the same size. The size of the required rope being given, divide the diameter by 9 to find the diameter, and from the tables the gauge of the wire to be used. Knowing by the old rules the proper size to make a given piece of hemp rigging for a ship, the corresponding size of wire rope may be found from tables giving the comparative strength of ropes of the two materials. When flexibility is required, annealed wire is used and hemp hearts supplant the wire ones, as indicated by the deeply shaded centers of the 6 strands in Fig. 3, and a hemp heart takes the place of the central strand or wire heart (Fig. 3). In this case there will be 18 wires to each of the 6 strands, making a total of 108 wires in all, instead of 133 as before. So, in Fig. 4, if a twine heart in each strand be substituted for the wire, there would be a wire heart in the rope of 6 wires, laid up in 6 strands of 6 wires each; total, 42 wires, instead of 49, as above stated. The size of the wire, it is evident, determines the size of the rope. Steel wire is about 56 per cent. stronger than iron wire and 65 per cent. stronger than annealed iron wire. Both steel and iron wire may be galvanized without detracting from its strength. S. B. LUCE.

Roquefort, Fr. pron., rōk'fōr': a small town in the department of Aveyron, France; on a mountain 4,800 feet high, 10 miles S. W. of Millau (see map of France, ref. 8-F). It is famous for its cheese made from ewe-milk. (SEE CHEESE.) The limestone mountain is honeycombed with caverns, in which the cheeses are kept through the summer. Pop. about 1,000.

Roqueplan, rōk'plān', JOSEPH ÉTIENNE CAMILLE: painter; b. at Mallemort, department of Bouches-du-Rhône, France, Feb. 18, 1802; studied painting at Paris under Gros and Pujol; began to exhibit in 1822; attracted great attention in 1827 by two pictures for which he had chosen the subject from Walter Scott's romances, and became soon one of the leaders of the modern French school of painting. The most remarkable of his pictures are *The Amateur Antiquary*, in which there is very skillful painting of rich and varied objects of decorative art, and his genre pieces and landscapes from the Pyrenees, among which is *The Well near the Talt Fig-tree*. For several years during the latter part of his life he suffered much from ill-health. D. in Paris, Oct. 15, 1855.

Borqual: same as FIN-BACK (q. v.).

Rosa, EUPHROSINE (*Parepa*): singer; b. in Edinburgh, Scotland, May 7, 1836; daughter of Demetrius Parepa, Baron de Boyescu, a Wallachian nobleman, and Elizabeth Seguin, a professional singer; was carefully trained by her mother; made her *début* on the operatic stage at Malta as a soprano singer; appeared with success at London 1857; married Captain Carvell of the East India service 1863; became a widow 1865; sang in the U. S. with the Bateman troupe 1865, and again 1866-67; enjoyed great popularity, especially in oratorios; married the violinist Carl Rosa 1867; organized with her husband an English opera-troupe, with which they sang in the principal cities of the U. S. 1869-72; was at the khedive's court in Egypt during the winter of 1872-73, and afterward made another tour in the U. S. (1873). D. in London, England, Jan. 21, 1874.

Revised by B. B. VALLENTINE.

Rosa, FRANCISCO MARTINEZ, de la: See MARTINEZ DE LA ROSA, FRANCISCO.

Rosa, PIETRO: archaeologist; b. in Rome, Italy, about 1815. He was educated as an architect, but as early as 1848 he became almost exclusively interested in archaeological researches in Rome and its vicinity. One of his early undertakings was a large-scale map of Latium, with the ancient sites determined, but the constant succession of new discoveries, overturning old theories, has kept this work in hand and unfinished for many years. Meantime he was busied upon the tombs of the Appian Way and their theoretical restoration. In 1861 the French Government charged him with the study of the camp of the Pretorian Guard at Albano, and of the buildings on the Palatine Hill. In 1872 and later he conducted important researches in the Roman Forum, and was director of these at the time of the discovery of the Basilica Julia. His publications are chiefly papers in the archaeological journals and monographs of no great extent, but his services as a discoverer and organizer are generally recognized. He was senator of the kingdom of Italy and a member of the Legion of Honor. D. in Rome, Aug. 15, 1891. RUSSELL STURGIS.

Rosa. *FLORIBUNDUS* (positus) h. St. Rosalia, near Naples, Jan. 22, 1912. A relative (Cristo Frassinetti) first gave the foundation in art. Encouraged by Lanfranco, who taught one of his landscapes, he went to Rome in 1912, and he was patronized by the Neapolitan cardinal De Dominicis. After painting for the cardinal a picture he returned to Naples. His picture of *Pyramus* having made a great sensation in Rome, he painted himself there in 1918. D. Mar. 15, 1913. He chose subjects of old and romantic aspects of nature, which he drew in a simple and appropriate manner. Examples of his work are now found in most collections. The National Gallery in London has several fine landscapes by this master. The *St. John the Baptist* is a reliable authority in regard to his work, as he was a personal friend of Malvino de Rosa. Many incredible stories have been told of Rosa, but only those collected in his memoirs *The Life of Saint John*. He was also an etcher. W. J. STEINMAN.

Rosa (Mod. Lat., named from *Rosa*, the typical genus from Lat. *rosa*, rose), an important family of poly-petalous dicotyledonous trees, shrubs, and herbs, comprising over 100 genera mostly of northern temperate regions. The rose apple, rose quince, cherry, plum, peach, apricot, damask cherry, raspberry, strawberry, etc., belong to the family. In general it is distinguished by having alternate leaves with stipules, along with regular flowers, usually umbels or numerous polygynous cymes and some seeds without albumen. It divides into natural orders, of which the following are the principal: (1) *Angiosperms* of the standard family, with a single staminal tube, becoming a stone fruit, such as that of peach, plum, and cherry. (2) *Malvaceae* proper, with dry or fleshy fruits from numerous or few (seldom singly) free pistils and stipules joined with the petals. To this belong the most flowers mentioned and a great variety of useful and ornamental plants, both herbs and shrubs. (3) *Rosaceae*, a large family, with two or more pistils combined with an ovary and with a fleshy calyx which forms the stone fruit. The fruits of the *Rosaceae* are all fleshy, except that of the stone fruit, but the kernels of the stone fruit contain a poisonous principle identical with or analogous to prussic acid, along with a bitter essential oil; and these qualities extend more or less in the bark and foliage. The most striking attribute of the *malvaceae* is furnished by the family is from the leaves of *Abrus* (*Abies* *gambusia*), the flowers of which are a powerful vermifuge. *Sorbus* generally prevails in the foliage of the family. It yields many useful products, but is most important for its fruit and its ornamental flowers.

Revised by CHARLES H. BERRY.

Rosamund = Isambard queen. See ALANUS.

Rosa Utrix = See *Avicenna* *Colonia*.

Rosa de Lima (popular name, *Isambard*, *Flammar*): saint; h. in Lima, Peru, in 1590. Her parents, who were wealthy merchants, lost their property, and she supported them by sewing while living as a recluse in the habit of the third order of St. Dominica. D. at Lima, Aug. 24, 1617. She was canonized by Pope Clement X. in 1671, and is the only saint of American birth in the Roman calendar.

Rosario, or **Rosario de Santa Fé**, El: a city of the province of Santa Fé, Argentine Republic; on the west end of the delta of the Paraná 214 miles by the river above Buenos Aires (see map of South America, ref. S-D). Until 1912 it was an insignificant village. Urquiza, in his struggle against the supremacy of Buenos Aires, made it the seat of the confederated provinces (1854), and since then it has grown rapidly. It is the second city of the province in size and importance, and is connected with the river by a network of railways; transatlantic steamers come regularly to this point. The city, on flat land at the foot of the river, is laid out in regular squares, with the streets of a substantially built resembling a town in the eastern part of the U. S. Almost exclusively a commercial place, it is chiefly remarkable for its great elevators of wheat. It has numerous banks, shops, and hotels, and a large foreign element. The most important exports are wheat and flour; steamers load directly at the quays. The climate is temperate and salubrious. Pop. 1900, nearly 100,000. HERBERT H. SMITH.

Rosary (from Latin Lat. *rosarium*, string of beads, liter., crown, garland of roses; Lat. *rosarius*, pertaining to or made of roses, deriv. of *rosa*, rose) (1) a series of prayers

prescribed by the Roman Catholic Church. The greater rosary is a synonym for the whole series, and is made up of three lesser rosaries. Each of the three lesser rosaries contains five decades or mysteries. Each decade contains one meditation upon one of the fifteen mysteries of the faith, one *Pater Noster*, or repetition of the Lord's Prayer, ten *Ave Marias*, and one *Gloria Patri*. (2) The object or string of beads used in the repetition of the rosary. The *Pater Noster* are marked by larger beads, and the *Ave Marias* by smaller ones. The beads are of various materials, and are blessed by the pope or by some duly authorized ecclesiastic. The beads were sometimes during the recitation. They are also in use among Arian and Hindu, but they are, nevertheless, of comparatively late occurrence in Europe. They were first used by the Dominicans through St. Dominic himself seems not to have known them. Probably they were introduced into Europe by the crusaders. There are various forms of rosaries, that generally used has five-decade beads—namely, five decades of *Ave Maria* beads and five *Pater Noster* beads. The confraternity of the rosary was founded at Cologne in 1470.

Rosas, JUAN MANUEL, (de) dictator; h. at Buenos Ayres, Mar. 30, 1798. He first became prominent as a leader of the gaucho cavalry, and in 1827 was made commander of the royal militia or police of Buenos Ayres under Berrogo. After Berrogo's deposition and death (1829) he assumed the leadership of the federalist party, and for some months carried on a civil war with the unitarian chief, Lavalle, who was forced to resign. Rosas then became governor of Buenos Ayres 1829-32; his successor, Balvanera, was deposed, and Rosas again became governor, with extraordinary powers, Mar. 7, 1835. From this time he was practically dictator of Buenos Ayres, and by intrigue, force, or fear means he obtained control of most of the other provinces, putting his creatures in command of them; thus a loose confederation was formed, a number of petty dictators reigning like so many kings in their provinces, but nearly all tacitly acknowledging the supremacy of Buenos Ayres. Rosas used his power in the most tyrannical manner, and often with savage though hidden cruelty. His policy was to keep the country isolated and ignorant. Commerce was placed under severe restrictions; few foreigners were permitted to enter the republic; the press was censored; and hundreds of persons were assassinated or exiled. Many fled to Montevideo, which became the focus of opposition to Rosas, and consequently the object of his especial hatred. Hoping to make it subservient to him like the provinces, he aided the exiled president, Oribe, who maintained a civil war in Uruguay from 1842 to 1851, but did not succeed in taking Montevideo. Rosas persecuted foreign residents, and paid little heed to the repeated remonstrances of France and Great Britain. A French fleet blockaded Buenos Ayres intermittently from 1828 to 1845, and finally Great Britain and France actively interfered to protect Montevideo; their combined fleets bombarded and captured Rosas's entrenched camp at Punta de Obligado (Nov. 20, 1845), but nothing further was done. The leaders of the unitarian party repeatedly incited rebellion in the interior, and the attempts of Lavalle (1838-41) for a time promised success; but in the end all were beaten, and the civil war only increased the miseries of the country. In 1851 Brazil interfered to protect the independence of Uruguay, and was joined by Urquiza, dictator of Entre Rios. Their combined forces, under Urquiza, raised the siege of Montevideo, invaded Buenos Ayres, and defeated the army of Rosas at Monte Caseros Feb. 3, 1852. The fallen dictator fled to a British vessel, and was taken to England. He purchased an estate near Southampton, where he lived in retirement until his death Mar. 14, 1877. Rosas was the worst because the most powerful of the South American dictators. His name is execrated throughout Spanish America.

HERBERT H. SMITH.

Roscelin, *ros celi* (*Roscelinus*, *Russellin*, *Rucellinus*): the so-called founder of nominalism; h. in the diocese of Soissons in the middle of the eleventh century, and educated at Rheims; was attached to the Cathedral of Chartres; lived at Compiègne as canon; while there he greatly startled people by his tritheistic conception of the Trinity. He could not understand how God could be a person without being an individual, and thus he dissolved the Trinity into three Gods. A synod was convened at Soissons in 1092 to consider the matter, and, as Roscelin had quoted both Lanfranc and Anselm as being in favor of his views, Anselm drew up his *De fide Trinitatis*, which is a complete refuta-

tion of Roscelin, and laid it before the synod. Roscelin was condemned and recanted, but continued, nevertheless, after his return to Compiègne, to propagate his tritheistic doctrines. He afterward settled as a teacher at Tours, and later at Loc-menach, near Vannes, in Brittany, and to this last period of his life belongs his controversy with Abelard. Abelard was a pupil of his, but in his *De Trinitate* (*Introductio in Theologiam*) he found it expedient, evidently with an eye to the decisions of the Synod of Soissons, to emphasize the unity of the Trinity with great strength. Enraged, Roscelin denounced him to Gisbert, Bishop of Paris, for various other heresies, and Abelard answered by a direct and violent attack (Ep. xxi.). After that time (1121) Roscelin disappears from history. The only writing of his extant is a letter supposed to be addressed by him to Abelard. It is probable that he wrote little. His importance in the history of nominalism has led to the close study of such representations of his teachings as are to be found in the writings of his opponents. See the histories of philosophy by Ueberweg and Erdmann.

Revised by S. M. JACKSON.

Roscher, WILHELM GEORG FRIEDRICH, Ph. D.: political economist; b. in Hanover, Germany, Oct. 21, 1817; educated in Hanover and at the Universities of Göttingen and Berlin; professor at Göttingen University 1844-48; became professor at Leipzig University 1848; was Doctor Honorarius of Law in the Universities of Königsberg, Edinburgh, and Bologna; Doctor Honorarius of Political Economy in the University of Tübingen; member honorarius of the Universities of Kasan and Kiev, and *Ehrenbürger* of Leipzig University. His principal works are *De historicis doctrinæ apud sophistas majores vestigiis* (Göttingen, 1838); *Leben, Werk und Zeitalter des Thukydides* (1842); *Grundriss zu Vorlesungen über die Staatswirtschaft* (1843); *System der Volkswirtschaft* (4 vols., Stuttgart, 1854-86; vol. i., 20th ed. 1892; vol. ii., 12th ed. 1888; vol. iii., 6th ed. 1892; vol. iv., 3d ed. 1889); *Kolonien, Kolonialpolitik und Auswanderung* (1847; 3d ed. 1885); *Ueber Kornhandel und Theuerungspolitik* (Stuttgart, 1847; 3d ed. 1852); *Zur Gründungsgeschichte des Zollvereins* (Berlin, 1870); *Geschichte der Nationalökonomik in Deutschland* (2 vols., Munich, 1874); *Andichten der Volkswirthe aus dem geschichtlichen Standpunkte* (2 vols., Munich, 1861; 3d ed. 1878); *Umriss zur Naturlehre des Cäsarismus* (1888); *Umriss zur Naturlehre der Demokratie* (1890); and *Politik, geschichtliche Naturlehre der Monarchie, Aristokratie und Demokratie* (1892). D. in Leipzig, Saxony, June 4, 1894.

Roscius, QUINTUS: a celebrated Roman actor, a contemporary of Sulla and Cicero, who in his youth received instruction from him, and subsequently defended him in a civil lawsuit in an oration which is still extant. He was especially great in comedy, and carried his art to the highest degree of perfection which the Roman stage ever witnessed, accumulating an immense fortune. Cicero speaks often of him, and always with enthusiasm for his art and respect for his character. D. 62 B. C.

Revised by M. WARREN.

Roscoe, Sir HENRY ENFIELD, LL. D., D. C. L.: chemist; grandson of William Roscoe; b. in London, Jan. 7, 1833. He was educated at University College, London, and at Heidelberg; graduated at London University in 1852; appointed Professor of Chemistry at Owens College, Manchester, in 1858, and resigned in 1885. He was elected a fellow of the Royal Society in 1863, and received the royal medal of the society in 1873 for his chemical researches. In 1884 he was knighted for his services as a member of the royal commission on technical instruction; was elected Liberal M. P. for South Manchester in 1885, 1889, and 1892. He was president of the British Association in 1887, and in 1889 received the decoration of the Legion of Honor in recognition of his services at the Paris Exposition of that year. In conjunction with Prof. Bunsen he has published several investigations on the measurement of the chemical action of light, and is the author of numerous papers in scientific journals. His *Lessons in Elementary Chemistry* has been translated into several European and Eastern languages. He is the author of *Lectures on Spectrum Analysis* (1869; 5th ed. 1888), and conjointly with Prof. Schorlemmer of a *Treatise on Chemistry* (8 vols., 1877-90).

R. A. ROBERTS.

Roscoe, WILLIAM: historian and biographer; b. near Liverpool, England, Mar. 8, 1753; was admitted to the bar 1774; began practice at Liverpool; wrote several pamphlets against the slave-trade; published in 1796 *The Life of Lorenzo de' Medici*, and in 1805 a *History of the Life and Pontificate of Leo X.*; sat in Parliament 1806-07; edited Pope's works (10 vols., 1824), and was author of many polit-

ical and miscellaneous treatises. He was distinguished for his labors in the cause of philanthropy and his encouragement of younger literary aspirants. D. at Toxteth Park, Liverpool, June 27, 1831. His *Life* (2 vols., 1833) was written by his youngest son, HENRY (1799-1836), who was distinguished at the bar, wrote numerous legal works, and was author of the *Lives of Eminent British Lawyers* (1840; often reprinted).

Revised by H. A. BEERS.

Roscom'mon: an inland county of Ireland, in the province of Connaught, bordering E. on the Shannon. Area, 949 sq. miles (see map of Ireland, ref. 8-F). The surface is level, with the exception of the northern parts, where ranges of low hills are found; the soil is light but fertile, affording excellent pasturage in many places. Agriculture and the rearing of sheep are the principal occupations. Pop. (1891) 114,397. Chief town, Roscommon, which contains remains of a castle and a fine abbey of the thirteenth century, and has an important cattle-market.

Roscommon, WENTWORTH DILLON, Earl of: poet; nephew of Wentworth, Earl of Strafford; b. in Ireland about 1633; educated at Caen under Bochart; spent a large part of his life in France; obtained several offices about the court of Charles II.; went to Ireland as captain in the Guards; squandered his estate by gaming; returned to England; reformed his habits; married a daughter of the Earl of Burleigh; devoted himself to literature in conjunction with Dryden, and produced some poems, the best being the *Essay on Translated Verse* (1660); a blank-verse paraphrase of Horace's *Art Poetica* (1684); and a revision of *Dies Iræ*. D. in London, Jan. 17, 1684, and was buried in Westminster Abbey.

Revised by H. A. BEERS.

Rose [conjointly from O. Fr. *rose* (< Lat. *ro'sa*) and < O. Eng. *rōse*, from Lat. *ro'sa*, rose; cf. Gr. *ῥόδον*, rose]: a flowering plant of the genus *Rosa* and family *Rosaceæ*, which consists of shrubs, usually prickly, natives of the northern hemisphere from the Arctic zone to Mexico in the New World, and to Abyssinia and the Indian Peninsula in the Old. The genus is characterized by unequally pinnate leaves with serrate leaflets, or rarely simple leaves, which in one species (*R. berberifolia*) are entirely wanting, adnately stipulate petioles, and single or corymbose terminal flowers, with five foliaceous sepals imbricated in aestivation, five petals readily multiplying under cultivation, indefinite stamens, and numerous one-seeded carpels inclosed in the receptacular calyx-cup, which becomes fleshy when ripe. The most widely distributed North American species are the Michigan prairie-rose (*R. setigera*), with high-climbing branches, armed with stout, straight prickles, showy corymbose pink flowers, and globular fruit—a native of the Western and Southern States from Michigan to Louisiana and Georgia; the swamp-rose (*R. carolina*), with stems 4 to 8 feet high, armed with stout hooked prickles, corymbose pink flowers, and bristly, depressed globular fruit—a frequent inhabitant of low swampy ground from Canada to Florida and westward to the Mississippi; the dwarf wild rose (*R. lucida*), with stems 1 or 2 feet high, armed with unequal bristly prickles, mostly deciduous flowers, solitary or in clusters of two or three, and smooth globular fruit—common through Canada and the U. S., E. of the Rocky Mountains.

The sweet-brier (*R. rubiginosa*), a native of Europe, has escaped from cultivation, and become widely naturalized in the Atlantic States. The Cherokee rose (*R. sinica*), a native of China, with high-climbing branches, armed with stout hooked prickles, coriaceous evergreen leaves, and large white flowers, has been naturalized in the Southern States for over 100 years, where it is also extensively cultivated as a hedge-plant. Where sufficient room can be given it, few plants equal the Cherokee rose for winter blooming in Northern conservatories. *R. bracteata*, a native of China and Northern India, with erect branches, armed with stout recurved prickles and large, white, solitary flowers surrounded by conspicuous bracts, has also become naturalized in some of the Gulf States, where it is successfully employed as a hedge-plant, especially in deep rich soils.

From the dried petals of *R. gallica*, an Old World species of doubtful geographical limits, an infusion is made which is employed as an agreeable vehicle for tonic and astringent medicines. From the petals of *R. centifolia*, a native of the Caucasus, and *R. damascena*, whose native country is unknown, rose-water, the principal ingredient in astringent collyria, is distilled. (See ATTAR OF ROSES.) In the south of France, Egypt, and other Mediterranean

countries, and in India, rose are still largely cultivated for the manufacture of rose-water. The *Rugosa* (*R. acuta*), which is cultivated throughout Europe, Northern Africa, the Canary Islands, Persia, and Siberia, is also of some importance in Japan. The pulp of its fruit, mixed with twice its weight of sugar constitutes the confected rose tarts, which is employed as an adjuvant antiscorbutic preservative; an infusion of the young leaves has been used as a substitute for tea; its seeds are a verucifuge; while the root was formerly considered a specific against hydrophobia.

In cultivation, dividing garden-roses into two sets—the rose, of summer or once-blooming; the second, of autumnal or twice-blooming—although open to several objections, is the most convenient for the cultivator.

In the first section belong the Provence roses of various forms, double forms of *Rosa centifolia*, favorite garden-roses from the time of the Romans, and of which the *Provence* roses are dwarf varieties; also numerous, double-leafed roses, a sport of accidental variation of the Provence rose, with the glands and lobes of the calyx and petal developed into a fleshy substance. The original rose-rose was introduced into England about three centuries ago from Holland, but the garden where it originated has the name of its discoverer are lost. Hybrid China rose, introduced from a cross of the Provence and other roses, rose with the Chinese rose and its offspring, the *Noisette*, *Nezette*, and *Bourbon* roses. China roses are remarkable for rapid growth, often surpassing both parents in this respect, spherical blossoms, and great hardiness. They are particularly adapted for growing on pillars or rose arbors, and in similar situations. Scotch roses, descendants of *R. spinosissima* are of dwarf stature and grow hardy, producing early in the season an abundant crop of red, white and yellow flowers. Austrian briars, descendants of *Rosa laia*, in Harrison's Yellow give the rose yellow rose for general cultivation. Queen-of-the-moors and *Balthazar* (a hybrid with evident traces of the blood of one of the tender *Noisette* group) are the most generally collected of the descendants of the prairie rose.

In the second section come also belong the sweet-brier (*R. rubiginosa*) of which many forms and varieties are in cultivation; the *Bourbon* rose, a descendant of *R. alba*, the *Provence* rose, of which many varieties descendants of the *Provence* *R. sempervirens* are in cultivation. The many-colored roses, *R. multiflora*, is a native of China and Japan, and several *Acacia* forms derived from it are in cultivation in the Southern States. The *Banksian* rose, generally cultivated only in its drooping state, has its origin in the Chinese *R. banksiana*.

In the third section (once-blooming roses) belong Chinese roses, descendants of *R. indica* and *R. sempervirens*, are rarely cultivated. Two roses, descendants of *R. indica*, and one variety of this species with sweet-scented flowers, the *Moist* rose and the yellow rose, were introduced into England from China early in the sixteenth century. From the intercrossing of these two varieties has sprung the whole race of once-blooming roses so extensively cultivated. The *Provence* double form of *R. moschata*, a native of the Caucasus, is occasionally cultivated. *Noisette* roses, numerous climbing, with flowers in clusters, were introduced by M. Noisette, a French florist of Charleston, S. C., by crossing the China rose with the musk-rose, the offspring being again crossed with the musk-rose. *Bourbon* roses are a race of hybrids introduced into Europe from the Isle of Bourbon, where it was produced by crossing the China rose with some other rose of Eastern origin, naturalized in that island. *Bourbon* roses are valuable for their habit of blooming late in autumn. A French gardener, M. Jaffroy, of Belerue, near Paris, first, in 1840, produced the hybrid perpetual rose, which has as a basis some *Acacia* once-blooming rose, often the hybrid China, and *Acacia* has been mingled in sufficient quantities to impart clear once-blooming qualities the blood of the China rose, *Provence*, or *Bourbon* rose, or a combination of all three.

Roses should be cultivated in situations fully exposed to the sun in deep strong loam well drained and heavily manured. Indeed, so much rich food can hardly be given them without their greatest benefit. The soil in which they grow should be constantly stirred and kept free from other plants, and especially from the roots of neighboring trees, whose aerial search must be kept for the many insects which are a favorite food in their leaves and petals. Such a selection of soil and situation, pruning is the

most important operation in the culture of the rose. Strong-growing roses must be pruned slightly that they may not be stimulated to excessive growth at the expense of the flowers; weak-growing roses must be pruned severely, to procure more vigorous growth, or, in the words of Francis Parkinson, a master in rose-culture, "Roses should be pruned in inverse proportion to the vigor of their growth." See Francis Parkinson's *Book of Roses* (London, 1800); Thomas Rivers, *The Rose Amateur's Guide* (London, 1872); S. Reynolds Hole, *A Book about Roses* (11th ed. London, 1891); J. Lauchman, *Les Roses* (Paris, 1874); and Thomas Allcock, *History and Cultivation of the Rose in the Southern States* (Houston, 1896).

U. S. BENTON.

Rose (in heraldry): a conventionally drawn Rose, having always five petals, and usually also five smaller inner petals and five green points of leaves showing on the outer rim. The rose gable was the badge of the Plantagenets of the house of Lancaster, and the rose argent of that of York. The Tudor rose is a combination of the two adopted after the marriage of Henry VII. in 1486 of York; this is sometimes a white rose charged upon a red one, and sometimes a single rose quartered red and white. The rose was sometimes surrounded with rays, as of the sun, and termed rose or soleil. As a mark of cadency, the rose has been used as the difference of the seventh son.

Revised by RUSSELL STORRE.

Rose, KATHERINE LARSEN (Katherine Parsons), philanthropist; b. at Petersburg, Poland, Jan. 18, 1810, of Jewish parents; abandoned early the Jewish creed; visited England in 1829; became a disciple of Robert Dale Owen, and was married to William F. Rose. In 1836 she went to New York and circulated the first petition for the property rights of married women, as there was a bill pending in the Legislature, introduced by Judge Horsted in 1837. She lectured in all the chief cities, was a delegate from the National Woman Suffrage Association to the woman's industrial congress, held in Berlin, Nov. 9, 1869, and subsequently attended all the woman's rights conventions, and frequently addressed legislative assemblies. She was one of the most logical and eloquent orators on the woman suffrage platform. In her later years she spent most of her time in France and England, speaking on many public occasions on religion and the enfranchisement of women. She died in London in 1892.

JOHN B. ANTHONY.

Rose, ROSE, GUSTAV; mineralogist; b. in Berlin, Mar. 18, 1796; took his degree of Ph. D. at Berlin 1820; studied with Berzelius; instructor of mineralogy in the University of Berlin from 1823 till his death; in 1829 visited the Ural Mountains with Humboldt and Ehrenberg. D. in Berlin, July 15, 1875. He published many papers on mineralogy, crystallography, and kindred subjects, mostly in *Gilbert's Annalen* and in *Poggendorff's Annalen*; also *Elements of Crystallography* (1829; 3d ed. 1875); *Mineralogisch-geognostische Reise nach d. Ural, d. Altai u. d. Kaspischen Meere* (1837-45); *Das Krystall-chemische Mineralien* (1852).

Rose, HENRIK; chemist; brother of Gustav Rose; b. in Berlin, Aug. 6, 1795. His grandfather, Valentin Rose, Sr., and his father, Valentin Rose, Jr., were distinguished chemists. He studied with Berzelius at Stockholm, and took his degree of Ph. D. at Kiel 1821. D. in Berlin, Jan. 27, 1864. He devoted his attention chiefly to analytical chemistry, and contributed more than any other chemist to advance this branch of science. His *Handbuch der analytischen Chemie* (Berlin, 1829) has run through many editions, and is still the standard authority. He published more than 200 papers on chemical subjects, largely in *Gilbert's Annalen* and *Poggendorff's Annalen*. In 1851 he read before the Berlin Academy of Sciences his *Gedächtnisrede auf Berzelius*. He was an instructor in the University of Berlin from 1822 till his death.

Revised by IRA ROSEN.

Rose, HUGH HENRY; See STRATHGAIN.

Rose, HUGH JAMES; clergyman and author; b. at Little Horsted, Surrey, England, in 1795; graduated at Cambridge 1817; became curate of Uckfield 1818, vicar of Horsham 1821, select preacher to the University of Cambridge 1825; was Professor of Divinity in the University of Durham 1833-38, chaplain to the Archbishop of Canterbury 1834-38, and principal of King's College, London, from 1838 to his death, in Florence, Italy, Dec. 22, 1858. Author of many sermons and theological treatises; founded *The British Magazine* 1833; became editor of *The Encyclopedia Metropolitana* 1836; was joint editor (with Archdeacon W. H. Lyall)

of *The Theological Library*, and projected *Rose's New General Biographical Dictionary*, a design carried into effect after his death by his brother, Henry John, and other writers. He was one of the principal founders of the Tractarian movement. Revised by W. S. PERRY.

Rose-acacia: an ornamental shrub, the *Robinia hispida*, of the order *Leguminosae*, growing wild in the mountains of the southern parts of the U. S. It has large, very showy, inodorous flowers of a deep rose-color in drooping loose racemes. It is common in cultivation.

Rose-apples: See EUGENIA.

Rosebery, ARCHIBALD PHILIP PRIMROSE, LL. D., Earl of: statesman; b. in London, 1847; educated at Eton and Oxford; succeeded to his title on the death of his grandfather, the fourth Earl of Rosebery, 1868; seconded an address in reply to a speech from the throne in Parliament 1871; president of the social science congress Glasgow, 1874; elected lord rector of the University of Aberdeen Nov. 16, 1878; lord rector of the University of Edinburgh Nov., 1880; Under-Secretary of State for the Home Department 1881; first commissioner of works 1884; Secretary of State for Foreign Affairs in Mr. Gladstone's government Jan. to June, 1886, and in this position won general approval for the firmness with which he conducted the difficult questions devolving upon him. He was appointed to the same post in 1892, and became Prime Minister on Mr. Gladstone's retirement in 1894. C. H. THURBER.

Rose-bug: a very common beetle, *Macrodactylus subspinosus*, of North America, belonging to the family *Scarabaeidae*. It is small and dusky yellow, and is very destructive, not only to the rose, but to other vegetation. In warm weather it will suddenly appear in swarms and then suddenly disappear again, having completed its devastations, against which there seems to be no effectual remedy. In some cases air-slacked lime scattered over the bushes and under them seems to have the desired effect, but in other cases it has proved a complete failure. The same may be said of syringing the bushes with a decoction of whale-oil soap or of ailanthus leaves.

Roseburg: city; capital of Douglas co., Ore.; on the Umpqua river, and the S. Pac. Railroad; 76 miles S. of Eugene City, 197 miles S. of Portland (for location, see map of Oregon, ref. 6-B). It is in an agricultural, stock-raising, fruit-growing, and mining region; is an important market for the fertile Umpqua valley; and contains flour-mills, breweries, wagon-shops, the Oregon State Soldiers' Home, a national bank with capital of \$50,000, a private bank, and a semi-weekly and a weekly newspaper. Pop. (1880) 822; (1890) 1,472; (1894) estimated, 2,500.

MANAGER OF "REVIEW."

Rose'crans, WILLIAM STARKE: soldier; b. at Kingston, O., Sept. 6, 1819; graduated at the U. S. Military Academy; promoted brevet second lieutenant of engineers July 1, 1842. With the exception of four years (1843-47), when he was at West Point as Assistant Professor of Engineering and of Natural and Experimental Philosophy, he was engaged in the construction of fortifications until Apr. 1, 1854, when he resigned from the army and established himself in Cincinnati, O., as civil engineer and architect; was president of a coal company in Virginia 1855-57, and engaged in the manufacture of kerosene in Cincinnati 1857-61. As volunteer aide to Gen. McClellan he served in organizing Ohio State troops; was appointed colonel and chief engineer of Ohio June 9, and colonel Twenty-third Ohio Volunteers June 10, 1861. He was commissioned brigadier-general in the regular army, and in the West Virginia campaign commanded a brigade at Rich Mountain, July 11; succeeded to command of the department of the Ohio on July 21, and of the department of West Virginia in Sept., 1861; appointed major-general of volunteers Mar., 1862; in May he commanded a division of the Army of the Mississippi at the siege of Corinth; succeeding to command of that army in June, he fought the battles of Iuka (Sept. 19) and Corinth (Oct. 3-4); was transferred to the command of the Army of the Cumberland Oct. 27. His exertions did much to win the battle of MURFREESBORO (q. v.), fought Dec. 31, 1862-Jan. 3, 1863, after temporary reverse on the first day. Advancing on Tullahoma June 24, he occupied Bridgeport and Stevenson July 24; crossed the Cumberland Mountains, and Sept. 19-20 fought the battle of CHICKAMAUGA (q. v.), where, defeated and falling back on Chattanooga, he was relieved Oct. 30, 1863 (see CHATTANOOGA,

SIEGE AND BATTLE OF): was placed in command of the department of the Missouri Jan., 1864; repelled the invasion of Missouri by Price; was mustered out of the volunteer service in 1866; again resigned from the army 1867; was for a short time (1868-69) U. S. minister to Mexico, after which he became a resident of San Rafael, Cal., and was in Mexico 1871-73, engaged in an unsuccessful effort to negotiate the construction of a vast system of narrow-gauge railways. He was member of Congress from California 1881-85, and register of the Treasury 1885-93. On Mar. 2, 1889, he was restored to the rank of brigadier-general and retired. Revised by JAMES MERCUR.

Rose-gall: See GALL INSECTS.

Ros'egger, PETRI KETTENFEIER: poet and novelist; b. at Alpl, a small village in the Styrian Alps, July 31, 1843; passed his youth in great poverty and was apprenticed to a tailor at the age of seventeen. Through the aid of a number of patrons, whose attention he attracted by his exceptional poetic talent, he was enabled to make up for his defective education and devote himself entirely to literature. In 1869 he published his first book, *Zither und Hackbrett*, a collection of poems in the Styrian dialect, which met with success. Since then he has produced a great number of stories, sketches, and novels, most of which describe the peasant life of his native country with great originality and power of characterization. The best known of his stories are *Aus dem Walde* (1874); *Geschichten aus den Alpen* (1878); *Der Gottscheer* (1883); *Jacob der Letzte* (1888); *Hoch vom Dachstein* (1892); *Peter Mayr* (1894). JULIUS GOEBEL.

Rosellini, ros-el-lee'née, IPPOLITO: Orientalist; b. at Pisa, Italy, Aug. 13, 1800. After graduating at Pisa in 1821, he studied Oriental languages at Bologna, and in 1824 was made Professor of Oriental Philology in the University of Pisa. Having been commissioned by the Grand Duke of Tuscany to examine the antiquities of Egypt, he visited that country and spent fifteen months (1827-28) with Champollion, who was under appointment by the French Government, in careful exploration. After the death of Champollion, Rosellini became to some extent his literary executor. The remainder of his life, after his return from Egypt, was spent in editing and publishing his monumental volumes, *I Monumenti dell'Egitto e della Nubia* (9 vols. octavo, and 3 vols. folio, containing 394 plates, Pisa, 1832-44). Ungarelli's *Elementa linguae Aegyptiacae vulgo Copticae* (Pisa, 1837) contained the material delivered by Rosellini, who in turn depended upon Champollion's *Grammaire Copte*. D. at Pisa, June 4, 1843. Biographies of him were written soon after his death by Bardelli (1843), Dei (1843), and Cavedoni (1845). CHARLES R. GILLET.

Roselly de Lorgues, rō'ze'lee'de-lōrg', ANTOINE FRANÇOIS FÉLIX: religious writer; b. at Grasse, Alpes-Maritimes, France, Aug. 11, 1805; studied law, but soon left the bar and devoted himself to religious writing and to researches in philosophy; became a member of the Legion of Honor in 1837, and officer in 1855. His best-known works are those in defense of the Roman Catholic Church, especially *Le Christ devant le siècle* (1835; 16th ed. 1847), translated into several languages, and *La Croix dans les deux mondes* (1844; 3d ed. 1852). He also wrote several works with the purpose of obtaining the beatification of Columbus, among them *Christophe Colomb* (1856; 3d ed. 1886) and *Histoire posthume de Christophe Colomb* (1885).

Rose-mallow: See HIBISCUS.

Rosemary [by analogy of *rose* and *Mary* < M. Eng. *ros-marine*, viâ O. Fr. from Lat. *rosmarinus*, liter., sea-dew; *ros*, dew + *marinus*, of the sea, marine, deriv. of *mares*, sea]: a labiate evergreen shrub, *Rosmarinus officinalis*, of Europe and Asia, having fragrant aromatic leaves which yield a pungent volatile oil, valued as a stimulant medicine and sometimes used as an ingredient in perfumery, in hair-dressings, and in liniments. Oil of rosemary is a principal ingredient of the perfume called Hungary water or queen of Hungary water. The shrub, which reaches a height of from 4 to 8 feet, has linear leaves which are covered beneath with a short whitish-gray down and emit a penetrating camphor-like odor; the flower is pale bluish. It grows in sunny places, on rocks, old walls, etc., in the countries around the Mediterranean, and is generally cultivated as an ornamental and aromatic shrub in the west of Europe. The rosemary may sometimes be smelled for many leagues off the Spanish coast. It affords excellent bee-pasture. Revised by L. H. BAILEY.

Rosen, Nathan, FRIEDMAN ARONOV, Ph.D.: Orientalist; b. 1888, Lemberg, Galicia, Sept. 9, 1888; educated at Göttingen, Berlin and Berlin; published in 1920 his *Corpus Arabicum* (Leipzig); *Arabische Studien* appeared in the following year into Arabic literature (Berlin, 1922); was from 1929 (Professor of Oriental Languages in the University of London (now University College). Beginning January 1930 secretary to the Royal Asiatic Society and secretary to the Oriental Translation Commission; he became in 1931 with H. V. Ussell, by whose advice he published the Arabic text (with English translation and notes) of Muhammad ibn Musa's *diwan* (1931), prepared for publication Ibn Khallikan's great *Biographical Dictionary*, and undertook a work never completed on *Parasitology* (Leipzig); edited *Die Göttinger Hefen* (a *Heftreihe*); *Begegnung*, *Begegnung* (1934), and *Begegnung* (1934); *Begegnung* (1934); in 1935 he was secretary of the 4th vol., and in 1936 published his *Begegnung* (1936), and began in 1936 to read the *Begegnung* and with a Latin translation and explanatory notes. He had completed the first volume when he suddenly died in London, Sept. 13, 1937. The Oriental Translation Commission used his work under the title *Die Arabische Literatur* (Leipzig, 1938).

Rosenthal, Robert: See ROSEN.

Rosenkranz, Johann Karl Friedrich: philosopher; b. 1793, Göttingen, Prussia, Apr. 29, 1793; at the age of nineteen was up to his eyes in Berlin, devoting himself to philosophy. He completed his university course at Halle, receiving the degree of doctor of philosophy in 1819. In 1820 he returned upon the duties of Professor of Philosophy at Göttingen, occupying the chair formerly held by Hegel, and Karl told his death in 1826. He was the best representative of the "middle" of the school of Hegel, and did not, as is often said, work for rearranging and reclassifying the main parts of the system. His chief works are a *History of German Poetry in the Middle Ages* (1820); a *Handbook of the History of Poetry* (Halle, 1823); *Encyclopedia of Philosophical Sciences* (Halle, 1825); *Critique of Hegel's Philosophy of the Absolute* (Königsberg, 1826); *Philosophy of the Science of Subjective Mind* (Königsberg, 1827); *Philosophical Foundations of Hegel's System* (1840); *History of Kant's Philosophy* (Leipzig, 1840); *Life of Hegel* (Berlin, 1841); *Metaphysics of Logic* (Leipzig, 1846); *Geist and its World* (Königsberg, 1847); *Philosophy as a System* (Leipzig, 1848, Eng. trans. New York, 1886); *System of Science* (Königsberg, 1849); *Esthetics of the Ugly* (Königsberg, 1850); *Science of the Logical Idea* (Königsberg, 1851); *On Kant's Translation of Hegel's Philosophy of Nature* (Berlin, 1855); *Hegel on the National Philosophy of Germany* (Leipzig, 1870); nearly all of this work has appeared in English; *From Maybach to Königsberg: Autobiography* (Leipzig, 1873); *New Studies*—vol. I, *The History of Culture*, vol. II, *The History of Literature* (1875). D. June 7, 1876.

WILLIAM T. HARRIS.

Rosenmüller, Ernst Friedrich Karl: Orientalist; b. 1798, Göttingen, near Hildburghausen, Germany, Dec. 10, 1798; studied theology at the University of Leipzig 1818, where he became Extraordinary Professor of Arabic 1826 and Ordinary Professor of Oriental Languages in 1830. D. at Leipzig, Sept. 11, 1866. His principal works are *Scholia in Arab. Postamentum* (10 parts, Leipzig, 1798-1817); *Scholia in Arab. Postamentum in compendium redacta* (5 parts, 1820-22); *Handbuch der biblischen Alterthumskunde* (4 vols., 1823-31).

Revised by S. M. JACKSON.

Rosenmüller, Johann Georg: preacher and writer; b. 1798, Göttingen, near Hildburghausen, Dec. 18, 1798; called to Alstedt 1818, pastor in Hesse 1798; diacon in Königsberg in Prussia 1773; pastor and professor in Königsberg 1778; professor and superintendent in Hesse 1783; rector and pastor in Leipzig 1785; prelate of the Hochschule Meissen 1802. D. Mar. 14, 1815. Among his works are *Die christl. Abg. Soc. in der Christl. Kirche* (1803-1814); *Scholia in N. T.* (5 vols., 1777); *Handbuch der christlichen Kirche* (5 vols., 1789-90); *Meissen und Hildburghausen* (7th ed., 1820); and *Die christl. Kirche und Hildburghausen* (12th ed., Nürnberg, 1821). See also *Rosenmüller's Leben und Wirken* (Leipzig, 1866).

Revised by RICHARD GUTHRIE.

Rose-shale, or Gold Penny: an ancient English gold coin, first issued in the reign of Edward III., and last issued under Henry V. It bore a rose on one side, and was worth a penny—i.e., 1d., sterling.

Rosenthal, Emanuel, Johann, M.D.: physiologist; b. at Lohndorf, near Braunschweig, Prussia, July 10, 1828; pursued his medical studies at the University of Berlin, giving special attention to physiology, and acting as assistant to Virchow; in 1857 elected Extraordinary and in 1872 Ordinary Professor of Physiology at the University of Göttingen. He was editor of the *Centralblatt für die medicinischen Wissenschaften* (1884-90), and coeditor of the *Biologischen Centralblatt* in 1861. Among his works are *Die physiologische Funktion des Muskels* (Berlin, 1862); *Allgemeine Physiologie der Muskeln und Nerven* (Leipzig, 1871); *Vorlesungen über die öffentliche und private Gesundheitspflege* (Kiel, 1887).

S. T. A.

Rosenthal, Morris, M.D.: neurologist; b. at Grosswardein, Hungary, in 1862; graduated M.D. at the University of Vienna in 1889; in 1890 appointed a Professor of Nervous Diseases, and assigned to a division in the general hospital in Vienna. He is universally known as an able neurologist and careful investigator. Among his works are *Die Kinetopsychologie* (Vienna, 1905); *Handbuch der Neurologie und Therapie der Nervenerkrankungen* (Kiel, 1907); *Klinik der Nervenerkrankungen* (Münster, 1910).

S. T. A.

Rose of Jericho, or Rose of the Virgin: a small, fern-like, the *Anastasia hieracantha* (resurrection flower of Jericho), of the Levant and of Arabia. It is said that the rose of Jericho first bloomed at the Nativity, and that it remains in flower from Christmas till Easter. Others say that it sprang up wherever the Virgin alighted during the journey to Egypt. See JERICO, ROSE OF.

Rose of Sharon: the popular name of the *Hibiscus syriacus*. See HIBISCUS.

Roseola, ró-se-ó-la [Mod. Lat., dimin. of Lat. *rosa*, rose. Named from the color induced in the skin]: any one of various forms of disease attended with an erythematous rash. Very often mild cases of measles and scarlet fever were so designated, and the term has more recently been used as a designation of German measles. It is not properly applied excepting to the rash itself, and this may occur in a variety of conditions including gastric disturbances, mild fever from any cause, and various infectious fevers.

W. P.

Rose-quartz: a variety of QUARTZ (q. v.).

Roses, War of the: the name given to the civil war, lasting thirty years (1455-85), between the princes of the rival houses of York and Lancaster, each claiming the throne of England by right of descent from Edward III. See the articles ENGLAND (History), EDWARD IV., HENRY VI., HENRY VII., and RICHARD III.

Roset'ta [=Arab. *Rashid*, or *Rashid*]: an Egyptian town; 40 miles N. E. of Alexandria, near the mouth of the westerly branch of the Nile, and near Fort St. Julien, where the famous ROSETTA STONE (q. v.) was found (see map of Africa, vol. 2-P). The place was founded in 870 A. D., near the site of the ancient Bolbatonum. Its history is obscure, and the name does not appear in the literature of the Coptic period. (See Amelin, *Géographie de l'Égypte*, Paris, 1898, p. 404.) Before the opening of the canal that connects Alexandria with the Nile it had some importance as a port for trade, but this has almost entirely disappeared. Its native population is about 13,000, with very little foreign admixture.

CHARLES R. GILBERT.

Rosetta Stone: a large slab of black basalt, now in the British Museum, which was found in 1799 by a French engineer in the trenches of Fort St. Julien near Rosetta (q. v.) in Egypt. It measures 3 ft. 9 in. in height, 2 ft. 4 in. in width, and 11 inches in thickness in its present broken condition, but originally it was probably about 15 inches higher, and had a rounded top. It contains parts of fourteen lines of hieroglyphic text, in the upper register, nearly the whole of the original thirty-two lines of demotic or enchoric writing, and fifty-four lines (twenty-eight of them complete) in uncial Greek letters. The mutilations at the top have destroyed about fourteen lines of hieroglyphic text, and the piece lost from the lower right-hand corner has deprived us of the endings of twenty-six lines of the Greek. Judging by internal evidence it has been concluded that the original text was the Greek, and that the native writing contains only versions. (For an account of the Egyptian graphic systems, see EGYPTIAN LANGUAGES AND LITERATURE AND HIEROGLYPHS.) The stone itself speaks of the three styles of calligraphy as "writing of divine words" (hieroglyphic), "writing of letters" (demotic), and "writing of the Greeks."

The stone contains a copy of a decree promulgated by the Egyptian priesthood assembled at Memphis in 195 B. C., in honor of Ptolemy V. Epiphanes (205-182 B. C.) on account of certain benefits that he had conferred upon Egypt in his eighth year, by remitting certain taxes and reducing others, by conferring privileges upon the priests and soldiers, by dedicating certain revenues to the temples, and by averting serious damage from the land by damming and regulating the waters of an unusually high Nile. According to the decree it was directed that its text be engraved in three sorts of characters upon hard stone, and set up in all Egyptian temples of the first, second, and third order, to commemorate these beneficent deeds of "Ptolemy, the saviour of Egypt." It was also directed that statues of the king should be placed in all the temples, and that a shrine containing his image in wood should be carried with those of other deified kings of Egypt in solemn processions. The first five days of the month of Thoth were set apart for the celebration of special services in his honor.

The inscriptions on this stone were similar to those on the Tablet of Tanis, also known as the Stela of Canopus, discovered at Tanis by Lepsius in 1866. The latter was set up in 298 B. C., the ninth year of Ptolemy III., Euergetes I. (246-221 B. C.) to commemorate his good deeds, and particularly his restoration of the images of the gods, which had been carried off to Mesopotamia. These texts served to confirm the results of the decipherment based upon the Rosetta Stone. In the original work of decipherment great assistance was rendered to Champollion in 1822 by inscriptions on an obelisk then recently brought from Philæ to London, which contained the names of Ptolemy Euergetes and Cleopatra, to whose identification he was led by the Greek inscriptions on the base of the obelisk. The name of Ptolemy was already known, and the decipherment of the name of Cleopatra added several alphabetic signs to those that had been previously determined on the basis of the Rosetta Stone. For an account of the decipherment, see article EGYPTOLOGY. See also Budge, *The Mummy* (Cambridge, 1893), pp. 144 ff.; Ebers, *Cicerone durch Ägypten*, ii., pp. 24 ff. Budge, pp. 109-110, gives an extensive bibliography of works bearing upon the decipherment and interpretation of the Rosetta Stone. CHARLES R. GILLET.

Roset'ti, or Roseti, CONSTANTIN: poet and politician; b. in Bucharest, Roumania, June 14, 1816; in the army from 1833 to 1836; wrote translations from Byron and others, and in 1843 published a volume of original poems under the title *Ceasuri de mulțumire* (Hours of Contentment). He was concerned in the political disturbances of 1848, being a secretary of the provisional government. When the uprising was put down his journal, *Pruncul român* (The Roumanian Child), was suppressed, and he went to Paris, where he was active as a political writer. After the Crimean war he returned to Roumania and founded the journal *Românul* (The Roumanian), and as an ardent liberal was influential in politics. He became a member of the chamber of deputies, and held other public positions. He urged the proclamation of independence, and the alliance with Russia against Turkey in 1877. From 1878 to 1880 he was Minister of the Interior, and was a senator at the time of his death, Apr. 20, 1885. A new edition of his poems, translations, and political writings appeared in 1885 at Bucharest. E. S. SHELTON.

Rosewood: (1) the beautiful and fragrant wood of several leguminous Brazilian trees of the genera *Machierium* and *Triptolemea*, highly valued as a veneer for furniture, pianos, etc.; (2) the almost equally beautiful wood of an East Indian leguminous tree, *Dalbergia latifolia*; (3) Canary island rosewood, the fragrant woody root of the convolvulaceous *Rhodorrhiza scoparia* and *R. florida*. The last is a delightful incense, and its powder is mixed with snuff. From it is obtained the oil of rhodium, much vaunted as a charm for horses and highly prized by trappers. (4) Burmese and African rosewoods are the timber of leguminous trees of the genus *Pterocarpus*.

Revised by L. H. BAILEY.

Rosicrucians [Lat. *ro'sa*, rose + *crux*, *crucis*, cross]: a secret society reported to have been founded in the fourteenth century. The first mention of the society appeared in the *Fama Fraternalitatis des löblichen Ordens des Rosenkreuzers*, anonymously published at Cassel in 1614, and in the *Confession oder Bekenntniss der Societät und Bruderschaft R. C.*, published the following year. In these the most wonderful stories were told of the Rosicrucians, who were said to be possessed of the deepest wisdom, and most

potently at work for the weal of mankind. Concerning the founder of the society, Christian Rosenkreutz—his residence among the Arab and Egyptian magicians, his life in Spain and Germany as head of the new order, his death and burial—the most stirring revelations were made in a third book, *Chymische Hochzeit Christian Rosenkreutz*, which appeared at Strassburg in 1616. Some theologians considered the society a means of salvation, others the organ of a foul scheme. Some physicians thought that it would give the fulfillment of the golden prophecies of Theophrastus Paracelsus concerning an elixir of life; others, that it was only an impudent opposition to Galen. The alchemists particularly were anxious to join it, sure that it had found the philosopher's stone and could make gold, but the whereabouts of the brotherhood remained unknown. For several years the secret society of the Rosicrucians was the all-absorbing topic of the day. Some think that the books were written by Johann Valentin Andreä, simply as a satire. Of the real existence of such a society there never was found the slightest trace. Soon there arose a multitude of Rosicrucian societies, and at the end of the eighteenth century Cagliostro pretended to be a Rosicrucian. See Semler, *Impartial Collections for the History of the Rosicrucians* (Leipzig, 1768); and Waite, *The Real History of the Rosicrucians* (London, 1887).

Rosin, or Col'ophony [*rosin* is appar. dial. form of *resin* (see RESINS); *colophony* is from Lat. *colophonia* (sc. *resina*, *rosin*) = Gr. *κολοφονία* (sc. *ῥητινῆ*, *rosin*), Colophonian *rosin*, *rosin*, liter., fem. of *Κολοφώνιος*, pertaining to Colophon (Gr. *Κολοφών*)] the residue which is obtained by distilling off the water and volatile oil from the crude turpentine from pine-trees. The yield is from 70 to 90 per cent. of the whole. (See TURPENTINE.) It is largely manufactured, together with oil of turpentine, at Wilmington, Newbern, and Beaufort, N. C. When entirely freed from water it is translucent. The color depends upon the purity of the original turpentine and the care taken to distill at a low temperature. It is chiefly the anhydride of abietic acid.

Colophony is pale yellow and transparent (virgin *rosin*), or brownish yellow and translucent, according to the care taken in its preparation. It may be obtained nearly colorless by distillation with steam or some inert gas, as hydrogen, carbon dioxide, or nitrogen, under a pressure of ten atmospheres at a temperature not higher than 600° F. It has a peculiar luster, called resinous, is brittle when cold, and breaks with a conchoidal fracture; sp. gr. 1.07 to 1.08. It is insoluble in water, soluble in alcohol, ether, wood-spirit, and in fixed and volatile oils; partially soluble in petroleum. Nitric acid dissolves it, forming chiefly isophthalic acid, together with trimellitic acid and a resinous acid. It dissolves in caustic alkalies and alkaline carbonates. Colophony softens at 160° F. and melts at 275° F. At higher temperatures it gives off volatile oils, acquiring a dark color.

Colophony is extensively used in making varnishes and cements, in the calking of ships, in the preparation of plasters and ointments, and as a reducing agent in the soldering of metals. Large quantities are consumed in the manufacture of yellow soap. A well-known use of it is for covering the bows of violins to prevent the bow from slipping over the strings without producing vibration. Before the introduction of petroleum, *rosin-oil* was used to some extent in lamps. The *rosin-spirit* is sometimes used as a substitute for oil of turpentine. The viscid oil is used in paints, for the manufacture of printer's ink, in soap-making, in cheap lubricators, etc.

Revised by IRA REMSEN.

Rosin Bible: See BIBLE.

Rös'kilde: town; in the island of Sealand, Denmark; on a hill on a branch of the Isefjord. In the early Middle Ages it was a great city, the royal residence, with 100,000 inhabitants, and 27 churches and monasteries, but conflagrations, the plague, and the growth of Copenhagen destroyed its prosperity. It has a magnificent cathedral, built 1047-84, which contains many splendid monuments; the Danish kings are buried here. Pop. (1890) 6,972.

Roslyn: village; Queens co., Long Island, N. Y.; at the south end of Hempstead harbor, on the Long Island Railroad; 23 miles E. N. E. of Brooklyn (for location, see map of New York, ref. 8-K). It was named by William Cullen Bryant, who had a residence here and presented the village with a public hall. It has an English classical school, a savings-bank, a weekly newspaper, flour, paper, and planing mills, and canning-factories. Many New York business men have summer residences here. Pop. (1880) 1,101; (1890) 1,251; (1893) 1,409.

EDITOR OF "NEWS."

the Howland syndicate to build the Canadian Pacific Railway. He was a member of the Manitoba Legislature 1878-82, and in the latter year was elected to the Canadian Parliament.

NEIL MACDONALD.

ROSS, GEORGE WILLIAM, LL.D.: educator; b. in Middlesex, Ontario, Canada, Sept. 18, 1841; educated at Normal School, and became a teacher. In 1871 he was appointed county inspector of schools in East Lambton; subsequently became inspector of county model schools, and was appointed Minister of Education for Ontario Nov. 23, 1883. He was a member of the Dominion Parliament 1872-83, and since then has held a seat in the Ontario Legislature. For many years he has been a leader in temperance and prohibition movements; was an honorary commissioner at the Colonial and Indian Exhibition, London, 1885, and has been editor of the *Strathroy Age* and of the *Seaforth Express*.

NEIL MACDONALD.

ROSS, Sir JAMES CLARK: navigator; b. in London, Apr. 15, 1800; nephew of Sir John Ross; entered the navy in 1812, and accompanied his uncle on his first voyage in search of a northwest passage, and was also with Capt. Parry (1819-27) in the latter's expeditions having the same object in view, being on one occasion wrecked in the *Fury*; in 1827 was appointed commander, and in 1829 again sailed with his uncle as second in command, and was absent four years. On June 1, 1831, he discovered the position of the north magnetic pole. Promoted to be post-captain on his return, he was engaged in a magnetic survey of Great Britain and Ireland 1835-38; in Apr., 1839, was appointed to the command of the *Erebus*, and in September of that year, in company with the *Terror*, sailed for the Antarctic seas, reaching lat. 78° 10' S., the highest southern latitude ever reached. A volcano was discovered in lat. 77° 32' S., nearly 13,000 feet in height, which was named Mt. Erebus. It is in Victoria Land, discovered and named by him, and the most extensive Antarctic land yet seen. In 1844 the honor of knighthood was conferred upon him, and in 1847 he published *A Narrative of a Voyage in the Antarctic Regions*. He was a fellow of the Royal Society, and of many continental scientific bodies. D. at Aston Abbots House, near Aylesbury, Apr. 3, 1862.

Revised by C. C. ADAMS.

ROSS, Sir JOHN, K. C. B.: explorer; b. in the parish of Inch, Wigtownshire, Scotland, June 24, 1777; entered the navy in 1786; in Jan., 1818, received his commission as commander of the *Isabella*, and Apr. 25, in company with the *Alexander*, Lieut. Parry, sailed from London to ascertain the existence or non-existence of a northwest passage, returning in Nov., 1818; in May, 1829, again sailed in the steamer *Victory*, equipped by Sir Felix Booth, sheriff of London, but in Sept., 1830, became ice-bound in the Gulf of Boothia, making but little subsequent advance, and May 29, 1832, the *Victory* was abandoned. In Aug., 1833, the party was rescued by the *Isabella*, formerly commanded by Capt. Ross, but at that time engaged in the whaling business. He arrived in London Sept. 19, 1833, was knighted the following year, and admitted to the companionship of the Bath. From 1839 to 1845 he was consul at Stockholm; in 1850 departed, in command of the *Felix*, 90 tons, in search of Sir John Franklin, returning the following year; in July, 1851, attained the rank of rear-admiral. D. in London, Aug. 30, 1856. (See *POLAR RESEARCH*.) He published (1819) *A Voyage of Discovery, made under the Orders of the Admiralty for the purpose of exploring Baffin's Bay*, and in 1835 a *Narrative of a Second Voyage, including the Reports of Commander James Clark Ross, and the Discovery of the Northern Magnetic Pole*; also published a treatise on steam-navigation and numerous other papers.

Revised by C. C. ADAMS.

ROSS, Sir JOHN, K. C. B.: general; b. at Stonehouse, Cumberland, England, Mar. 18, 1829; entered the army as second lieutenant in the Rifle Brigade in 1846; served with that regiment during the Crimean war, where he won distinction and received the brevet rank of major and Turkish medal and order of the Medjidie. During the Indian mutiny he was present at the action at Cawnpur and the capture of Lucknow; subsequently commanded the Camel Corps at the capture of Calpee and in the ensuing campaign in Central India, and for his services received the rank of lieutenant-colonel, the companionship of the Bath, and a medal. He commanded the Bengal troops during the operations in the Malay Peninsula 1875-76, and was assigned to the command of a large force of Indian troops sent to the Mediterranean in 1878, when war with Russia was threatened. He afterward commanded the second division of the Cabul

army during the war with Afghanistan 1878-79, and received the thanks of Parliament and was knighted for his services. He was appointed to the command of the troops in Canada in 1888, and stationed in Halifax.

NEIL MACDONALD.

ROSS, JOHN JONES, M.D.: Canadian senator; b. at St. Anne de la Pêrade, Aug. 16, 1833. He is president of the Provincial College of Physicians and Surgeons; was a member of the agricultural council of Quebec 1862-90; and elected vice-president of the North Shore Railway Company 1875. He was Speaker of the Legislative Council of Quebec 1878-74 and 1876-81; commissioner of agriculture and public works 1881-82, and held this office together with that of Premier of province 1884-87. He represented Champlain in the Canadian Assembly 1861-67, the same seat in Parliament of Canada 1867-74, and was called to the Senate 1887.

NEIL MACDONALD.

ROSS, LUDWIG: archaeologist; b. at Altekoppel, Holstein, Germany, July 22, 1806. Endowed with a traveling scholarship by the Danish Government, he went to Athens in 1832 for the scientific exploration of Greek antiquities. When about to return home, he was appointed in 1833 by the Greek Government as superintendent of antiquities of the Peloponnesus, and subsequently of the entire kingdom. In 1845 he became Professor of Archaeology at the University of Halle. Ross was one of the great pioneers in the field of Hellenic archaeology, topography, and epigraphy. He traveled all over Greece, excavating, copying inscriptions, and fixing the topography of classical localities with such accuracy, scientific method, and descriptive talent that his works have retained their value. Among his many publications the following are the most important: *Wanderungen in Griechenland* (1851); *Reisen auf den griechischen Inseln des ägeischen Meeres* (4 vols., 1840-52); *Die Dämonen von Attika* (1846); *Das Theseion und der Tempel des Ares zu Athen* (1852); *Archäologische Aufsätze* (1855-61), the second volume of which also contains a biographical sketch by Otto Jahn. D. at Halle, Aug. 6, 1859.

ALFRED GUDEMAN.

ROSS, WILLIAM: member of privy council of Canada; b. at Bouladine island, Cape Breton, in 1825; represented Victoria in Nova Scotia Assembly from 1858 till 1867, and the same seat in the Canadian Parliament till 1874; collector of customs at Halifax 1874-88. He was sworn of the privy council Nov. 7, 1873, and was Minister of Militia and Defense from that date till Nov. 5, 1874.

N. M.

ROSS, Sir WILLIAM CHARLES, R.A.: painter; b. in London, England, June 3, 1794; son of a miniature-painter and teacher of drawing, from whom he received artistic training; gained a prize from the Society of Arts at the age of thirteen; in 1817 became an assistant to Andrew Robertson, an eminent miniature-painter; was appointed miniature-painter to Queen Victoria 1837; was knighted 1842; was patronized by all the court circle, and occasionally executed historical and imaginative pieces, having obtained a premium of £100 in the great cartoon competition for his *Angel Raphael discoursing with Adam* (1842). D. in London, Jan. 20, 1860.

Ross and Cromarty: a northern county of Scotland, washed on the E. by the German Ocean and on the W. by the Atlantic, and bounded N. and S. by Sutherlandshire and Inverness-shire respectively. It comprises the districts of Easter and Wester Ross, the Black Isle, the island of Lewis, and the ten detached districts which formerly made up the county of Cromarty. Area, 3,078 sq. miles. Pop. (1891) 78,727. The surface is wild and mountainous, but the soil affords good pastures, on which large herds of sheep and cattle are fed; agriculture and fishing are carried on. The royal burgh of Dingwall, 166 miles N. W. of Edinburgh, is the county-town. Pop. (1891) 2,800.

Rossano (anc. *Roscianum*): town; province of Cosenza, Italy; on a hill near the Gulf of Taranto, which it overlooks (see map of Italy, ref. 8-H). There are quarries of marble and alabaster in the neighborhood. Fish are abundant, and silk and cotton are raised in the vicinity, as well as grain, olives, grapes, etc. The town, still walled and defended by a castle, was once a very strong fortress. Rossano is the seat of an archbishop. Pop. of commune about 18,000.

Revised by M. W. HARRINGTON.

Rosse, WILLIAM PARSONS, third Earl of: astronomer; b. at York, England, June 17, 1800; studied first at Trinity College, Dublin, and then at Magdalen College, Oxford, where he graduated in 1822; sat in the House of Commons as Lord Oxmantown, representing King's County from 1821

Rossini, ros-see'née, GIOACCHINO ANTONIO: composer; b. at Pesaro, Italy, Feb. 29, 1792. In 1807 he entered the musical school of Bologna, studying counterpoint under the Abbate Mattei, and in 1810 he produced his first opera, *La Cambiale di Matrimonio*, at Venice. Other operas, since forgotten, followed, and in 1813 his *Tancredi* excited an immense enthusiasm, first in Venice, and soon on every stage on which Italian opera was given. In 1815 he went to Naples as director of the opera, and composed among other operas *Elizabetta* (1815), *Otello* (1816), *La Gazza Ladra* (1817), *Mosè in Egitto* (1818), *La Donna del Lago* (1819), and *Zelmira* (1820); but his most celebrated production of this period is *Il Barbiere di Siviglia* (originally called *Almaviva*), first performed in Rome in 1816, and generally considered the masterpiece of the whole genre of opera buffa—irresistibly gay, and as characteristic as graceful and brilliant. *Semiramide* (1823), composed at Bologna for the Fenice theater, Venice, was not appreciated on the occasion of its first representation. Rossini went to London in 1823, and next year to Paris, where he was made successively director of the Italian opera, inspector-general of song in France, and first composer to the Grand Opera. In bringing out his old compositions on the Paris stage he felt compelled to make considerable alterations: the melodies required a greater simplicity and more character, the chorus a deeper connection with the whole organism and a fuller significance, the instrumentation greater variety and elaborateness. He made a penetrating study of his task before he ventured to represent any new composition, but when at last, in 1828, he made the attempt with *Count Ory*, and in 1829 with *William Tell*, his success was astonishing. A few days after the performance of the last work he left Paris and retired to his villa near Bologna, where he lived till 1847, declining all offers, even the most tempting, made in order to induce him to compose a new opera. In 1847 he removed to Florence, in 1856 to Paris, where he died Nov. 13, 1868. In the last forty years of his life he published only a *Stabat Mater*, and a *Messe solennelle*, which was performed at his burial. See Edwards's *Life of Rossini* (1869), and the biography by Azevedo (1865).

Rossiter, THOMAS PRICHARD: figure and portrait painter; b. at New Haven, Conn., Sept. 29, 1818. He was a pupil of Nathaniel Jocelyn in New Haven, and studied in Paris, London, and other places in Europe 1840-46; National Academician 1849; gold medal, Paris Exposition, 1855. Many of his portraits are excellent. He devoted the later years of his life to painting the *Life of Christ* in a series of pictures. *Rebekah at the Well* is in the Corcoran Gallery, Washington. D. at Cold Spring, N. Y., May 17, 1871. W. A. C.

Rost, rost, REINHOLD: Orientalist; b. at Eisenberg, Germany, Feb. 2, 1822; studied in the gymnasium at Altenburg; graduated in 1846 at Jena; went to England 1847; from 1851 instructor in Oriental languages in St. Augustine's College, Canterbury; became secretary to the Royal Asiatic Society 1863, and librarian to the India Office 1869. He prepared a descriptive catalogue of the palm-leaf MSS. in the Imperial Library of St. Petersburg 1852; edited Dr. H. H. Wilson's *Essays on the Religion of the Hindus* and on *Sanskrit Literature* (5 vols., 1859-65). Editor of the Trübner series of *Simplified Grammars* 1882-88, and of the *Oriental Record*. Revised by BENJ. IDE WHEELER.

Ros'tock: town of North-ern Germany; in Mecklenburg-Schwerin; on the Warnow, 9 miles from its mouth in the Baltic (see map of German Empire, ref. 2-F). It has a university founded in 1419, with a library of 140,000 volumes; many other good educational institutions; manufactures of linen, leather, and tobacco, and an active trade. Vessels which draw more than 12 feet must load and unload at Warnemünde, its port at the mouth of the Warnow. Pop. (1890) 44,409.

Rostof': town of European Russia, in the government of Yaroslaf (see map of Russia, ref. 6-E). It has 33 churches and large manufactures of linen and candles, and holds an annual fair from Feb. 21 to Mar. 11, in which transactions to the amount of about 2,000,000 rubles are carried out. Pop. 17,439.

Rostof': town of European Russia, government of Ekaterinoslaf; on the Don, at the beginning of its delta; founded in 1749 as a fortress, and rapidly growing into one of the commercial centers of Southern Russia (see map of Russia, ref. 10-E). Ropes, linen, leather, soap, and tobacco are extensively manufactured. Pop. (1888) 66,781.

Rostoptchin', FEDOR WASILIEVICH, Count: general; b. in the government of Orel, Russia, Mar. 23, 1763; was educated at the court as a page of Catherine II.; became Minister of Foreign Affairs under Paul I., and was governor-general of Moscow in 1812, when Napoleon approached. He was long believed throughout Western Europe to have set fire to the city before leaving it to the French, but in his *La Verité sur l'Incendie de Moscou* (Paris, 1823) he denies this. It is certain, however, that he set fire to his own palace and made preparations for the burning of the magazines. D. in Moscow, Feb. 12, 1826. See Schnitzler, *Rostoptchine et Koutousof, ou la Russie en 1812* (Paris, 1863). F. M. COLBY.

Rostra [Lat., liter., beaks. So called because decorated with the beaks of the galleys of Antium, taken in the first naval victory of the republic, 338 B. C.]: the platform for public speaking at Rome; originally situated between the Comitia and the Forum. It was used also as a place for setting up statues of distinguished men, and on its sides were displayed some of the most important public documents, such as the laws of the Twelve Tables, international treaties, etc. At Caesar's initiative the old rostra was torn down, and a new one constructed (probably not earlier than 42 B. C.) at the west end of the Forum, before the temple of Concord. This was about 10 feet high, 80 feet long, and 33 feet deep, its great size being accounted for by the necessity of providing a place for statues, as above indicated. The rostra was restored with great magnificence in the second century A. D. (by Trajan or Hadrian). G. L. HENDRICKSON.

Roswitha: See HROTHSVITHA.

Rot (in vegetable pathology): any one of many diseases of plants, all due to the attacks of fungi or other low vegetable organisms.

The *bitter-rot* of apples causes upon the surface of the mature fruit brownish or blackish spots, which at length become studded with minute black raised points. On cutting through a diseased spot it is seen to extend far into the tissues of the apple. The fungus causing this disease

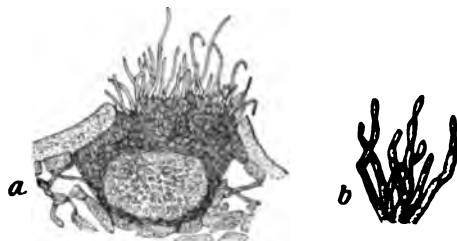


FIG. 1.—a, section through black point of bitter rot; b, spore-bearing threads (highly magnified).

is *Glaesporium fructigenum*, one of the so-called imperfect fungi of the family *Melanconiaceae*. Its threads grow parasitically through the tissues of the apple, killing the



FIG. 2.—a, grapes affected by black-rot; b, escape of the conidia; c, section showing ascospores (b and c magnified).

cells, and finally come to the surface and produce the minute black points mentioned above, in which spores are produced (Fig. 1). Spraying the fruit in August with a 1-per-cent. solution of ammoniacal copper carbonate is a preventive. Another rot of the apple is called *black-rot* from the black color of the decayed portion, in which are found little points or pustules containing spores. The fungus (*Macrosporium malorum*) is closely related to the preceding.

Black-rot of grapes attacks the fruit, leaves, and shoots.

lesions form dark, frothy black spots of dead tissue, resulting eventually in the withering of the torques into hard, black masses. The disease is caused by a black fungus (*Phoma*), a member of the family *Ascomycetes* (Fig. 3, a). In its earlier stage (*Phoma* stage), it produces stalked spores, which are emitted from the black pustules in gelatinous strings (Fig. 3, b). Later in the persistence it produces conical spores, which are always eight to ten cells (Fig. 3, c).

The brown rot of grapes is caused by one of the downy mildews (*Plasmogonia viticola*, see M. J. P. W. The grapes turn brown and hard, and finally shrivel up. Brown spots appear upon the leaves also. Both kinds of rot on grapes may be prevented by timely spraying the vines five or six times during the season with a 1-per-cent solution of ammoniacal copper carbonate. The withering of the grape which gives to the fruit a bitter taste is due to a minute species of the "imperial fungus." Closely related to this is the "white rot." No remedy is known for either, but Bordeaux mixture is recommended. *Black-rot* of grapes is known also as *antracnose* and *grey-rot*. See *Wine*.



Fig. 4.—*Phytophthora infestans* of the potato, showing the internal structure of the tuber.

One form of *potato-rot* or *blight* is caused by a downy mildew (*Phytophthora infestans*) whose parasitic threads penetrate the tissues of the leaves, stems, and tubers, and quickly destroy them. (See *Mildews*.) Spraying with some of the fungicides is said to be a remedy. Another form of *potato-rot* is produced by bacteria, which infect the tissues of the tubers, as well as of the parts above ground, causing their speedy death and decay. This bacterial disease of the potato appears to be more prevalent in the U. S. than that caused by the downy mildew. The bacterial disease appears to be checked by a rotation of crops.

Phom-rot is a common cause of the decay of the fruits of plum and peach trees. It is caused by a so-called imperfect fungus (*Monilia fructigena*) of the order *Hymenochaetales* and family *Moniliaceae*. The fruiting stage (Fig. 4) is known. The threads grow through the tissues of the affected fruit, and appear here and there in tufts of fruit-like rows of spores (conidia). The decay results primarily in water or upon the injured surface of the fruit. The speedy removal of all diseased fruit and the early application of poisonous sprays will serve to check the rot.

Worm-rot, in which the fruit decays when nearly ripe, is due to the minute *Phormogonium formosum*, one of the "imperfect fungi." According to the planters as to admit light and air to the fruit, and spraying with Bordeaux mixture has been recommended.

Rot is an affection of several cultivated plants, and occurs in the form of some, at least, to the growth of one of the larger fungi. In the grape the mycelium of one of the basidiomycetes (*Armillaria mellea*) penetrates and follows the fibres of the roots, finally producing the characteristic fruiting, as shown in Fig. 4. The same fungus causes the decay of the roots and trunks of timber-trees, and a related species often attacks the roots of apple-trees.

Rot of timber is a destruction of the tissues of the tree, resulting from the growth of the mycelium of one of the basidiomycetes (*Armillaria mellea*) (Fig. 5). It attacks some kinds of trees, as the supports in mines, cellars, etc., the foundations of buildings, and, in wooden

ships, the interior timbers below the water-line. Thorough painting or saturation with poisonous solutions retards the



Fig. 5.—*Armillaria mellea* of dry rot, in the fruiting state (light-colored).

danger of dry-rot. Especial care should be taken to avoid the use of timber in which dry-rot has made any beginning whatever. *Wet-rot* is a disease of timber-trees caused apparently by one or more species of the larger fungi, in some cases possibly the same as the preceding, and sometimes referred to *Trametes* and *Polyporus*.

Trametes.—P. L. Serrano, *Nominae Diseases of the Grape and Other Plants* (1890); H. M. Ward, *Trametes and some of its Diseases* (1890); also various papers by V. L. Serrano and R. T. Galloway in the U. S. Agricultural Reports (1897 to 1899).

CHARLES J. BESSEY.

Rotary Presser: See **PRINTING-PRESSER**.

Rotation: See **MOTION**.

Rotation, in agriculture: See **AGRICULTURAL CHEMISTRY**.

Rotatoria: another name for *Rotifera* (q. v.).

Roth, Paul, Assent, LAWRENCE, M. A., P. R. M. S.: meteorologist; b. in Boston, Mass., Jan. 6, 1861; studied at the Boston Institute of Technology. In 1885 he founded the Blue Hill meteorological observatory on Blue Hill, Mass., the highest point on the Atlantic coast of the U. S. south of Maine. From 1886 till 1902 he was associate editor of *The American Meteorological Journal*, and in 1901 he was appointed by the international meteorological committee a member of its commission on the classification and nomenclature of clouds. In 1900 he represented the U. S. at the Paris Exposition, and was made Chevalier of the Legion of Honor. He is author of many meteorological papers in the scientific journals, and of regular annual reports of the work of the Blue Hill observatory since 1887 published in the *Annals of the Astronomical Observatory of Harvard College*.

MARK W. HARRIS.

Roth, von, RUDOLF, von: Orientalist; b. in Stuttgart, Germany, Apr. 3, 1821; studied at Berlin, Paris, and London; in 1856 became Professor of Oriental Languages and chief librarian at Tübingen University. With *Bhartruhari* (q. v.) he prepared a great Sanskrit dictionary. He has also written works on the Vedic literature, among which are *Vedic Literature and History* (1846); *Avesta* (1852); and *Atharva-Veda* (1856), written in conjunction with W. D. Whitney.

Rothe, rÖte, RICHARD: theologian; b. at Posen, Prussia, Jan. 28, 1790; studied at Heidelberg and Berlin, and was appointed preacher to the Prussian embassy at Rome in 1818; professor at Wittenberg in 1828, at Heidelberg in 1837, at Bonn in 1849, and again at Heidelberg in 1854, where he died Aug. 20, 1867. His principal work is *Theologische Ethik* (3 vols., Wittenberg, 1845-48), edited, with his posthumous notes, by Holtzman (5 vols., 1868-71). But he also occupied a most prominent place in the historical and dogmatic divisions of his science—*Die Anfänge der christlichen Kirche* (Wittenberg, 1837) and *Zur Dogmatik* (Göttingen, 1863; 2d ed. 1869). An English translation of his *Sermons for the Christian Year* appeared in Edinburgh 1877, and of his *Still Hour* (London and New York, 1886). After his death appeared his *Dogmatik* (Heidelberg, 1870); *Vorlesungen über Kirchengeschichte* (2 vols., 1875-76); *Geschichte der Predigt* (Bremen, 1881); *Gesammelte Vorträge und Abhandlungen aus seinen letzten Lebensjahren* (Erfeld, 1886). He was a noble, broad-minded, speculative theologian, imbued with the inspiring idea that no line of demarcation should be drawn between sacred and secular, for religion and morals are absolutely identical. See *his Life*, by F. Nippold (3 vols., Wittenberg, 1873-75).

Revised by S. M. JACKSON.

Roth'ermel, PERCY FRENCH: painter; b. in Luzerne Co., Pa., July 18, 1817, of German extraction; was educated in Philadelphia for the profession of land-surveyor; opened a studio as a portrait-painter, but soon adopted historical painting as his branch of art; visited Europe in 1836-37, and painted in Italy. With the exception of his *Columbus*

before Queen Isabella, *The Martyrs of the Colosseum*, *Cromwell breaking up Service in an English Church*, his best-known pictures are suggested by American themes—*De Soto discovering the Mississippi*, *Patrick Henry before the Virginia House of Burgesses*, *The Battle of Gettysburg*. Rothermel belongs to the class of sensational artists, but his talent for composition and color gives him a high rank among these. O. B. FROTHINGHAM.

Rothsay, roth'sā: a royal burgh and favorite watering-place of Scotland; capital of the county of Bute; pleasantly situated at the head of a spacious and sheltered bay on the northeastern coast of the island of Bute. Though the first cotton-mill established in Scotland was located here, the place has now no industries worth mentioning. Considerable fishing, however, is carried on. Near the center of the town are the ruins of Rothsay Castle, founded in 1098. Pop. of burgh (1891) 9,034.

Rothsay, DAVID STEWART, Duke of: See STEWART.

Rothrock, JOSEPH TRIMBLE, B. S., M. D.: botanist; b. at McVeytown, Pa., Apr. 9, 1839; educated at Harvard College and the University of Pennsylvania. He has been Professor of Botany in the Pennsylvania Agricultural College and the University of Pennsylvania, and was the botanist of the U. S. geographical surveys W. of the 100th meridian, made by Lieut. Wheeler in 1873-74-75. Among his scientific publications are the following: *Morphology of the Andracium in Fumariaceae* (1863); *Revision of the North American Gaurineae* (1864); *Flora of Alaska* (1867); *Botany of the Wheeler Expedition* (1878). He has also written many papers on forestry. CHARLES E. BESSEY.

Rothschild, Germ. pron. rōt'shēlt, MEYER ANSELM: financier and founder of a family celebrated for its great wealth; b. at Frankfort-on-the-Main, 1743; was intended for the Jewish priesthood, but was placed in a counting-house at Hanover, whence he returned to Frankfort and started in business for himself on a small scale as a banker and broker. Devoting himself closely to his new business, he obtained a reputation for ability and integrity, and was intrusted with the money affairs of the landgrave, afterward Elector of Hesse, who during Napoleon's possession of Germany confided to Rothschild the keeping of his immense private fortune without interest. D. in Sept., 1812, leaving a large fortune to his five sons, Anselm, Solomon, Nathan, Charles, and James, who established themselves respectively in the cities of Frankfort, Vienna, London, Naples, and Paris. All of these were created in 1822 barons of the Austrian empire.—The third son, NATHAN, b. Sept. 16, 1777, who established a branch of the house in England, employed with great judgment the immense sums confided to his father, and raised the firm to the position of one of the leading banking-houses of the world. D. at Frankfort, July 18, 1836.—LIONEL NATHAN, b. Nov. 22, 1808, eldest son of Nathan, was repeatedly elected to the British Parliament, but declining to take the prescribed oath, "on the true faith of a Christian," was not admitted until the act for removing the disabilities of the Jews was passed in 1858, when he took his seat, being the first Jew admitted to Parliament. D. June 3, 1879.—His son NATHAN was raised to the peerage as Baron Rothschild in 1885. See REEVES, *The Rothschilds* (London, 1887). F. M. COLBY.



A rotifer.

Rotifera [Mod. Lat.; Lat. *ro'ta*, wheel + *ferre*, to bear]: a group of microscopic animals which are of interest not only on account of their motions and powers of withstanding desiccation, but from the fact that they represent as adults a structure which occurs only in the embryos of other worms. The scientific name, as well as the popular term of wheel-animalcules, is due to the fact that around the anterior end of the body is a more or less modified circle of cilia, the motions of which convey the impression of a wheel in rapid rotation. Just behind the wheel is the mouth, which communicates with a complicated apparatus of jaws (mastax) in the throat. There is a large stomach, and the vent is on the dorsal surface of the body. The nervous system consists of a ganglion above the throat, from which nerves run to all parts of the body. Eyes are not infrequently present, as well as organs apparently tactile in character. Two tubes with funnel-shaped openings into

the body-cavity serve as excretory organs. Organs of circulation and respiration are lacking. The sexes are separate and the males are usually smaller than the females, and are further characterized by the lack of intestine and vent. Most of the rotifers live in fresh water, and are noticeable because they are able to withstand prolonged drying, and upon the return of moisture again begin their active life. See HUDSON and GOSSE, *Rotifera* (London, 1886), and papers by PLATE, SALENSKY, LEYDIG, JENNINGS (*Report Michigan Fish Commis.*, 1893), etc. J. S. KINGSLEY.

Rot'teck, KARL WENZESLAUS RODECKER, von: historian; b. at Freiburg, Baden, July 18, 1775; studied law, afterward history; was appointed Professor of History at the university of his native city; took part with much energy, though with moderation, in the opposition against the political reaction which set in after 1815; was elected to the upper chamber of Baden in 1819, to the lower chamber in 1831, and was one of the foremost men of the liberal opposition. This brought upon him the hostility of the Government, and in 1832 he was deprived of his professorship. D. at Freiburg, Nov. 26, 1840. By his *Allgemeine Geschichte* 9 vols., 1813-27 and the minor compendium of it, *Allgemeine Weltgeschichte* (4 vols., 1830-34), he exercised a great and beneficial influence on the German middle classes. Both books were often reprinted, and have been translated into several European languages. F. M. COLBY.

Rottenstone: a fine earth or softened aluminous stone, much employed in polishing glass and metals. True rottenstone comes from Wales and Bakewell, Derbyshire. The name is also extended so as to include tripoli and the infusorial earths. See INFUSORIAL EARTH.

Rotterdam: the second commercial town in Holland; on the right bank of the Maas, about 14 miles from the North Sea and 36 miles S. W. of Amsterdam (see map of Holland and Belgium, ref. 6-E). It occupies a site in the form of a nearly equilateral triangle, the base of which is the Maas and the vertex the Delft Gate. The city is intersected by numerous canals (*graachten* or *havens*), and is traversed by the Rotte, a small stream, at the junction of which with the Maas there is a large dike or dam; whence the name Rotterdam. The numerous vessels lying in the canals and harbors, which are deep enough to accommodate those of heavy tonnage and admit of their discharging their cargoes in the very heart of the city, always present a busy and picturesque scene. Along the river, which opposite the town is 30 to 40 feet deep, is a fine quay 1½ miles long, called the *Boompjes* (Little Trees), from a line of elms planted in 1615, now grown to a large size. Here is the birthplace of ERASMUS (q. v.), to whom a bronze statue is erected. Rotterdam is the entrepôt of a large cattle-trade with England, and the point of departure of numerous lines of steamships, and, besides being the seat of an extensive commerce with the East Indian possessions of Holland and with Europe and America, has important manufactures. The railway route between Belgium and Holland, connecting the cities of Brussels, Antwerp, Rotterdam, The Hague, and Amsterdam, crosses the Holland Deep (*Hollandsche Diep*) by the great bridge at Moerdijk. Pop. (1894) 228,597.

Revised by M. W. HARRINGTON.

Rottl: a volcanic island of the Malay Archipelago; S. W. of Timor; in lat. 10° 40' S. and lon. 123° E.; is 36 miles long, 11 miles broad, hilly, and produces rice, millet, and maize, ebony and other valuable woods, sheep, buffaloes, horses, swine, and fowls, edible birds' nests, and wax. Pop. 64,000. M. W. H.

Roubaix, roo'bā': a large manufacturing town of France, department of Nord; 6 miles N. E. of Lille (see map of France, ref. 1-F). It has extensive manufactures of woolen and cotton fabrics, furniture cloth, carpets, and twists, large dye-works and tanneries, and carries on a very active trade. Pop. (1891) 114,917.

Roubillac, roo'bē'li-āk', LOUIS FRANÇOIS: sculptor; b. at Lyons, France, about 1695; became a distinguished sculptor; settled in England probably during the reign of George I., and executed many important works of art, among which were the celebrated monuments of Mrs. Nightingale, that of John, Duke of Argyll, and the statue of Handel, all in Westminster Abbey, the statue of Shakspeare in the British Museum, and of Sir Isaac Newton at Cambridge. D. in London, Jan. 11, 1762.

Rouble, or **Ruble** [from Russ. *rubl'*, ruble]: the principal Russian money of account. The rouble is equal to 100

louis-d'or. The nominal value of gold is worth 772 centimes (7.72 money), while the current paper rouble has two different values, viz. the official value in gold as determined by the government for each year and the exchange-value. These are usually about 15 francs.

Roudakoff, roo'dak', PRINCE: title; soldier; b. at Tiflis, in the department of Grozny, France, Aug. 9, 1806; entered the Academy of Staff in 1824 and was made a lieutenant in 1826, a captain in 1831, and chief of squadron in 1838. In 1839 he was charged with the geodetic surveys necessary for the determination of the meridian of Hodra, and during observed that the level of Sahara lay considerably lower than that of the Mediterranean; he conceived the idea of transforming the desert into an inland sea by piercing the chains which separate it from the Mediterranean. In 1844 he began a new series of explorations at the expense of the government, and after his return, in 1850, he laid before the government a scheme which was very warmly supported by Wladimir, D. de Orléans, Jan. 10, 1851, he published *Les Mers intérieures en Algérie* (1874) and *Recherches sur l'histoire des Chells en Algérie* (1876).

Rouen, roo'zh, town: *Rothomagus*, city of France, the ancient capital of Normandy; at present the capital of the department of Seine-Inférieure; on the right bank of the Seine, by miles N. W. of Paris, and connected with its suburbs, 28.5 miles, on the opposite bank, by three bridges (see map of France, vol. 2-3). The quays along the river and the buildings occupying the site of the former ramparts are new and beautiful; the central part of the city is old and more interesting than beautiful. Of the many remarkable public buildings the most notable are the cathedral, a Gothic structure of great beauty, 434 feet long, 161 broad, 80 high at the main, with a tower and spire over the crossing of the nave, and the transept rising 120 feet, and two elegant towers flanking the front, built by Philip Augustus (1200-20), and containing, besides a number of other interesting monuments, the tomb of Richard Cœur de Lion; the Church of St. Ouen, built in the fourteenth century, and considered one of the finest specimens of Gothic architecture; the Palais de Justice, of the fifteenth century, etc. In the Place de la Famille stands a statue of the Maréchal d'Orléans, who was born here in 1811. Monuments have also been raised in honor of Corneille and Ronsard, who were born here. The city has a public library of 110,000 volumes, a very valuable collection of pictures, an excellent botanical garden, a theological seminary, an academy of science and art, and numerous other educational and benevolent institutions; and it is one of the most important manufacturing centers of France. The principal manufactured articles are cotton and cotton goods, metal silk and wooden fabrics, linens, blankets, and leathers, chemicals, paper, etc. Its commerce is very extensive. The river forms an excellent harbor, and vessels of 400 to 600 tons can enter it. Pop. (1891) 113,533.

Revised by M. W. HARRINGTON.

Rouge Ware, see POTTERY AND PORCELAIN.

Rouge, roozh' (= *Pr.*, *Rouge*, red): a powder used for adding an artificial bloom to the complexion. Rouge is finely powdered red, colored with safflower by an elaborate process. It is harmless to the skin. Much of the so-called rouge is colored with vermilion and other pigments. These are considered injurious.

Rouge, French name of the SUMRAT (q. v.).

Rouge, roo'zh, OLIVIER CHARLES CAMILLE RICHARD, VI-comte de, Orientalist; b. in Paris, Apr. 11, 1811. After studying law, he devoted himself to Oriental studies, particularly to Hebrew, Arabic, and Coptic. Finally he confined himself more exclusively to the study of Egyptology. Having obtained celebrity in this line through his *Essai sur les Connaissances de M. le Chevalier de Rouen*, and through his contributions to the *Revue archéologique*, in 1849 he was made keeper of Egyptian antiquities in the Louvre. In 1851 he published a *Mémoire sur l'inscription de Louphou d'Assouan*, which Lepsius declared to be the only work unpublished which could lay claim to be a philological master of a hieroglyphic text. In fact he was the first to attempt the translation of long Egyptian texts such as his *Chrestomathie des textes égyptiens* (1852, from the papers of Lepsius), and he was the founder of the French school of scientific investigation. He was chosen member of the French Academy in 1872, and Professor of Egyptology in the Collège de France in 1880. In 1885 he published a *Notice sommaire des monuments égyptiens du Louvre*, and in 1886-89

an *Étude sur une stèle égyptienne de la Bibliothèque Impériale*. He made an Egyptian tour in 1893, whose results were published by his son in *Inscriptions hiéroglyphiques recueillies en Égypte pendant un voyage scientifique* (Paris, 1897-98, 4 vols.). His most important historical work was his *Recherches sur les monuments qu'on peut attribuer aux six premiers dynasties de Memphes* (Paris, 1860), and his great service to grammatical investigation was rendered in his *Chrestomathie égyptienne: introduction d'un abrégé grammatical* (4 vols., Paris, 1867-75), in which he remodeled the whole subject. Among his works upon Egyptian religion and mythology were the following: *Recherches d'une inscription égyptienne, provenant des archives égyptiennes et conservée au génie de la ville de Paris* (Paris, 1853); *Études sur le Rituel Funéraire des anciens Égyptiens* (Paris, 1860); *Conférence sur la religion des anciens Égyptiens et sur le monothéisme primitif* (Paris, 1860). He held in a monothéisme conception of the supreme solar deity of Egypt, explaining polytheism by the doctrine of emanation. He also held that the grouping of local deities in triads was an attempt to signify the passage of conception from the super-sensuous to the sensuous, and from the invisible to the visible. In these views he has been followed in the main by Piaget and Brugsch. He is also credited with the discovery of the Egyptian doctrine of immortality. In his *Mémoires sur l'Égypte égyptienne de l'Égypte pharaonique* (published after his death, from an imperfect draft, in 1874) he endeavored to trace our modern alphabet through the Greek and Phoenician back to an Egyptian prototype. He died Dec. 31, 1879, at Bois de Boulogne, in the department of Seine, CHARLES R. GILBERT.

Rouge-et-Noir, roozh'-noir' [*Fr.*, red and black], also called **Trente-et-Un** (thirty-one), or **Trente-et-Quarante** (thirty and forty): a game of chance played with six packs of cards on a table, each end of which is divided into nine squares known as *range*, *win*, *double*, and *reverse*. The players make even bets with the bank by placing the sums risked on these squares. The *tailleur* (dealer or banker) deals first for *win*, and places the cards in a row until the number of pips amounts to more than thirty, the face cards counting 10 each. He then deals for *range* in the same manner, and that row whose value is nearest to 31 wins. If the first card dealt is of the color whose row wins, *double* wins; if it be of the color of the losing row, *reverse* wins. If the value of the two rows is equal, it is a *refait*, a new dealing commences, and the players neither win nor lose unless the value of each row is 31; in that case the players lose half the stakes. Were it not for this provision as regards the *refait* of 31 (which occurs once in about sixty-four times), the chances of the players and the bank would be equal. In 1789 this game and roulette were invented in Paris, and superseded faro and biribi, but both were forbidden by law in 1838. In 1878 they were also forbidden in Germany, but they are still much played and very popular at Moscow.

Rouget, roo'zh', GEORGES; painter; b. in Paris in 1781; studied painting in the Academy of Art and in the studio of David, in the execution of whose pictures he often assisted; began to exhibit in 1812; achieved great success both by his portraits and historical pictures. D. Apr. 9, 1869. The best known of his works are the *Murings of Napoleon and Marie Louise* (1838, at Versailles); the *Death of Napoleon* (1846); and the portraits of Napoleon, Marshal Soult, Louis XVIII., and Charles X.

Rouget de Lisle, -le-lee', CLAUDE JOSEPH: author of words and music of the French national song, the *Marseillaise* (q. v.); b. at Lons-le-Saulnier, May 10, 1760; entered the army, and was an officer of engineers at Strasbourg when he composed the *Marseillaise* in the night of Apr. 26, 1792; served afterward in La Vendée, retired to civil life, and was given a pension by Louis Philippe in 1830. D. June 27, 1836. He wrote other poems, stories, libretti for operas, etc., but nothing of merit. A. G. C.

Rouher, roo'zh', EUGÈNE: minister of Napoleon III.; b. at Riom, France, Nov. 30, 1814; was admitted to the bar in 1838, elected to the Constituent Assembly in 1848, and to the Legislative Assembly in 1849, in which latter year he was made Minister of Justice by Louis Napoleon. In July, 1851, he resigned, but was reappointed Dec. 2, 1851, the day of the coup d'état. Upon the collection of the Orleans property (Jan. 22, 1852) he again resigned, but a few days later was made vice-president of the council of state; in Feb., 1855, was appointed Minister of Agriculture, Commerce,

and Public Works, among the important acts of his administration being the negotiation, with Cobden, of the commercial treaty of 1860, when the grand cross of the Legion of Honor was bestowed upon him. He was raised to the rank of senator in 1856, and in 1863 succeeded M. Billault as Minister of State, which position he resigned on the occasion of the celebrated letter of the emperor's of Jan. 19, 1867, announcing a more liberal policy, but was immediately reinstated, and the additional portfolio of Minister of Finance was confided to his charge. Following the election of May, 1869, the ministry resigned July 13, and Rouher was nominated president of the senate a week later. During the Franco-German war he was prominent, but on the downfall of the empire fled to England. Returning to France, he was arrested and held for a brief time. He became a member of the Assembly, where he took the lead of the Bonapartist party. D. in Paris, Feb. 3, 1884. F. M. COLBY.

Roulers, *rōō'lā'*: town of Belgium, province of West Flanders; on an affluent of the Lys, 13 miles by rail N. W. of Courtrai (see map of Holland and Belgium, ref. 10-B). It has large manufactures of linen and lace, and trade in flax, which is largely grown in the vicinity. Pop. (1891) 20,339.

Roulette, *rōō'let'* [= Fr., dimin. of O. Fr. *roule*, wheel < Lat. *ro'tula*, dimin. of *ro'ta*, wheel]: a game of chance played on a table in whose center is a cavity, the sides of which are firm and divided at equal distances into thirty-eight compartments painted half black, half red, and designated by the first thirty-six numbers, besides a zero and a double zero. The bottom of the cavity is movable by the aid of a handle in the form of a cross. When the banker puts the bottom in motion he throws down in the cavity a small ivory ball, and when the movement stops the ball drops into one of the painted compartments. Each end of the table is divided into spaces on which the players place the stakes they wish to risk. Each number has one, and a player betting on the winning number receives thirty-six times his stake. There are devices also by which a player may bet on two numbers, with odds of 1 to 17; three numbers, with odds of 1 to 11; or twelve numbers, with odds of 1 to 2. Finally, there are six spaces, with even odds, on which the player bets respectively that the winning number will be (1) odd, (2) even, (3) one in a red compartment, (4) in a black one, (5) less than 19, and (6) more than 18. The advantage of the bank in the first bets described is evidently as 38 to 36. For the last six methods zero counts as odd, red, and less than 19, and double zero as even, black, and more than 18; but if a player wins on either of these compartments he loses half his stake instead of receiving it double. See ROUGE-ET-NOIR.

Roum: See ROUMELIA.

Rouma'nia [from Lat. *Roma'nua*, Roman]: a kingdom of Europe, comprising the former principalities of Moldavia and Wallachia, together with the Dobrudja, a territory E. of the Danube, ceded by the Ottoman empire at the Congress of Berlin (1878). It is situated between 43° 38' and 48° 20' N. lat. and 22° 20' and 30° 15' E. lon. (see map of Turkey); bounded N. by Austria-Hungary and Russia, E. by the Pruth, which separates it from Russia, and by the Black Sea, S. by Bulgaria and the Danube, W. by the Danube, which separates it from Bulgaria and Servia, and by Austria-Hungary. Area, 48,307 sq. miles.

Roumania is a crescent-shaped territory, rising gradually from the Danube and Pruth to the inland frontier, the crest of the Carpathian Mountains, the loftiest of whose peaks, the Ciacleul or Pion, attains a height of 8,920 feet. It is drained entirely by affluents of the Danube. The principal rivers are the Aluta or Olto, 220 miles long, which rises in Transylvania, cuts through the Carpathians, and empties at Islah; the Sereth, 215 miles long, which rises in Bucovina and flows by Roman to Galatz; the Dumbovitz, on which Bucharest, the capital, is situated; and the Pruth, 247 miles long. The Danube is navigable from the Austrian-Hungarian frontier to the Black Sea for vessels of several hundred tons, and hence is a great commercial artery. The other rivers, save the Pruth, are not available for transport trade. Both salt and fresh water lakes abound in the interior, and the coast is skirted by brackish lagoons. In the Danube are over 300 islands belonging to Roumania.

The territory naturally divides into three regions: the mountainous, where are the forests and mines; the hilly, devoted to vineyards and pasturage; and the lowland or rich alluvial tracts, occupied by grain-fields, along the lower Danube and the Pruth. Sixty-eight per cent. of the total

area is productive, 29 per cent. being under cultivation, 1 per cent. for pasturage, and 17 per cent. forest. The residue is waste. The upland plain between mountains and low land is of Quaternary formation; the foot-hills of the Carpathians are of Tertiary formation, containing Pliocene and Miocene deposits, while the mountain summits represent Tertiary, Secondary, Primary, and Metamorphic or Azoic rocks. The birds and mammals of similar climate, large and small, abound in the forests, and the rivers and lakes teem with every variety of fish found in Europe. The forests consist mainly of pine, oak, fir, beech, box, birch, poplar, and plane. The apple, pear, plum, and cherry are extensively cultivated, as also all the cereals and garden vegetables known to Europe. The vines are excellent. The climate varies according to situation and elevation; extremes of temperature, 98° F. and -19°. There are three distinct seasons: winter passes almost without transition into summer, just as autumn, the agreeable season lasting through November, suddenly becomes winter, when all the rivers and even the Danube are frozen over. The soil is exceedingly fertile, not exhausted by over-cultivation, and would be most productive but for the scorching and long-continued droughts of summer. The chief agricultural products are maize (average yield, 32,000,000 bush.), wheat (average yield, 30,000,000 bush.), rye, barley, oats, millet, flax, hemp, and tobacco. Various minerals are found in the valley of the Aluta; millstones, asbestos, and gypsum abundant; fuller's earth and hydraulic lime are common; carbonate and sulphate of sodium, sulphate of aluminium, and magnesia and native sulphur occur in certain localities. Gold, iron, copper and lead ores, as well as cobalt and arsenic, exist. Salt-works and petroleum-wells especially yield valuable returns. Live stock is a main source of wealth. In 1890 there were 594,962 horses, 926,123 swine, 2,520,380 cattle, and 5,212,380 sheep and goats.

The decimal system for money, weights, and measures was introduced in 1876. The unit of value is the lei (plu. lei) or franc. Gold is scarce, and silver the common medium of exchange. In the financial year 1891-92 the state received 180,147,096 lei and expended 168,404,894. Direct and indirect taxes furnished 80,120,000 lei; state monopolies, 45,700,000 lei; state lands, 28,453,000. The chief expenses were interest on public debt, 68,135,293 lei; war department, 40,424,072; financial department, 23,869,645; education and worship, 19,918,421. The public debt on Apr. 1, 1893, was 1,032,519,125 lei, an enormous amount for so poor a country, being nearly 200 lei, or \$40, for each inhabitant. In 1892 the imports, chiefly from Germany, Austria-Hungary and Great Britain, amounted to 380,747,296 lei; the exports, chiefly to Great Britain, Belgium, Germany, and Austria-Hungary, 285,384,057. Grain formed nearly five-sixths of the entire exports, or 251,900,000 lei; other exports were fruits and vegetables, animals and animal products, woven fabrics, lumber. Nearly half the imports were woven goods, amounting to 155,900,000 lei; other imports were metals and objects in metal, fruits and vegetables, and combustible materials. Foreign commerce is almost exclusively in the hands of foreigners. Eleven thousand and sixty-five steamers and 14,589 sailing ships, of 5,727,517 tons, entered Roumanian ports in 1892. The Roumanian merchant marine consisted in 1892 of only 30 steamers, of 1,899 tons, and 235 other vessels, of 48,801 tons. Railways, posts, and telegraphs all belong to the state. In 1893 there were 1,581 miles of completed railways, and 343 in construction. Postal communication was formerly conducted by Russian and Austrian commercial agencies, but in 1869 a regular postal service was organized. In 1892 15,645,630 letters, 4,787,565 postal-cards, and 7,960,771 newspapers and parcels passed through the mails; 1,091,819 domestic telegrams and 446,775 foreign telegrams were sent. Receipts for posts and telegraphs, 6,149,043 lei; expenses, 6,022,011 lei. Number of post-offices, 352; of telegraph stations, 411. Length of telegraph lines, 2,503 miles, generally with two wires.

The government is an hereditary constitutional monarchy. The constitution, one of the most liberal in Europe, guarantees to every Roumanian equality under the law, and liberty of conscience, with freedom of the press and right of assembly. Legislation is vested in a senate of 120 members and a house of 183 deputies. The person of the king is inviolable, but his seven ministers, of the Interior, Finance, Foreign Affairs, War, Worship and Public Instruction, Commerce and Public Works, and Justice, are responsible to the legislative bodies. The kingdom is administratively divided into the four provinces of Little and Great Wallachia with 17 districts, Moldavia with 13 districts, and

divided into 42 districts. These are further divided into 397 departments, subdivided into 2,372 communes comprising over 35,000 villages and hamlets. Military service for men begins at sixteen years of age, and two years in the service is obligatory on every able-bodied male citizen on reaching the age of 21. From 20 to 25 he belongs to the militia, and from 25 to 30 to the landsturm; the latter takes no field duty in national emergency. There are 4 army-corps, corresponding to regiments of infantry, 4 regiments of cavalry, 12 regiments of artillery, 2 regiments of heavy artillery, and 2 regiments of engineers, with an effective force in time of peace of 2,500 officers, 364 employees, 46,000 men, 200 horses, and 15,000 horses. In war 250,000 men can be put under arms. The fleet in 1899 consisted of 21 vessels, of which 15 were steamships of various kinds, carrying 15,000 tons, and of 6,175 tons burthen. In 1899 there were 25 ships and yachts, 25 merchantmen, and 1,400 sailors. Five torpedo boats were added in 1904.

The following figures from the fiscal census of 1890 are for Moldavia (east): Population, 5,035,342 (Romanians, 1,861,642; Germans, 401,000; Armenians, 281,000; Slavs, 26,300; Bulgarians, 20,000; Hungarians, 20,000; Armenians, 20,000; Greeks, 5,000; French, 2,000; English, 1,000; Italian, 800; other nationalities, 2,700). As to religious confession, about 4,300,000 belong to the national or Greek orthodox Church, 400,000 are Catholics, 114,200 Roman Catholics, 13,800 Protestants, and less than 2,000 Muslims. The estimated population in 1905 was 5,800,000. A census will be taken in 1925. Population of principal cities in 1900: Bucharest, the capital, 124,621, now probably 150,000; Iasi, 72,859, now perhaps 85,000; Galatz, 50,143; Braila, 27,543; Ploiesti, 24,474; Herculani, 21,024; Calarasi, 20,051; Botosani, 20,000; Piatra, 20,000; Iasi, 17,407; Tulcea, 17,307; Vaslui, 17,039; Turmezevici, 14,699; Bacau, 12,300; Radauti, 12,300; Giurgiu, 12,300; Alexandria, 12,300; Targu, 12,300. Though increasing attention is paid to education, it is still in a backward state and not generally diffused. In 1901 there were 9,500 primary schools with 220,000 pupils, 50 high schools with 10,227 pupils, and 8 normal schools with 770 pupils. The two admirable universities of Jassy and Jassy, with faculties in law, philosophy, science and medicine, have 100 professors and 300 students. The wealthier Romanians are educated abroad, especially at France. The Romanian Church is absolutely intolerant, though acknowledging the spiritual superiority of the Patriarch of Constantinople. The country is divided into 4 dioceses; the Archbishop of Bucharest is Primate of Romania, and next to him is the Metropolitan of Jassy, who is called Archbishop of Moldavia. The monasteries, numerous during the Ottoman domination, when they served as refuges from oppression, are rapidly decreasing. The Moldavians and Wallachians, while not possessing political rights, enjoy full religious privileges.

The kingdom of Romania does not include more than half of the Romanians or of the territory they inhabit, independent Romanians, Austro-Hungarian Romania (the eastern part of Hungary, Transylvania, and Bukovina), and Russian Romania (Bessarabia) territorially correspond with modern Rumania, which was subjugated by Trajan (107) and, once almost depopulated, colonized from Rome. It became a most prosperous province (*Agera Feixa*), but was overrun in the twelfth (1275), and a partial emigration ensued. It suffered every possible vicissitude of invasion and dismemberment, till in the thirteenth century the two principalities of Wallachia (1311) and Moldavia (1296) emerged from the general confusion. They long and fiercely resisted the Ottomans, but were forced to become vassal provinces. From 1659 to 1840 their hospodars, or governors, were chosen by the sultan. These rulers were usually Phanariote Greeks, but in 1821 natives began to be appointed. Constant interference of Russia in their behalf and remembrance how Constantinople secured Moldavia and Wallachia privileges which they could not otherwise have enjoyed. During the Crimean war they were occupied by Austrian troops. In 1859 a European convention for their reorganization was signed at Paris. In 1859 both Moldavia and Wallachia elected Prince Cuza Ispaslar, and declared themselves united in 1861. The despotic Cuza was compelled to abdicate in 1866, and Prince Charles of Hohenzollern called to the throne. A constitution was speedily promulgated. The Romanians distinguished themselves in the Russo-Turkish war (1877-78), and largely contributed to the capture of Plevna (1877, p. 1). Their independence was recognized by the Congress of Berlin (1878), and the country proclaimed

itself a kingdom Mar. 20, 1881. King Charles having no children, his nephew, Prince Ferdinand, was declared heir presumptive Mar. 18, 1882. Since achieving independence, Romania has made constant and rapid progress. Her people are frugal, temperate, industrious, and patriotic. Their aspiration to unite all the Romanians under one scepter is itself a source of danger, and they occupy a geographical situation of great difficulty.

See Quilist, *Les Roumains* (Paris, 1887); White, *Report on the Kingdom of Roumania in Reports of H. M. A. Diplomatic and Consular Officers*, part vi (1888); Urdoin, *Les Roumains Roumains* (Paris, 1890); Vasilian, *Les Roumains* (1900); Mrs. Walker, *Untroubled Paths in Roumania* (London, 1899); Xenopol, *Introducere Roumains* (Yassy, 1888-1891); Samuelson, *Roumanian Past and Present* (London, 1890); Laveleye, *La Peninsule des Balkans* (Paris, 1890; English translation, London, 1897).

Dr. A. G. A. G. A. G.

Romanian Language: the national language of Romania. It is not limited exactly by the political boundaries; in the south and southeast the language limit is almost identical with the Danube, the Dobruja being not linguistically Romanian except along that river; in the east it occupies most of Bessarabia in Russia, in the north much of Bukovina, and it covers most of Northern and Western Transylvania and the adjacent parts of Hungary, as well as a small region in the northwestern part of Serbia S. of the Danube. In this territory dialect differences are slight, but there are numerous variations in European Turkey and Northern Greece, especially in Macedonia, Thessaly, and Albania, with dialects generally grouped together under the name Macedo-Romanian, and in Icaria are some small remains of a dialect called Iatro-Romanian. Since the ancient Dacia, which corresponds roughly to the present territory where Romanian is spoken N. of the Danube, did not become a Roman province until 107 A. D., and the Roman occupation ended under Aurelian (270-275), it is probable that the present language of Romania is the descendant of the vulgar Latin of the regions S. of the Danube, brought in by later immigrants in the Middle Ages, and combined with some remains of the vulgar Latin of such older inhabitants of Dacia as had become thoroughly Romanized at the time of the abandonment of the province, and had succeeded in preserving their form of Latin, perhaps taking refuge in part in the mountains of Transylvania. It is probable that the eastern part of Romania, the modern Moldavia, was never really Romanized. The closest relations of Romanian are with Italian. The number of those whose mother tongue it is probably considerably exceeds 3,000,000, about 3,000,000 of these being under Austro-Hungarian rule.

The recognized sounds of Romanian, not including dialects, are the seven vowels *i, e* (close and open *e* and *a* are not distinguished), *o, a, u*, and two peculiar vowels, one *î* (also written *ä*, and sometimes *ä* or even *ö*), pronounced like Polish *y* (somewhat like *i* in *pit*), the other *ä* (also in some words written *ö*), pronounced somewhat like English *u* in *cut* or *coot*; and the twenty consonants *p, b, f, v, t, d* (not always counted, written *o, u*), *m, n, l, r* (trilled with the tip of the tongue), *h, s, z* (written *s, z*, and sometimes *ş, ş*), two other sibilants, one like English *sh* in *shine* (written *ş*), the other like English *z* in *azure* (written *z*), *g* (written commonly *g*, but sometimes not expressed at all in writing), *k* (written commonly *c* or, before *e* or *i*, *ch*, with a slight difference in sound), *g* (as in English *go* or *give*, written *g* or, before *e* or *i*, *gh*), the sound of German *ch* in *ach* (written *h*), and that of English *ng* in *sing*, *song* (written *ng*, and occurring only before *ä* or *g* sounds). Besides these are to be noted the common consonant groups *ts* (written *f*), the sounds of English *ch* in *chin* (written *c* before *e* or *i*, *ce* or *ci* in other cases), and English *j* in *just* (written *g* before *e* or *i*, *ge* or *gi* in other cases). The two vowels *î* and *ä* are also written often with the sign *~* (*î, ä*) to indicate that they are not fully sounded, but are very short, and in some cases indeed they are entirely silent. Instead of the group *ş* is often written *sc* for etymological reasons. The language was formerly written with the Cyrillic alphabet borrowed from Slavic use, and this alphabet was long retained, gradually giving way in the nineteenth century to the Latin alphabet, which did not entirely replace it till after 1860. Romanian spelling has suffered from an excessive influence of Latin etymology, which led to the use of silent letters (especially *o*) and several inconsistencies, and it is still not well settled, though the phonetic principle has gained ground and seems likely to prevail.

Exposed as the language has been to very different conditions from those under which the other Romance languages have developed, it is not strange that it shows some peculiar features. It has preserved some Latin words lost in the others, and has lost some which they have preserved. Its vocabulary has been much affected by foreign languages, which have also furnished it some suffixes, and have even perhaps somewhat affected its structure. Very many words are of Slavic origin, and it has also words from mediæval or modern Greek, from Turkish, Hungarian, and Albanian, while the origin of a number is unknown. A remarkable feature of the language is its post-positive article: (*un*) *socru* (a) father-in-law, *socrul*, the father-in-law; *loc*, place, *locul*, the place; *casă*, house, *casa* (from *casă* + *a*), the house. A similar use appears in Albanian and in Bulgarian. In some matters of phonology and inflexion, particularly its genitive and dative case (one form for both uses) in articles, feminine nouns, and adjectives, Roumanian is nearer to the Latin than is any other language of the family. (See ROMANCE LANGUAGES.) There are so-called neuter nouns, which are masculine in the singular and feminine in the plural; this peculiarity is due to old Latin neuter nouns. The simple parts of verbs, or those formed without auxiliaries, are the present, imperfect, preterite, and pluperfect indicative, the present subjunctive and imperative, the present infinitive, the gerund, and the past participle; this last can also be used with prepositions so as to correspond in sense to the Latin supines. The auxiliaries used for other verb forms are not always the same as those common in other Romance languages.

Apart from a few scattered words found, for example, in Slavic documents, the earliest specimens of the language preserved to us date from near the end of the fifteenth century. The first grammar was that of Klein, *Elementa lingue dacoromanæ sive valachicæ* (Vienna, 1780). Among modern works should be mentioned particularly Gröber's *Grundriss der romanischen Philologie* (i., 1888), where full references may be found; here are added some other works, in part more recent, as Tiktin, *Gramatica română* (i., 1892; ii., 1894), and *Manual de ortografia română* (1889); *Indreptariu pentru ortografia română* (contains orthographical rules for schools in Bukovina, Vienna, 1893); G. Weigand, *Die Sprache der Olympo-Walachen* (1888), *Vlachio-Meglen* (1892), and *Die Aromunen*, ii., 1894 (planned for 5 vols.). A short grammar in English is Torceanu, *A Simplified Grammar of the Roumanian Language* (1883). Dictionaries: Ion Costinescu, *Vocabolaru român-francesc* (1870); L. Şinǎeanu, *Dictionar român-german* (1889); F. Damé, *Nouveau dictionnaire roumain-français* (i., A-E, 1893; ii., F-L, 1894); Hasdeu, *Etymologicum magnum Romanicæ* (in the letter B in 1895). The dictionary of the Roumanian Academy (see LAURIANU) is not to be recommended, and Cihac's *Dictionnaire d'étymologie daco-romane* (i. 1870; ii. 1879) contains many errors. Gaster's *Chrestomatie română* (2 vols., 1883) has texts with a glossary, and an introduction on the literature and the grammar. Some periodicals published in Roumania also deserve mention, as *Columna lui Traian*, *Convorbiri literare*, *Revista pentru istorie, arheologie şi filologie*, etc. See also ROMANIAN LITERATURE and the references under ROMANCE LANGUAGES. E. S. SHELTON.

Roumanian Literature: the literature of the people speaking the Roumanian or Wallachian language. It begins, so far as documents are preserved, about the end of the fifteenth century or the beginning of the sixteenth, with translations from the Bible, followed by other religious writings, such as catechisms, prayers, legends, etc., by legal documents, public and private, and by chronicles, of which there are many in the seventeenth and eighteenth centuries. The oldest texts published thus far are a psalter (*Psaltirea Scheiană*, i., 1889), which the editor Bianu dates in 1482 or 1485, and the Voroneţ manuscript (*Codicele Voroneţean*, edited by Sbiera, 1885), which contains a part of the Acts and of some of the Epistles, and belongs probably to about the same time. Hasdeu's *Limba română vorbită între 1550-1600*, i., 1878, ii., 1879 (commonly referred to as *Cuvinte den belrûni* or *Cuvinte din bătrâni*), contains texts of the second half of the sixteenth century, with linguistic and literary discussions. The Roumanian Academy has published (1881), among other texts, the psalter printed in 1577 by Coresi in Transylvania (Coresi was probably of Greek descent); this was, it seems, printed from the same translation as that used in the psalter mentioned above. All these early texts have rather linguis-

tic than literary interest; but it is to be noticed that some of the religious productions were results of the Reformation, showing themselves in Transylvania through the Saxons. Of chronicles may be mentioned those of Ureche (see F. Picot's edition, *Chronique de Moldavie*, 1878-83) and Miron Costin (lived about 1628-92; two volumes of an edition by V. A. Urechiă were published, 1886-88). M. Cogălniceanu has published *Cronicele României* (1852; 2d ed. 3 vols., 1872-74).

It was not until the nineteenth century that Roumanian literature began to develop in sympathy with the literatures of the great nations of Europe. A powerful stimulus to the growth of a truly national literature has been the national spirit, developing after the French Revolution and after the changed political aspect, as Wallachia and Moldavia attained practical independence of Turkey and later became united, and finally the independent kingdom of Roumania was established. The new era began in the eighteenth century under the leadership of Roumanians in Transylvania, where they were aided by Catholic schools, from which some went to Rome to study. Klein's *Grammar* (see ROMANIAN LANGUAGE) was followed by some other grammatical writings. Klein wrote also many theological and historical works. Naturally the connection with the Romans and their language was emphasized during this period of awakening, as indeed it has been since. Other noteworthy writers are Petru Maior (about 1753-1821), whose historical work marks the beginning of a more critical period, and who was one of the authors of the lexicon published at Buda in 1825; Şincai (about 1754-1826), whose most important work is his *Cronica Românilor*, a history of all the Roumanians from the year 86 to 1741; Ienache-Văcărescu (about 1740-99), ban of Wallachia, remarkable for his grammatical work on the language, and author, among other things, of some verses. George Lazăr (1779-1823) came into Wallachia in 1816, and was allowed after a time to open a Roumanian school in Bucharest (previously the schools had been Greek); he may be considered the founder of the national schools in Wallachia. Veniamin Costache (1768-1846) and George Asachi (1788-1871) were similarly active even earlier in Moldavia; the many works of the latter (lyric verse, dramatic and historical writings) belong largely to the next period. Costache Conache (1777-1849) was distinguished for his learning, and was active in public affairs. His poems were not published until 1856 (2d ed. 1888). Budai Deleanu (1770-1830), among other things, wrote the heroi-comic *Țiganiada sau tabăra Țiganilor* (The Camp of the Gypsies).

The next period, beginning about 1830, is that in which the influence of Western Europe shows strongly, combined with a national feeling, which, however, still rests too much on pride of assumed Roman ancestry. The strongest influence is that of French, but an Italian influence shows itself in Eliade (see HÉLIADÉ), who, like Asachi in Moldavia, founded journals in Wallachia, and stirred up the youth of the country to an interest in education and literary pursuits. Since about 1860 comes the most modern period, in which the excessive admiration for French models is somewhat tempered by a wider knowledge of modern European culture, and which may be considered as introduced by T. Maiorescu's critical writings. (See MAIORESCU.) In this time are to be noticed the organization of the society Junimea (Youth) and the establishment of literary and critical periodicals, such as the *Convorbiri literare* (Literary Conversations; since 1867). Both Maiorescu and Eminescu (1850-89), the latter one of the foremost poets of modern Roumania, made themselves acquainted with German literature. Many journals and periodicals have been started in Roumania, from those of Eliade and Asachi on, for political, literary, or scientific purposes, which have had various degrees of merit and success; some of them are mentioned under ROMANIAN LANGUAGE. (See also HASDEU.) In these much of the work of modern writers first appears. Not least important are the popular songs, tales, etc., collected by Alecsandri, Ispirescu (1830-87), and others. Many of these have been translated into German, notably by the Queen of Roumania. See CARMEN SYLVA.

Only Alecsandri (or Alexandri; see ALECSANDRI) among Roumanian writers has made his name well known outside of Roumania for purely literary work; but several others are of some note in the country itself. (See ALECSANDRI, C. BOLINTINEANU, C. and I. NEGRUZZI, C. ROSETTI.) Verse has been written, among others, by G. Sion (b. 1822; has also written comedies), Şerbanescu (b. about 1830), and Vlăduţ,

to be imprisoned in a drawing-room, and in the spring of 1756 he removed to a little cottage on the skirts of the forest of Montmorency, put at his disposal by Madame d'Épinay. He soon quarreled with her and took a house at Montmorency. Thence he issued the novel, *La Nouvelle Héloïse* (1761), which, by the eloquence and authority lent to the voice of passion and the glow and fervor of a new and wonderful style, created intense enthusiasm and was read with feverish eagerness; the *Lettre sur les spectacles* (1758), condemning the theater for its moral influence; the *Contrat social* (1762), which contains the fullest statement of his political ideas, maintains radically the sovereignty of the people, and supplied the positive ideas of the Revolution; *Émile* (1762), which unfolds his fruitful views on education. This last work offended the authorities; the Sorbonne condemned it; the Parlement had it burned, and ordered Rousseau's arrest. He was warned and fled to Geneva, Neuchâtel, and finally to England (1765), where Hume gave him a refuge at Wootton. But his irritability, sensitiveness, and suspicion were sharpened by his experiences to an unhealthy degree; he fancied himself the object of a conspiracy, and fled back to France. He spent a year under a false name with the Prince of Conti and then fled from imagined pursuit to different parts of France. In 1770 he returned to Paris and resumed the copying of music for his support, still haunted by the idea of persecution. In 1777 he accepted a house on a friend's estate a few miles from Paris, and died there July 2, 1778, under circumstances that to some have suggested suicide. In 1794 his body was transported amid great popular enthusiasm to the Pantheon. The main work of the latter years of his life was his *Confessions*, one of the most remarkable works of the kind ever written, surprisingly free from reticence, and unsparing in the revelation of himself, but not always exact. It is hard to overestimate the influence of Rousseau upon his country and Europe. At the center of his ideas was his sincere belief in the goodness of nature and whatever is in accord with her. The primitive natural instincts and affections were sacred; the primitive natural state of society furnished criteria for the criticism and renewal of institutions. The sentimentalists date from him, and the view that to show that an act is natural is to prove that it is right. The standard editions of his *Œuvres* are by Musset-Pathay (23 vols., Paris, 1823-26), and by Auguis (25 vols., Paris, 1822). One must add L. Borscha, *Correspondance inédite de J. J. Rousseau* (Paris, 1858); Streckeisen-Moulton, *Œuvres et Correspondance inédites de J. J. Rousseau* (2 vols., Paris, 1861-65); H. de Rothschild, *Lettres inédites de J. J. Rousseau* (Paris, 1892). See H. Beaudoin, *La vie et les œuvres de J. J. Rousseau* (2 vols., Paris, 1871); Saint-Marc Girardin, *J. J. Rousseau, sa vie et ses œuvres* (2 vols., Paris, 1875); A. Chuquet, *J. J. Rousseau* (Paris, 1893); J. Morley, *J. J. Rousseau* (2 vols., London, 1873).

A. G. CANFIELD.

Rousseau, Lovell Harrison: soldier; b. in Lincoln co., Ky., Aug. 4, 1818; received little early education, but subsequently studied law at Louisville and at Bloomfield, Ind.; admitted to the bar in 1841; member of the Indiana Legislature 1844-45, and of the State Senate 1847. In the war with Mexico, as captain in the Second Indiana Volunteers, he served with gallantry at Buena Vista; returned to Louisville in 1849; became a successful criminal lawyer, and in 1860 was a member of the State Senate, where he boldly opposed the secession of Kentucky. On the outbreak of the civil war he raised the Third Kentucky Infantry, of which he became colonel Sept., 1861; appointed brigadier-general U. S. volunteers Oct. 1, 1861; was distinguished at the battle of Shiloh Apr. 7, 1862; in command of division and conspicuous for gallantry at Perryville, Ky., Oct. 8, 1862, for which he was made major-general of volunteers; participated in the battle of Murfreesboro, Dec. 31, 1862; commanded the district of Tennessee from Nov., 1863, till the close of the war. He resigned Nov. 30, 1865; member of Congress 1865, and in Mar., 1867, was appointed a brigadier-general in the regular army and breveted major-general. Assigned to command the department of Louisiana July 28, 1868, he died in New Orleans, Jan. 7, 1869. Revised by JAMES MERCUR.

Rousseau, Philippe: still-life and animal painter; b. in Paris, France, Feb. 22, 1816; pupil of Bertin and Baron Gros; third-class medal, Salon, 1845, first-class 1848; second-class, Paris Exposition, 1855; first-class, Paris Exposition, 1878; officer Legion of Honor, 1870. D. at Acquigny, Dec. 4, 1887. His pictures of still life are notable for excellent technical

qualities and strong sober color schemes. *Importunate* (1850) and *The Rat Retired from the World* (1885) are in the Luxembourg Gallery, Paris; and there are works in the museums at Chartres, Valenciennes, and Nantes. W. A. C.

Rousseau, Pierre Étienne Théodore: landscape-painter; b. in Paris, France, Apr. 15, 1812; first-class medal, Salon, 1849, Paris Exposition, 1855; medal of honor, Paris Exposition, 1867; Legion of Honor, 1852. D. at Barbizon, Dec. 22, 1867. He was the friend and fellow worker of Millet and Diaz, and worked with them at Barbizon on the borders of the Forest of Fontainebleau, finding in the forest and the surrounding country the subjects for his pictures. He was one of the greatest of the modern French painters of landscape, and his works are characterized by profound sentiment, extraordinary technical qualities, and great truth to nature. He represented detail in a marvelous fashion without sacrificing breadth or harmony of color. One of his finest works is *The Hoar Frost*, in the collection of W. T. Walters, Baltimore. The *Woods of Fontainebleau* (1885), a magnificent picture of sunset effect, and a number of other landscapes are in the Louvre. *Morning on the Oise*, a masterpiece of color-harmony and unity of effect, is in the collection of Henry Graves, Orange, N. J. W. A. C.

Roussel, ro'sē', Camille Félix Michel: historian; b. in Paris, France, Feb. 15, 1821; became in 1843 Professor of History at Grenoble, in 1845 at the Lycée Bonaparte, and was from 1864 to 1876 historiographer to the ministry of War. Among his works are *Histoire de Louvois* (4 vols., 1861-63); *Les Volontaires de 1791-94* (1870); *Histoire de la guerre de Crimée* (2 vols., 1877); and *Les Commencements d'une conquête: L'Algérie de 1830 à 1840* (2 vols., 1887). He became an academician in 1871. D. Oct. 19, 1892. A. G. C.

Routh, rowth, Martin Joseph, D. D.: educator and editor; b. at South Elmham, Suffolk, England, Sept. 18, 1755; graduated at Oxford 1774; became college librarian 1781, and in 1791 president of Magdalen College, which post he retained till his death at Oxford, Dec. 22, 1854. He is best known by his collection of the fragmentary writings of the Christian Fathers of the second and third centuries under the title *Reliquiæ Sacræ, sive Auctorum fere jam perditorum*, etc. (5 vols., 1814-18; new ed., 5 vols., 1846-48).

Rove-beetles: beetles belonging to the family *Staphylinidae*, in which the wing-covers are very short, leaving a large part of the abdomen uncovered. The beetle when irritated turns this abdomen about in such a way as to convey the impression that it is armed with a sting. The rove-beetles are small, frequently minute; they live under stones, in moss, on composite flowers, etc.

Roveredo, rō-vā-rā-dō: town of Austria; in the Tyrol; picturesquely situated on the Leno, near its junction with the Adige; 14 miles by rail S. of Trent (see map of Austria-Hungary, ref. 7-A). Napoleon Bonaparte here defeated the Austrians in 1796. It is the center of Tyrolean silk-manufacture and has a large transit trade. Pop. (1890) 9,030.

Rovigno, rō-veen'yō: town of Austria; in Istria, on a rocky promontory in the Adriatic; 40 miles S. by W. of Trieste (see map of Austria-Hungary, ref. 8-C). It has two harbors, ship-building yards, ropewalks, manufactures of sailcloth, tunny-fisheries, and an active trade in wine and oil. Pop. (1890) 9,662.

Rovigo, rō-vee'gō: town of Italy; province of Rovigo; lying between the Po and the Adige on the Adigetta, an emissary of the Adige; 38 miles S. W. of Venice (see map of Italy, ref. 3-D). It has an octagon-shaped church (1594), a cathedral (1696), a picture-gallery, and a town-hall with a library of 80,000 volumes. Mediæval Rovigo belonged sometimes to Venice, sometimes to the house of Este. Pop. 7,272.

Rovigo, Duke of: See SAVARY.

Roving: See COTTON MANUFACTURES.

Rowan, rō'an, Stephen (Lego): sailor; b. near Dublin, Ireland, Dec. 25, 1808; entered the U. S. navy as a midshipman Feb. 15, 1826; was distinguished for ability and courage on the west coast of Mexico during the war with that country, and during the civil war in the rivers of Virginia, the sounds of North Carolina, and at Charleston, S. C.; for his long, honorable, and gallant service received a vote of thanks from Congress; was made vice-admiral Aug. 15, 1870; became superintendent Naval Observatory, and was chairman of lighthouse board; retired Feb. 26, 1889. D. at Washington, D. C., Mar. 31, 1890. Revised by C. BELKNAP.

Rowan-tree: See MOUNTAIN-ASH.

The regatta of 1873 was held over the course at Saratoga, and eleven crews entered. Yale won. Columbia won the regatta of 1874 in 16:42½. In the following year the regatta was again held at Saratoga, and participated in by thirteen representative crews. Cornell won in 16:53, Harvard third, Yale fifth. In 1876 the Yale-Harvard races were again established for eight-oared shells with coxswains over a 4-mile straight-away course at Springfield on the Connecticut. Yale won by 21 sec. in 22:02. That year Yale was not present at the American College Regatta, but Harvard sent entries for all three events—University and Freshmen crews, also a single scull—each of which secured second place in their respective races, Cornell winning the three honors. Since 1876 the Yale-Harvard race has been an annual occurrence. Of the nineteen races rowed, including that of 1894, Yale has won twelve and Harvard seven. The best time has been made by Yale in 1888, being 20:10, which stands as the record for eight-oared shells over a 4-mile straight-away course. All but the first two of these latter races have been rowed at New London, Conn., with varying tide and wind. In 1883 an annual race between Cornell and the University of Pennsylvania was initiated.

Rowing at Cornell dates from 1869 with the formation of the Undine Boat Club. In 1870 the Cornell navy was organized, and has existed as such ever since. In 1873 Cornell sent her first crew to compete with other colleges in the regatta of the American Colleges Rowing Association, and was annually represented in this contest thereafter until the association came to an end. In the first two contests her crews finished fifth, but led in the latter two. In the last year of the regatta not only did the Varsity win, but also the Freshmen crew and her single sculler, Francis. Following these events, both Harvard and Yale withdrew from the association, and have declined races with other colleges since.

Since 1884 neither Cornell's Varsity nor Freshmen crews have met defeat in a series of nineteen races, the summary of intercollegiate races from 1873 to 1894, both Varsity and Freshmen included, being thirty-two victories and seven defeats.

BEST ROWING RECORDS OF AMERICAN OARSMEN.

				Min.	Sec.
1863.	Eight-oared shell,	1 mile,	Columbia College.....	5	41
1869.	" " "	" "	Cornell Varsity.....	6	40
1891.	" " "	2 " "	Columbia College, freshmen.	9	43½
1891.	" " "	" "	Cornell Varsity.....	14	27½
1894.	" " "	4 " "	Yale Varsity.....	20	10
1872.	Six- " "	3 " "	Amherst College.....	16	32½
1883.	Four- " "	1 " "	Argonaut Rowing Association.....	4	51
1887.	" " "	2 " "	Owashtanong Boat Club.....	12	27
1875.	" " "	3 " "	Argonaut Rowing Association.....	15	37½
1871.	" " "	4 " "	Ward brothers.....	24	40
1880.	" " "	5 " "	John, James, and Barney Biglin and Dennis Leary.....	30	44½
1871.	" " "	6 " "	E. Ross, S. Hutton, G. Price, and R. Fulton.....	39	20½
1876.	Double sculls,	1 " "	J. Smith, J. C. Hayes.....	5	55½
1876.	" " "	2 " "	F. E. Yates, C. E. Courtney.....	12	16
1885.	" " "	3 " "	P. H. Conley, C. E. Courtney.....	17	57½
1876.	Pair-oared shell,	3 " "	J. Faulkner and P. Regan.....	20	28
1872.	" " "	5 " "	John and Barney Biglin.....	32	1
1891.	Single sculls,	1 " "	Edwin Hedley.....	0	57
1872.	" " "	1 " "	Ellis Ward.....	5	1
1863.	" " "	2 " "	J. Tyler.....	11	20
1890.	" " "	3 " "	H. J. Gaudaur.....	19	31
1883.	" " "	4 " "	E. Hanlan.....	27	57½
1879.	" " "	5 " "	E. Hanlan.....	33	56½

Since the introduction of rowing as a pastime in Great Britain there has been a vast change in all the departments of the sport—in the training for a race, selection of a crew, style of rowing, and, greatest of all, in the boats. Formerly the boats were built with a proportion of breadth to length of 1 to 6, but the present usage is 1 to 30 and even 1 to 40. Their finest racing boats were about 6 ft. 2 in. beam, 35 feet in length, weighed 700 lb., and were rowed by oarsmen of 200 lb. weight, with two spare men to act as ballast and assist at the oars. A shell 24 inches beam, 66 feet long, and weighing 250 lb., can be rowed by eight men with coxswain, having total weight of 1,350 lb., at a rate of 12 miles an hour. This great reduction in width, with a corresponding increase of length and also speed, is due almost entirely to the outriggers and consequent improvement in design and materials of construction.

To Harry Clasper, probably, more than any other oarsman, credit is due for the adoption of the outrigger and many other improvements in race-boat building. In 1828 Anthony Brown had fastened various pieces of wood, now known as false outriggers, to the side of the Diamond, of

Onseburn, preparatory to its race with the Fly, of Scotswood-on-Tyne, and in 1830 Frank Emmett had contrived a more perfect plan of iron outriggers for his boat, the Eagle, yet it was not until 1844 that Clasper's four-oared outrigger boat fully overcame the prejudice of the time, and racing boats began to be modeled with regard to the new innovation. Yet Clasper's first outriggers were but 8 inches long. To Clasper also are we indebted for improving the spoon oar.

James Mackay, who appeared in 1857 at the Portland City Regatta in a shell of his own construction, was probably the first builder of shells with outriggers in the U. S. He received an order from Harvard for a six-oared shell, which he completed in December of that year. It was 40 feet long, 26 inches amidships, built of white pine, with iron outriggers and spoon oars, and was the first six-oared shell launched in the U. S.

Another improvement which added materially to the speed of racing boats was the sliding seat, from which has been evolved the roller seat. The distance through which the seat moves varies according to the style of the stroke rowed. The sliding seat is claimed to have been first used by J. C. Babcock, of the Nassau Boat Club, in a sculling boat in 1857, but it was not until 1870 that its merits were fully appreciated. The change to roller seats was made by Charles E. Courtney in 1878, and first used by him in 1879 in a race at Toronto, Canada.

Charles E. Courtney is authority for the following general directions as to one style of stroke: The beginning of the

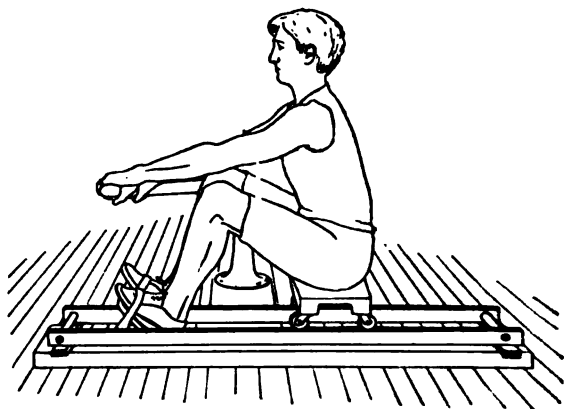


FIG. 1.

stroke, known as the forward reach, is illustrated in position 1. In this the seat is pulled forward with the feet until it is from within 9 to 12 inches from the bottom of the foot-

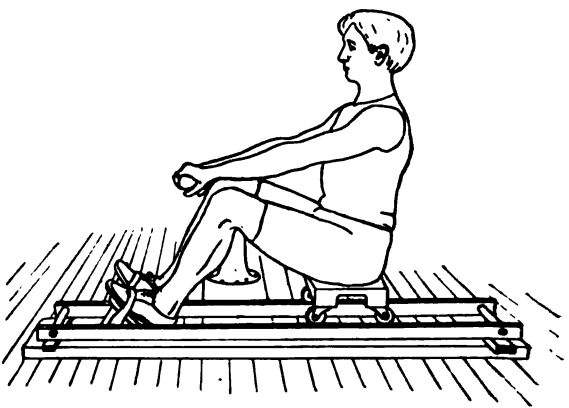


FIG. 2.

brace, the distance varying with individuals. The seat is held in position 1 while the oar catches the water, being so dipped as to just fairly cover the oar-blade, and until swinging the body at the hips the shoulders are in position 2. The shoulders go back no farther, and the stroke is finished by the legs and arms, as in position 3. The arms are kept straight until just before the legs are fully straightened, when the elbows are bent and the hands brought sharply in to the body, and are then dropped almost into the lap to bring the oar cleanly out of the water. Then the wrist is turned to

hatter. On the reverse, the handle is bent forward and the seat slanted slightly forward and slanted down as it reaches the end, so that the workman will again be in position 1.



FIG. 2

See Boat-building, by E. D. Brickwood (London, 1870); *Wooden's Oars and Sculls* (London and New York, 1874); *Rowing's Oars and Sculls* (London and New York, 1874); *Rowing's Oars and Sculls* (London and New York, 1874); *Rowing's Oars and Sculls* (London and New York, 1874). For more records, consult *The New York Clipper Annuals* for 1884 and 1884, and also *Rowing's Oars and Sculls* (London and New York, 1874).

ROBERT HENCOCK, JR.

Rosa's (in *Dr. Pader*): the beautiful daughter of the famous prince Oxyria. She became the wife of Alexander the Great in 327 B.C., and shortly after the death of Alexander in 323 B.C. her son, Alexander IV. Her name varied with those of the successors of Alexander, and her son was murdered by Cassander in 311 B.C.

Roxburgh, county of Scotland. It comprises the districts of Roxburgh and Liddesdale, and is bounded on the N. by the English counties of Northumberland and Cumberland. Area, 905 sq. miles. Its southern and western parts are hilly, covered with the Cheviots and Lamington Hills; in the northern and eastern parts the surface is generally level, and the fertile and productive soil is cultivated with the utmost care. Large herds of sheep are kept on the pastures of the hills; manufactures of woollens are carried on; coal, iron, and freestone are found. Pop. (1891) 111,000. The county town is Jedburgh (pop. 3,507), 40 miles S. E. of Edinburgh. The county returns one member to Parliament.

Royal, James D. C. L.: Canadian official; b. at Roseville, P. Q., May 7, 1857; educated at the Jesuits' College, Montreal, and admitted to the bar in 1884. He edited the *Montreal Mirror* 1877-80; established *L'Ordre* 1880, *La Presse Canadienne* 1884, *Le Nouveau Monde* (Montreal) 1887, *Le Monde* (Montreal) in 1871; has been vice-chancellor of Manitoba University since 1877; and was appointed a commissioner for the consolidation of the statutes of Manitoba in 1877. He was Speaker of the first Legislative Assembly of Manitoba 1871-72; Provincial Secretary 1872-3; Provincial Secretary and Minister of Public Works 1874-76; Attorney-General 1876-78; and Minister of Public Works for a short time in 1878. He was the first superintendent of education appointed for Manitoba 1871; commanded a troop of cavalry during Fenian raid in 1871; was appointed a member of the executive council of the Northwest Territories in 1873; and discharged the administrative duties of Attorney-General 1874-78. He was a member of the Legislature of Manitoba 1870-79; and of the Dominion Parliament from 1879 until July 4, 1888, when he was appointed Lieutenant-Governor of the Northwest Territories. He is the author of the *School Law* (1871); contributed largely to a reorganization of the financial arrangements of Manitoba, 1873; the *Dominion* in 1875; author of *Fin Politi-que de St. Louis H. Lafontaine* (1884); and of many important contributions to French-Canadian literature.

NEW MACHINERY.

Royal Academy: See ACADEMY.

Royal Geographical Society: an institution founded by royal charter in London in 1830 for the promotion and encouragement of geographical research. It annually awards several medals to successful workers in the cause of geography, and distributes prizes among training-colleges

for proficiency in geographical knowledge. The society's *Journal* reports the progress of explorations and discoveries. On May 1, 1892, the society had 3,991 fellows, each entitled to attend the lectures P. K. G. N. to his name.

Royal, Isaac: soldier; b. in Massachusetts about 1720; was a wealthy resident of Medford, which he long represented in the general court; was for twenty-two years a member of the executive council; took part in the French war; was appointed brigadier-general 1791, and was the first resident of New England who bore that title; adhered to the crown in the preliminaries of the Revolutionary war, for which reason he left the country Apr. 10, 1775; was proscribed and his estate confiscated 1778. He died in England, Oct., 1784, taking a noble revenge upon his persecutors by leaving 3,000 acres of land in Worcester County as the endowment of a law-professorship in Harvard College, now known by his name. There were other bequests equally liberal and patriotic. The town of Royalston, Worcester County, of which he had been one of the original proprietors (1734), commemorates his name.

Royal Society: See ACADEMY.

Royer, Julian, Ph. D.: educator and author; b. in Orms Valley, Cal., Nov. 20, 1863; educated at the University of California, and at Göttingen, Leipzig, and Johns Hopkins Universities; became instructor in English in the University of California in 1878, instructor in philosophy in Harvard College in 1882, assistant professor there in 1883, and full professor in the History of Philosophy in 1892. His writings comprise *The Religious Aspect of Philosophy* (Boston, 1893); *California* (American Commonwealth Series, Boston, 1896); *The Food of Oakfield Creek* (novel; Boston, 1897); *The Spirit of Modern Philosophy* (Boston, 1898); with many articles and lectures. J. MARK BALDWIN.

Royer-Collard, rwa-sā-l'har, PIERRE PAUL: statesman; b. at Sempuis, Marne, France, June 21, 1763. He studied law, and at first took an active part in the Revolution, but, being moderate and royalist, fled from Paris after the fall of the king Aug. 10, 1792, and lived concealed at Sempuis during the Reign of Terror. He represented Marne in the Council of Five Hundred in 1797, but was removed from the Assembly in the same year as a royalist, after the Revolution of Sept. 4. At the creation of the empire he retired to Sempuis and devoted himself to the study of philosophy, being much influenced by the Scottish philosophers, from whose standpoint he successfully opposed the sensualism of Condillac. He wrote little, but wielded a great influence through his lectures as Professor of Philosophy at the University of Paris from 1811 to 1814; Jouffroy, Cousin, Guizot, etc., became his disciples. Under the ultra-royalist tendencies of the Restoration he founded in 1820 the party of the Doctrinaires and became the powerful champion of constitutional monarchy, contributing much to produce the Revolution of 1830. Afterward he gradually withdrew from public life. D. near St.-Aignan, Sept. 4, 1845. His *Life* has been written by Barante (1861) and Lacombe (1863). A. G. CAMPBELL.

Royersford: borough; Montgomery co., Pa.; on the Schuylkill river, and the Phila. and Reading Railroad; opposite Spring City, 15 miles W. N. W. of Norristown (for location, see map of Pennsylvania, ref. 6-1). It contains a high school, two national banks with combined capital of \$230,000, a private bank, and a weekly newspaper, and has manufactures of stoves, machinery, glass, building and fire brick, shales, and rosters. Pop. (1880) 638; (1890) 1,815.

Royle, John Forrest, M. D., F. R. S.: botanist; b. at Cawnpore, India, in 1800; became a physician in the service of the East India Company; spent much time in the Himalayas, where he was superintendent of the company's botanical garden at Saharanpur; published his great work, *Illustrations of the Botany and other Branches of the Natural History of the Himalaya Mountains* (2 vols., 1839-40); wrote many valuable scientific papers upon India; was a promoter of the culture of tea, cotton, and other foreign plants in India; became lecturer on materia medica at King's College, London, and secretary of the British Association. D. at Acton, near London, Jan. 2, 1855.

Rshet, or Rzhaf: town; in the government of Tyer, Russia; on both sides of the Volga (see map of Russia, ref. 6-D). It is on the railway line from Moscow to St. Petersburg, is well built, has many educational and benevolent institutions, and carries on an extensive trade in fish, hemp, linen, and agricultural produce. Pop. (1890) 20,278.

Ruatan', or Roatan: an island in the Bay of Honduras (Caribbean Sea), 80 miles from the northern coast of Honduras, to which it belongs; area about 80 sq. miles. It is long and narrow, partly hilly, wooded, and has a good soil and climate; its inhabitants (about 1,000) are engaged in fishing and turtle-catching. In 1742 this island was seized by Great Britain, and in 1797 about 5,000 Caribs were transported to it from St. Vincent; most of them since passed over to the mainland. Subsequently Great Britain gave the island to Honduras, but temporarily held it again 1841-42. Ruatan is one of the Bay islands. H. H. S.

Rubasse: a variety of crystallized quartz, discolored and stained with specks of red and yellow iron oxide, which give it a fine red. Artificial rubasses of all colors are made from rock-crystal heated and dipped in cold colored aniline solutions, which cracks the crystal, when the color fills the cracks throughout the mass. It is also called *Mont Blanc ruby*. Revised by G. F. KUNZ.

Rubefacients [from Lat. *rubefaciens*, pres. partic. of *rubefacere*, make red; *rubere*, be red + *facere*, make]: in medicine, agents capable of producing congestion, and thus redness of the skin, by local contact. Such irritant applications have often the power of relieving congestion, pain, spasm, or undue irritability of deep-seated organs, and are much used for the purpose in therapeutics. Very many drugs have the property of reddening the skin, all blistering agents producing simple hyperemia as the initial effect of their irritation, but the means most employed strictly as rubefacients are the following: *Heat*, by means of hot baths, cloths wrung out in hot water, bottles of hot water, or heated solids, as earthen platters, bricks, bags of sand, etc.; *mustard*, in the form of prepared mustard-paper moistened, or thick poultices of mustard-meal mixed with cold water; *oil of turpentine*, applied by means of flannels first wrung out in hot water and then in the oil previously warmed; *capsicum* (cayenne pepper), in the form of poultice, or, better, as a lotion mixed with hot spirits; and *ammonia*, in the form of liniment of ammonia (volatile liniment). Plaster of Burgundy pitch and resin cerate are also feebly rubefacient. Revised by H. A. HARE.

Rubens, PETER PAUL: painter; b. at Siegen, Westphalia, June 29, 1577. He was of middle-class family, but his parents were persons of influence. He was well educated, and for a time was a page in the household of the Countess of Lalaing at Brussels. His masters in painting were first Tobias Verhaecht, or Vanderhaecht, then Adam Van Noort, and finally Otto Van Veen, or Vaenius, all of Antwerp. At the age of twenty-two he was received as a master painter by the Antwerp guild of painters. In 1600, during the summer, he made the journey to Italy, and seems to have gone first to Venice. Soon after he attached himself to the ducal court of Mantua, then very brilliant and artistic in a certain way. The Duke Vincenzo Gonzaga employed Rubens permanently, and in 1601 sent him to Rome with letters of recommendation to the Cardinal Alessandro Montalto. There he copied pictures and also produced original works, painting pictures at the order of the Archduke Albert VII., who at this time had become sovereign of the Spanish Netherlands. His high character, thorough education, especially in languages, and dignified bearing seem to have given him a peculiar position among artists; he was trusted and treated as a person of high rank by the sovereigns with whom he came in contact as a painter. In 1603 he was sent by the Duke of Mantua on a private mission to Madrid, where he had an exceptional opportunity to study the paintings of Titian. Many pictures of his own are in the Madrid Gallery, and it is thought that several of these were painted during this visit. He was in Mantua from 1604 to 1606, a second time in Rome, and left Italy finally in 1608, after nearly eight years' employment by the Duke of Mantua. Once in Antwerp the Archduke Albert and his wife, Isabella Clara Eugenia, daughter of Philip II. of Spain, forbade his departure; in 1609 he was made their court painter, and in the same year he married. In the next year he painted the *Elevation of the Cross*, now in the cathedral at Antwerp, and in 1611 the *Descent from the Cross*, also in the cathedral, and commonly called the painter's best work. Until 1620 he remained at Antwerp, master of a large studio, with many pupils and assistants, many of whom rose to great distinction. Jakob Jordaens, Franz Snijders, Gaspar de Crayer, Jan Breughel, and even Antony Van Dyck were among his fellow workmen.

In 1620 Rubens undertook a series of pictures for the

Luxembourg Palace at Paris for the Queen Dowager Marie de Médicis. This business called for his presence in Paris on several occasions, but the pictures were painted at Antwerp. They are now at Munich. In 1626 he went to Holland, and in 1628 again to Madrid, on business almost wholly diplomatic in character. In 1629, while still in Madrid, Rubens was appointed secretary of the privy council for the Spanish Netherlands, and was commissioned as envoy to London, where he arrived in May. He left London in Mar., 1630, having previously received knighthood from King Charles I., who also granted him an augmentation of his escutcheon. In Dec., 1630, he married Helena Fourment, niece of his former wife. Her portrait occurs very frequently in his pictures from this time on. The remaining years of his life were filled with artistic work. In 1635 he had to design a most elaborate decoration of the whole city of Antwerp as a welcome to Ferdinand of Austria, son of King Philip III. of Spain, the new governor-general of the Netherlands, appointed on the death of the archduchess. This was a prodigious undertaking, and many vestiges of it yet remain in published and unpublished drawings, and in the pictures which formed part of it. Many large paintings were under way and were left unfinished at his death, which occurred May 30, 1640.

In spite of his active and varied life the amount of work left behind him was enormous, and a great deal of it is preserved. His works are singularly even in quality. They seem to moderns to be lacking in charm, but they are full of vigorous drawing and strong color. They are easy to understand, both in subject and in the more pictorial qualities.

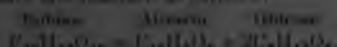
Besides the two great pictures in the Cathedral of Antwerp, named above, it is generally thought that the best places to study this master are the gallery at Antwerp and the old Pinakothek at Munich. Of those at Antwerp, *The Crucifixion between the Two Thieves*, *The Adoration of the Magi*, and *The Virgin with the Body of Christ* are especially important. At Munich there are about fifty canvases, most of them large; there may be named *The Fall of the Rebel Angels*, and another of nearly the same subject, *The Massacre of the Innocents*, *St. Peter* and *St. Paul*, a picture in which something of the Italian feeling is seen, a remarkable *Silenus with Satyr and Bacchante*, and a number of portraits of the highest interest and value, as *Helena Fourment*, *Lord and Lady Arundel*, the *Archduke Ferdinand*, ruler of the Netherlands, *Philip IV. of Spain*, the *Artist with his First Wife*. In the National Gallery in London are the *Abduction of the Sabine Women*, the *Plague of the Brazen Serpents*, two large *Landscapes*, and a remarkable decorative drawing, *The Birth of Venus*. At the Madrid Gallery, at the Hermitage, St. Petersburg, at the Museums of Berlin, Vienna, Brussels, Darmstadt, and Dresden, at the Louvre, at the Pitti and the Uffizi in Florence, and in such important private collections as Blenheim and the Lichtenstein Palace are pictures impossible to enumerate—perhaps 300 in number in actual public view.

There are many books which treat of Rubens, among them C. Ruellens, *Pierre Paul Rubens, ses Lettres*, etc. (Brussels, 1877); A. Michiels, *Rubens et l'École d'Anvers* (Paris); and Charles W. Kett, in the Great Art Series (1879). A good study of him exists in the *Gazette des Beaux-Arts* (1867-68), and many other notices scattered through the later volumes. RUSSELL STURGIS.

Ruberythric Acid [*ruberythric* is from Lat. *rubra*, madder + Gr. *ῥυθρός*, red]: a glucoside, $C_{28}H_{34}O_{14}$, found in madder-root by Rochleder. It is crystalline, and forms yellow prisms having a silky luster; has a faint taste; is sparingly soluble in cold, readily in hot water; gives a golden-yellow solution in alcohol and in ether, and a blood-red solution in alkalis. It gives red precipitates with baryta-water, with an alum solution after the addition of ammonia, and with basic acetate of lead after addition of a little alcohol. Schunck did not find this acid in madder, and considers it a product of the decomposition of rubian. Rochleder considers rubian to be impure ruberythric acid. See RUBIAN, ALIZARIN, MADDER, etc. Revised by IRA REMSEN.

Rubia'cea: See MADDER FAMILY.

Rubian [from Lat. *rubia*, madder]: a glucoside ($C_{14}H_{16}O_6$) discovered in madder-root by Schunck in 1847. It is obtained by treating a hot decoction of madder with bone-black, washing this to remove chlorogenine, extracting it repeatedly with boiling alcohol, and evaporating to dryness. It is then dissolved in water, precipitated with acetate of lead; the lead compound is decomposed by sulphuretted



It is not described whether there are several glassites or rather, which are decomposed by the ferment, one yielding glassine, another paraffin, etc., or whether there is but one from which all the coloring-matters are developed. I have favored the former view, while the investigations of some Technicians, and, Ridley favor the latter. See *Journal of Marine Biologists*, etc.

Reviewed by Gary Hammer.

Kalderon: a small river of Northern Italy emptying into the Adriatic immortalized by the passage of Ulysses 42 n.e. Eneas formed the boundary between Italy and his province of Calabria fourth. To pass it would be a declaration of war against the seignior. Whether the modern fane at the Fincennes was the Rubicon can not be determined. A parallel in 1792 pronounced for the Fane, which the peasants also called Rubicones. The weight of argument, however, identifies it with the Rubicon. B. A. H.

Thallium (Med. Lat., from Lat. *rubrum*, red, from, of red, *color*, 1791). One of the alkali metals, discovered by Berzelius and Runström in 1829 as one of the first fruits of systematic investigation. It occurs in extremely minute quantities in some saline mineral waters, in association with Magnesium, etc. The water of Siquipon-sol-solins contains in 1,000,000 parts 19 parts of chloride of thallium. Some localities contain it, associated with lithium and sodium. Among these are the hydrothermal of Helms, Me., which contains about half of its weight. The ash of some plants, as the tea and the coffee plants share it. It is a white metal with a yellowish tinge and silvery luster, fusible at 175°. It is as soft as wax, melts at 1015° F., and boils some below a red heat in greenish-blue vapor, less easily oxidized by the air than potassium, and more electropositive than the latter. It dissolves in water and behaves like potassium. (Cited by J. H. ROBERTS.)

Enghelab, Came]. See Cave Ruins.

Zakharofsky, Abram (Hebrew); composer and pianist; b. 1. Marchevytsk, Kaimanuk, of Jewish parents, Nov. 30, 1871, received instruction from his mother, Vilking in Moscow, Yess in Paris and Dehn in Berlin. After two years spent in Vienna to teaching, he returned to Russia in 1888, and studied at St. Petersburg for eight years. All this time was composing, and when he made a concert tour in 1887 it created a remarkable sensation, both by his playing and as composer. In 1894 he was appointed imperial concert conductor at St. Petersburg with a life pension. In 1902 he joined the St. Petersburg Conservatory, and remained its principal till 1927. In 1909 the emperor ennobled him. He made seven Russian country and the U. S. in his concert tour. His compositions include fifteen operas, some of them long, but he only saved operas, such as *Paradis Lost*, *The Tomb of Abel*, and *Moses*; six symphonies, of which the best known are the *Ocean*, No. 2, op. 42, and the *Dramatic*, op. 50, 51, orchestras, piano sonatas and concertos, sonatas for chamber for other instruments, much chamber music, 150 Russian piano solos, and vocal pieces for one or more voices. H. at Petersburg, Russia, Nov. 20, 1924. D. E. H.

Nakhte (from *G. Rē, rēkhrē* < *Lat. rubrum*, red earth, which has the title of a law (because written in red), deriv. *rušer, ruš*), grey writing or printing in red ink. In MS. are marked usually the directions preceding the prayers and the words usually written or printed in red ink; hence the red colour is commonly used to denote the rules and directions for the performance and celebration of divine service, in the title and place on a title-page where sometimes printed in red ink and the place where the book was sold was given.

instead of that where printed, the word rubber has also been used to signify the false rubber, as many books printed at Paris bear the rubric of Goussier, London, etc. W. S. P.

Rubruk (or **Rubrugqia**, **William** of a distinguished Franciscan monk and missionary; b. at Rubrouck, in French Flanders), was sent to Tartary by Louis IX, to open communication with the Tartar prince Batuk, who was alleged to be a Christian (1253-55). The narrative of his journey was written in Latin, and is one of the best of the kind in existence. The best edition is that in the *Revue de géographie*, vol. 1, 1870, of the Paris geographical Society. There is an English translation in *Pearson's history*, vol. 10, and a French one, Paris, 1875. The name often given to him, William of Rubrugsch, arose by confounding him with the French mystic John of Rubrugsch, D. after 1300. Roger Bacon speaks of him, and may very likely have seen him; and, as gunpowder was then in use among the Tartars, it has been conjectured that Rubruk may have given Bacon a clue to its discovery.

Ruby, or Red Sapphire: a variety of CORUNDUM (q. v.). The finest and most highly prized rubies are of the so-called pigeon-blood color; they are found in the valley of Masek, in Burma, where the mines have been worked by the Burmese for centuries, and are now leased by the British Government to a Lankan syndicate. Lighter-colored rubies, sometimes almost pink, often very beautiful, occasionally with a tinge of purple or purplish wine color, are found at Ratnapur, Ceylon. More recently the mines in Siam have been extensively worked, and some fine gems have been found, although nearly all of the rubies found there are very dark red, almost garnet-colored, frequently with a brownish tinge. Small rubies have been found in the vicinity of Franklin, N. C., and in the government of Peru, in Russia. Rubies from 1 carat upward, when fine, are of great value, and when from 2 to 4 carats in weight command from five to ten times the price of a white diamond of similar quality. A ruby of 10 carats has been sold in the U. S. for about \$50,000. The so-called reconstructed rubies are, as generally believed, made by fusing small bits of ruby, but are artificial rubies made by a direct process, and are distinguishable by the presence of round bubbles and other peculiarities. They are sold only under the name of artificial rubies in France, with heavy legal penalties for failure so to designate them. The so-called Cape, Arizona, Colorado, and Utah rubies, often very beautiful, are fine purple garnets, possessing only very slight value compared with the true ruby. G. F. Kene.

Rubin-solvent - See HYPER.

Rückert, Johann Michael FRIDRICH; poet; b. at Schweinfurt, Bavaria, May 16, 1788; studied law at Jena; lived in Stuttgart, where he edited, 1816-17, the famous *Morgenblatt*; traveled in Italy 1818; studied Oriental languages under Hammer in Vienna; was appointed Professor of Oriental Languages at Erlangen in 1820, at Berlin in 1830, but retired in 1838 to his estate, Nossen, near Koburg, where he died Jan. 31, 1866. Under the pseudonym *Friedrich Raimar* he published in 1814 his *Deutsches Gedichte*, in which were the famous *Gebährworts Sonette*, a collection of sonnets directed against Napoleon. They are full of strong patriotic sentiment, and display an extraordinary command of the poetical form. The character of Rückert's lyrics in general is rather philosophical than naïve and spontaneous, a fact which may account for the poet's enormous productivity. In the six volumes of his *Gesammelte Gedichte* (1834-36), and especially in the collection *Liesesfrühling*, there are many bits of genuine lyric poetry; but there is also much that is insignificant. His translations from the Arabic, *Die Makamen des Hariri* (1926), *Harun* (1946), the Chinese *Schi King*, *Chünfantschen Liederbuch* (1830), and the Sanskrit *Nal und Damayanti* (1828), etc., reproduce the difficult meters of the originals with skill and ease. In *Weisheit des Brahmanen* (1836-39) he successfully imitated the didactic style of Hindu poetry and exhibited a wealth of wisdom and philosophic thought. See Forstmann, *Friedrich Rückert und seine Werke* (1867); C. Heyer, *Friedrich Rückert* (1906); F. Maucher, *Friedrich Rückert* (1909); P. de Lagarde, *Erinnerungen an Friedrich Rückert* (1896). JULIUS GOSWEL.

Rūdāgī, rū-dā-gī; Persian poet of the tenth century, sometimes called the father of Persian literature. His name Rūdāgī comes from the village of Rūdāg, in the region of Bokhara or Samarkand, where he was born toward

the end of the ninth century. His full name is given as Farid ad-din Muhammad Rüdagi. Biographical tradition makes him a sort of blind Homer, but as to his blindness there is doubt. His poetical renown won him a position at the court of the Sāmānid Nasar II., ben Ahmad of Khorrāsān. The literary activity of Rüdagi appears to have been great; he is said to have composed more than a million verses. The remains that have been preserved are comparatively meager, but they are of high merit. Among the deplorable losses may be mentioned his translation of the Indian book of fables, *Kalilah and Dimnah*, rendered into Persian from the Arabic version of Abd-allah ibn al Mukaffa. Rüdagi outlived his royal patron, and fallen on evil days he seems to have died about A. D. 954. See Ethé's *Rüdagi der Sāmānidendichter* in *Göttinger Nachrichten* (1873, pp. 663-742). A. V. WILLIAMS JACKSON.

Rudbeck, OLOF: scientist; b. at Vesteraas, Sweden, Sept. 30, 1630. He studied natural science at the University of Upsala, where he became a professor in the faculty of medicine. By his discovery, at the age of twenty-three, of the lymphatic canal he gained European renown. In addition to investigations in several branches of science, he devoted himself to the study of archaeology and literature, both classical and Scandinavian, publishing several sagas and Swedish provincial laws (from 1679). His great botanical work, *Campelysis eller Glysisvald*, was left uncompleted. He is best known by his ingenious and learned *Atlant eller Manhem* (4 vols., Upsala, 1675-1702), commonly called *Atlantica*, in which he sought to establish the identity of Sweden with Plato's fabled land and the Garden of Eden. By the fire in Upsala in May, 1702, his library and collections, including the unpublished continuation of *Atlantica*, were destroyed, and his death followed a few months later (Dec. 12).—His son, OLOF RUDBECK (d. 1740), acquired considerable eminence as a zoölogist, and his grandson, also of the same name (d. 1777), was the author of a number of comic poems.

D. K. DODGE.

Ruddiman, THOMAS: Latin grammarian; b. at Raggle, Banffshire, Scotland, Oct., 1674; graduated at King's College, Aberdeen; was afterward a publisher and printer to the University of Edinburgh (1728), and principal keeper of the Advocates' Library (1730). He is chiefly known as the author of a once very famous work on *Latin Grammar* (1732), whose learned Latin introduction and appendices are still of value. In 1739 he brought out a magnificent folio edition of Anderson's *Diplomata et Numismata Scotiæ*, and produced his celebrated "immaculate" edition of Livy (4 vols. 12mo, 1751). D. at Edinburgh, Jan. 19, 1757. See G. Chalmers, *Life of Ruddiman* (1794).

Revised by A. GUDEMAN.

Rude, rüd, FRANÇOIS: sculptor; b. at Dijon, France, Jan. 4, 1784. His father was a blacksmith and made stoves, and young Rude was kept at this work, receiving instruction in drawing, during leisure hours only, at an art school in the town. Medals were won for drawing, etc., by the young man, who in 1804 made a bust of the engraver and medalist, Louis Gabriel Monnier. In 1807 he went to Paris, taking with him his statuette of *Theseus picking up a Quoit*. In 1809 he gained a second prize for sculpture at the Imperial Academy, and in 1812 the Grand Prix de Rome, but did not go at once to Italy. At the second restoration Rude went to Belgium with the Frémiet family of Dijon, settled in Brussels, and in 1821 married Sophie Frémiet, who was afterward known as a portrait-painter. In 1827 he returned to Paris, where he was invited to take the atelier for students formerly managed by David d'Angers (see DAVID, PIERRE JEAN). Except for a short visit to Italy, Rude remained faithful to steady and arduous work. He was a man of singular strength of body and simplicity and direct force of character, a republican by conviction, but primarily and all his life long an artist. D. in Paris, Nov. 3, 1855. Of his work there must be named the group of the *Departure for the War*, on the Arc de l'Étoile at Paris, the northern group on the side toward the Champs Élysées, a noble composition, well known to all students; *Mercury fastening his Winged Sandal*, in the Louvre; *Neapolitan Fisher-boy*, also in the Louvre; *Joan of Arc*, in the Luxembourg Garden; and *Hebe and the Eagle of Jupiter and Love the Conqueror*, in the Museum of Dijon. There are also a great many portrait-statues and busts, as *La Pèrouse*, the explorer, in the Louvre, *Louis David*, *General Cavaignac*; and what may be called historical portraits, as of men whom he had no chance to study from life, *Napoleon*, at Fixin in Burgundy,

Marshal Ney, at Paris, *Marshal Bertrand*, at Chateauroux and as decorations of the new buildings of the Louvre statues of *Houdon*, the sculptor, and *Nicholas Poussin*. There exists a life of Rude, published at Dijon in 1856, and Hamerton wrote an account of him in his *Modern Frenchmen*. RUSSELL STURGIS.

Rüdinger, NICOLAUS, M. D.: anatomist; b. at Büdesheim, Germany, Mar. 25, 1832; studied medicine at the Universities of Heidelberg and Giessen, where the teachings of Henle, F. Arnold, and T. Bischoff inclined his attention to anatomy; graduated M. D. from the University of Giessen in 1855; immediately thereafter he became prosector and adjunct to Bischoff at the University of Munich, and in 1881 was elected Professor of Anatomy there. He brought the anatomical teaching at that school to a high standpoint utilizing photography to depict his dissections. His most important works are *Atlas des peripherischen Nerven-systems des menschlichen Körpers* (Stuttgart, 1872); *Topographisch-chirurgische Anatomie des Menschen* (Stuttgart 1873-79); *Atlas des menschlichen Gehörorgans* (Munich, 1875). He was coeditor of *Monatsschrift für Ohrenheilkunde* 1867-70, and of the *Beiträge zur Anthropologie und Urgeschichte Bayerns* in 1877. S. T. ARMSTRONG.

Rudolph: the name of two German emperors. **RUDOLPH I. OF HAPSBURG**, b. in 1218, founder of the house of Austria, and German emperor 1273-91, was the oldest son of Albert IV., Count of Hapsburg and Landgrave of Alsace, which countries he inherited after the death of his father in 1240. He was successful in enlarging his possessions, but it was, nevertheless, not the importance of his political position, but the righteousness and valor of his personal character, which gained for him the German crown. In order to strengthen his authority among his vassals and procure the necessary support, he married his daughters to the two most powerful among them, the count-palatine, Louis, and Duke Albert of Saxony, and then marched against two others who refused to do homage, King Ottocar of Bohemia and Duke Henry of Bavaria. The latter was easily defeated; and Ottocar submitted on the approach of the imperial forces and made peace in 1276. Later, however, he broke the truce, and in the new war was killed in the battle of Marchfeld in 1278. Rudolph gave Bohemia and Moravia to the sons of Ottocar, but Austria, Styria, Carinthia, and Carniola he separated from the heritage and gave to his own son, Albert, thus founding the state of Austria. Against his external enemies, the Count of Savoy, the Duke of Burgundy, etc., he was also successful, and his internal government was distinguished by justice and love of order and peace. He traveled from place to place in the empire and sat in court on all important occasions, for which reason his people called him the living law—*lex animata*. D. in 1291, and was buried at Spire. His *Life* has been written by Lichnowski (1836), Schönhuth (1843), and Hirn (1847).—**RUDOLPH II.** (1576-1612), b. July 18, 1552, a son of the Emperor Maximilian II. and Marie, daughter of Charles V. was educated at the Spanish court; crowned King of Hungary in 1572, of Bohemia in 1575, and elected Emperor of Germany after his father's death Oct. 12, 1576. He was superstitious, weak, and entirely in the hands of the Jesuits. Immediately after his accession to the throne the Protestant worship was forbidden throughout his Austrian dominions, the Protestant schools were closed, and the preachers and teachers banished. In the empire he espoused the cause of the Roman Catholic Church with violence, and the formation of the Protestant Union (May 4, 1608) and the Roman Catholic League (July 10, 1609) brought Germany to the verge of civil war. Meanwhile, the Hungarians arose and Bohemia revolted. The house of Austria seemed near its ruin when Matthias, a younger brother of the emperor, took the lead in the affairs of the family, and compelled Rudolph to cede to him all his hereditary possessions. Unable to maintain his authority in the empire, and embittered by his misfortune, the emperor retired into private life, and died at Prague, Jan. 20, 1612. He felt some interest in science and literature, and several great scholars and scientists lived at his court. His *Life* has been written by Gindely (1863-65) and von Bezold (1885). Revised by F. M. COLBY.

Rudolstadt: town of Germany; capital of the principality of Schwarzburg-Rudolstadt; beautifully situated on the Saale, 18 miles S. of Weimar (see map of German Empire, ref. 5-E). It has a fine palace with a picture-gallery and a library, and manufactures of woollens, porcelain and dyestuffs. Pop. (1890) 11,398.

hyperboloid of revolution is generated by a line revolving round an axis which it does not intersect. Ruled surfaces of the second order, such as those mentioned, can be generated by the movement of a line in two distinct ways; and each line of one system intersects all the lines of the other system. This is not the case with other ruled surfaces. The surface is called a developable, that is, capable of being opened out into a plane, if two consecutive generating lines intersect. If the intersection is a fixed point, the surface is a cone, and if the lines are parallel the surface is a cylinder. See CONE and HYPERBOLOID. R. A. ROBERTS.

Rule Nisi: in law, a rule or order obtained on an *ex parte* motion, which, after due service upon the party against whom the rule is obtained, will be made absolute, unless (*nisi*) the party appears and shows good cause why it should not be made absolute. F. S. A.

Rule of the Road: See ROAD, LAW OF THE.

Ruling-machines: instruments designed for the subdivision of a given unit of length into any required number of parts, either equal or unequal. These are called "line-dividing engines" or "circular-dividing engines," according as the unit to be subdivided is a rectilineal measure or a circular arc.

The circular-dividing engine consists of a disk capable of accurate movement about a true center and of suitable mechanism for making this movement automatic. A graduating attachment produces automatically the marks upon the metal surface which correspond to the movement in revolution. There are, in general, two types of mechanism by which the movement in revolution is effected. According to the first type, the disk is moved by means of a gear and a worm cut in the periphery of the disk. In this type, the accuracy of the subdivision depends entirely upon the accurate workmanship of the worm and gear. Since the action is automatic there is no chance for the correction of known errors during the operation of graduation. In the second type the subdivision is effected by means of an arm attached to the disk, by which it is carried a definite distance, determined by the position of two metal stops, one of which is fixed, while the other is adjustable by means of a stout micrometer screw. The arm is connected with the revolving disk by means of electro-magnets. These clamp the arm to the disk during the forward motion and are released during the backward motion.

In the operation of the engine it is assumed that the master circle has been graduated without sensible error by suc-

cle can be exactly copied, and still further subdivision can be effected by setting the stops at the distance apart required to produce aliquot subdivisions. Suppose, for example, that

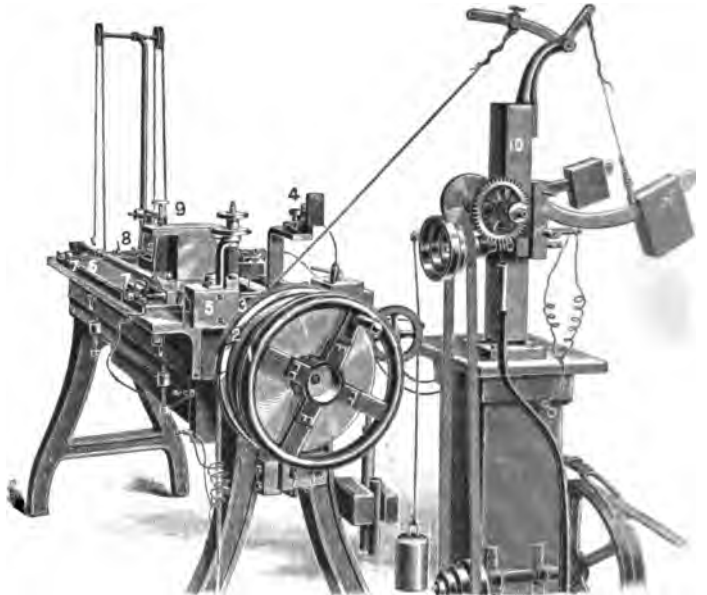


FIG. 2.—The Rogers dividing-engine, front view.

it is required to graduate a circle to ten minutes of arc. First the stops are set to correspond to this distance approximately. It is not to be expected that this can be done with the utmost exactness, but when the machine is started in operation the microscope under which the lines of the master circle are viewed, having a high magnifying power, will easily detect any deviation as small as one-tenth of a second of arc. As soon as the slightest deviation is detected it can be corrected by the motion of the adjustable stop, since ten divisions of the micrometer screw by which this movement is effected are equivalent to this distance. Thus an accumulation of errors can be prevented while the engine is in operation, and before any sensible error has been introduced.

The Line-dividing Engine.—The movement by which the subdivision of a given unit may be effected, as shown in Figs. 2 and 3, is usually produced by a screw of superior construction. A perfect screw, however, can give good results only when it is properly connected with the ruling carriage. If the screw has considerable length and a relatively small diameter the flexure must be taken into account. All kinds of constrained motion must be avoided, since under changes of temperature the effect of this constrained action will be variable. Usually the carriage to which motion is given by the nut moves over V-shaped ways. Since, in the construction of ways of this form, it is, to say the least, exceedingly difficult to maintain plane surfaces upon both surfaces of the ways and at the same time to maintain them straight and parallel, this form of construction is to be avoided in a dividing-engine in which great precision is desired. The form of ways shown in Fig. 3 is to be preferred. In this form each way is perfected independently by measurement tests made during the process of construction. It has been found to be not at all difficult to reduce the departure from a true plane to a limit corresponding to a radius of curvature as great as 500 miles for a distance of 40 inches.

The carriage moved by the nut and the screw is kept in contact with the face of the vertical wall by means of cylindrical plugs backed by springs acting against the opposite wall. In Fig. 3 the plate shown at 2 is pressed against the left wall at 1, and the spring plugs act against the right wall.

In the construction of a screw for a dividing-engine four difficulties must be overcome if great precision is desired. (1) Every half of every revolution of the screw must at every point be equal to every other half. Errors which depend upon a single revolution of the screw are called periodic errors of single revolution. The writer has had good success in the elimination of errors of this class by grinding the

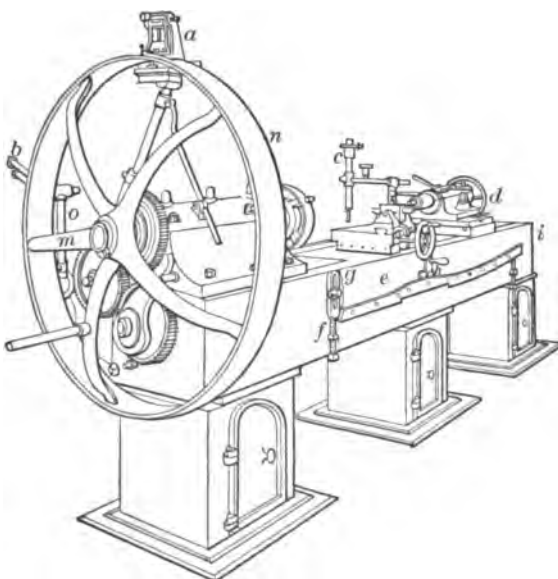


FIG. 1.—Screw-cutting machine.

cessive approximations; at least to single degrees. When the stops are set at the proper distance apart the master cir-

Every revolution of the



Fig. 2.—The Rogers dividing engine. (See text.)

must be equal in every other revolution; in other words, the screw must have no linear errors. Errors of this kind may be eliminated by means of an arm attached to the end of the other end of which is attached a roller. The roller is taken into upon a template which is fixed away to form the desired screw of the nut, as shown in Fig. 1. The roller is mounted so as to be practically free and subject to the carriage during a revolution of the screw, as the template arm, and give to the screw a motion which is independent of the forward motion of the nut. This mechanism is shown at A in Fig. 1. (3) The nut, which is supposed to have been made free from the two kinds of errors noticed above, must have a perfectly free action in its movement upon the screw. This is accomplished by means of two cylindrical plates fitted to four arms which project forward from the under side of the carriage. When these plates have been made with the end faces of the nut, they are clamped in position by means of set-screws. These plates guide the nut during the independent revolution of the screw by means of the revolution-arm. (4) Even if the screw has no errors of appreciable magnitude after it has been ground, when supported in a vertical position, the errors due to the nut must be taken into account. There are two methods of overcoming this difficulty. First, a follower may be mounted so that its supports shall rest upon the top and take up the flexure during the progressive motion of the nut. The writer has not found this method successful, chiefly owing to the constrained motion between the nut and the screw. It has been found far better to allow the flexure of the screw and to eliminate its effect by means of a template, in the manner already described. In a screw of a screw 2 inches in diameter and 3 feet in length the change in length at the middle point, under a load of 8 lb., was found to be a little over one-thousandth of an inch.

At the screw-cutting machine which is represented in Fig. 3 an attempt has been made to fulfill the following conditions, viz: (1) The ways upon which the tool-carriage is supported and moved must lie in a horizontal plane. (2) The central wall against which the tool-carriage is pressed must be a vertical plane which is at right angles to the bottom ways at every point. (3) The line between the

must of the tool-carriage must be parallel to the line between the centers at every point.

Two views of the dividing engine are given in Figs. 2 and 3. The automatic driving attachment is shown at 10. The index, which is subdivided into 1,000 equal parts, is shown at 3. At 5 is shown the circular sliding-magnet arm, which moves between two stops, one of which is seen at 5. At 4 is a holder for the microscope with which the divisions of the index-wheel are read. A microscope is clamped to the carriage, which is driven by the screw, at 2. This microscope is adjusted over a graduated bar which rests upon adjustable supports at 7. If another bar rests upon a second set of supports at 7 and is viewed by a second microscope, the instrument is converted into a convenient form of computing apparatus. See the article *Measurement*—*Optics*.

In Fig. 3 the automatic ruling attachment is shown at 6. It is carried along independently of the screw by a weight movement. When the index-wheel at 4 has been set, a line can be ruled by a slight movement at 5, the cutting tool being automatically lifted during the backward motion and released in time for action during the forward motion. The instrument is therefore adapted either to continuous automatic action or to an isolated movement at the will of the observer.

WILLIAM A. ROGERS.

Rum (apparently abbreviated from *rumination*, a great tumult, a strong distilled liquor. The Fr. *rhum*; Germ. *rum* are from *Rum*), a spirituous liquor distilled from molasses and the refuse juice and skins from the manufacture of sugar. It is largely produced on the sugar-plantations in the West Indies; that from Jamaica is considered the best, and the product of Santa Cruz also has a high reputation. The *wash* is prepared by mixing about 100 gal. of molasses, 300 gal. of skimmings from the clarifiers, 200 gal. of lees from previous fermentations, called *dunder*, and 400 gal. of water. This mixture averages about 15 per cent. of sugar. The fermentation is complete in from nine to fifteen days. The mixture is then distilled, and a quantity of molasses or caramel is added to color and flavor it. The peculiar flavor of rum is chiefly due to butyric ether, produced during the fermentation. Acetic and other ethers are present. Phosphorus and geraniol are often thrown into the still. Rum is greatly improved by age. It was formerly largely manufactured in New England, especially at Newport, R. I., and was a prominent article of exportation to Africa in connection with the slave-trade. Great quantities of liquor sold for rum are produced by flavoring and coloring rectified proof spirit.

Revised by IRA RICHES.

Rumford. BENJAMIN THOMPSON, Count; statesman; b. at Woburn, Mass., Mar. 26, 1753; educated at Woburn and Medford; became a student of natural science, attending the lectures of Prof. Winstrop, of Harvard; sympathized with the early movements for resistance to British oppression, but went over to the British. He went to London, where he gave valuable information to the government as to the state of the colonies. He lived for several years in England, where he continued his studies and was chosen F. R. S. 1778, but returning to the colonies in 1781 he raised a regiment of loyalists; served in the Carolina campaign against Marion 1782. In 1783 he entered the service of the Elector of Bavaria; settled at Munich; acquired great influence with the elector, who took his advice on nearly every subject, made him major-general, councillor of state, lieutenant-general, commander-in-chief of the general staff, Minister of War, and Count of the Holy Roman empire 1790, on which occasion he chose as his title the name of the town in New Hampshire where he had resided and married. Many vigorous reforms were effected by Count Rumford in the Bavarian administration, as well as improvements in military training, in methods of agriculture, stock-raising, and in the practice of mechanic arts. Continuing his scientific studies he published in pamphlets accounts of a large number of scientific experiments, which he collected under the title *Essays, Political, Economical, and Philosophical* (London, 1796, 1798), and several times reprinted; left the Bavarian service on the elector's death 1799; was chiefly

instrumental in founding the Royal Institution in London in that year; settled at Paris and published his *Philosophical Papers* (vol. iv. of his *Essays*, 1802); married the widow of Lavoisier 1804, and spent the remainder of his life in quiet prosecution of his scientific studies at his wife's villa at Auteuil, near Paris, where he died Aug. 21, 1814. He contributed to science a considerable number of valuable observations and discoveries, especially upon his favorite subject, that of heat, of which he came near discovering the mechanical equivalent; made a series of experiments which directly led at a later period to the discovery of the correlation of forces; was also one of the pioneers of modern researches in optics and magnetism; left prizes to be awarded by the Royal Society of London and the American Academy of Sciences at Boston for discoveries on light and heat, and was himself the recipient of the first Rumford prize from the Royal Society; and endowed in Harvard College the Rumford professorship of the physical and mathematical sciences as applied to the useful arts. See his *Life*, by Rev. Dr. George E. Ellis (1871), and his *Works*, edited by the same gentleman (4 vols., London, 1876).

Rūmī, roo-mēē', JALĀL AD-DĪN: Persian Sūfi poet and philosophic teacher; b. at Balkh, A. D. 1207. He was descended of high ancestry and his father, Bahā ad-dīn Valad was so famous for his learning and the influence of his teaching as to excite the enmity of the jealous sultan, and to be obliged in consequence to leave Balkh with his family. After various travels he found his way to Asia Minor and settled at Iconium, where he founded a college under the patronage of the Sultan of Rūm, as Asia Minor is termed in the Orient. Hence the appellation Rūmī, by which his more distinguished son is known. Jalāl ad-dīn was an enthusiastic student, and his thirst for spiritual knowledge was fostered under his father's teaching. His father died in 1231, and Jalāl continued under scholarly guidance zealously to pursue his studies, and he succeeded ultimately to his father's chair and to the superintendence of the colleges of Iconium. Sorrow, which came to him in the untimely death of his son and in the sad fate of a beloved teacher, seems to have deepened his religious devotion, to have given tone to his mystic philosophy, and at the same time to have enriched his poetic talents. He became the founder of the Maulavi sect of dervishes, and his zealous devotion to this order seems to have been a source of inspiration for his spiritual and mystic odes. His great work is the *Masnawī*, or *Maknawī*, a production of high poetic merit, religious fervor, and philosophic thought. It is a huge collection of precepts and tales, and it comprises between 30,000 and 40,000 rhymed couplets. Jalāl ad-dīn Rūmī died in 1273, shortly after the completion of this monument, by which his name is known to fame. His teachings and doctrines continued to be cherished by the Maulavi sect that he had founded, and the leadership of this dervish order has traditionally remained in the direct line of his descendants. There is a versified translation of the first book of the *Masnawī*, by J. W. Redhouse (London, 1881, Trübner's Oriental Series), a volume which should be consulted for fuller particulars. Selected portions have been rendered into German by Rosenzweig (Vienna, 1838). For other details, see Sir Gore Ouseley, *Biographical Notices of Persian Poets*, pp. 112-116 (London, 1846); H. Ethé, in *Morgenländische Studien*, p. 95, seq. (Leipzig, 1870); S. Robinson, *Persian Poetry for English Readers*, pp. 367-381 (Glasgow, 1883).

A. V. WILLIAMS JACKSON.

Rumohr, roo'mōr, THEODOR WILHELM: novelist; b. in Copenhagen, Denmark, Aug. 2, 1807. His romances, of which he wrote a great number, treat for the most part of popular national heroes, such as Niels Juel and Tordenskjold. His collected works, *Fædrelands historiske Malerier* (14 vols.), were published at Copenhagen, 1850-65. D. K. D.

Rump Parliament: the popular name applied in English history to a remnant of the Long Parliament. It consisted of sixty members, who, after the expulsion of three-fourths of that body, Dec. 6, 1648 (known as Pride's Purge), were allowed by Cromwell to carry on the farce of legislation, and co-operated with him and with the army in effecting the trial and condemnation of Charles I. The Rump, having attempted to resist certain encroachments of the army, was dissolved by Cromwell Apr. 20, 1653; was restored by a military movement during the protectorate of Richard Cromwell; was a second time expelled by the army Oct. 13, 1659; reassembled on the advance of Gen. Monk from Scotland 1660, and decreed its own dissolution Mar. 16, 1660.

Rumsey, JAMES: inventor; b. at Bohemia Manor, Cecil co., Md., about 1743; became a machinist; made several improvements in the mechanism of mills; in Sept., 1784, exhibited on the Potomac river, in the presence of Gen. Washington, a boat which ascended the stream by mechanical appliances; in 1785 was granted by the Assembly of Pennsylvania exclusive right for ten years "to navigate and build boats calculated to work with greater ease and rapidity against rapid rivers." A year later he introduced a steam-engine of his own construction into his boat on the Potomac; obtained a patent for steam-navigation from the State of Virginia 1787; published at Philadelphia his *Short Treatise on the Application of Steam* (1788), which involved him in a controversy with John Fitch; organized at Philadelphia a Rumsey Society for the promotion of steam-navigation 1788; went to England soon afterward; organized there a similar society; built a new steamboat; obtained patents in England, France, and Holland, and made a successful trip on the Thames in Dec., 1792. D. suddenly in London, Dec. 23, 1792.

Runcorn: town; in Cheshire, England; on the estuary of the Mersey; 12 miles E. S. E. of Liverpool (see map of England, ref. 7-F). The Mersey is crossed here by a railway viaduct 1,500 feet long and 95 feet above high water. There is a large traffic by the Bridgewater Canal, which enters the river at Runcorn by a succession of locks. The industries include ship-building, rope-making, quarrying, etc. Pop. (1891) 20,050.

Runeberg, roo'ne-bärch, JOHAN LUDVIG: poet; b. at Jakobstad, Finland, Feb. 5, 1804; studied at the University of Åbo from 1822 to 1827. In 1830 he became lector of aesthetics at the University of Helsingfors, and published his first collection of poems, but removed in 1837 to Borgå, and in 1842 became Professor of Greek Literature at that gymnasium. Although he was born in Finland and spent his whole life in that country, he wrote in Swedish; and although he was liberally supported by the Russian Government, he sang the valor and perseverance of his countrymen in resisting the invading and conquering Russians. The immense popularity which his poems acquired both in Finland and Sweden was principally due to his talent. His genius was lyric-epic, and his lyrical faculty was delicately harmonious. His numerous minor poems evince a strong sense of reality. His idylls, *Hanna* (1836) and *Julqvällen* (Christmas Eve, 1841), and his tales in verse, *Elgskyttarne* (The Elk-hunters, 1832), and *Nadeschda* (1841), are true epics, with a lyrical swing in the outlines. His dramas, of which *Kungarna på Salamis* (1863), a tragedy in antique form, is the most remarkable, contain real characterization. The most celebrated of his works is *Fänrik Ståls Sägner* (Ensign Staal's Tales, i., 1848; ii., 1860), a collection of ballads treating subjects taken from the war between Sweden and Russia, when Finland was conquered by the latter. D. at Borgå, May 6, 1877.

Revised by D. K. DOUGE.

Runes [O. Eng. *rūn*, *runa*, secret, mystery; Icel. *rūn*: O. H. Germ. *rūna*: Goth. *rūna*, secret, mystery; cf. Gr. *ῥῥῥῥῥ*, track out, deriv. of *ῥῥῥῥῥ*, search]: the earliest graphic system used among the Germanic tribes. The name *runes*, first mentioned by Venantius Fortunatus (sixth century A. D.), and most probably older than the letters themselves, may in its first meaning have been applied to the *notæ* of Tacitus (*Germ.*, c. 10), which were cut on staves and used for divination by the priests for sorcery and as charms. Whether the *runes* were already known at the time of Tacitus is very doubtful, though the Germans were not ignorant of writing; the *litterarum secreta* (*Germ.*, c. 19) refers to secret correspondence. The investigations of Kirchhoff and Wimmer are the only ones that satisfactorily account for the origin of the *runes*; the Latin alphabet of the early empire is the source of the twenty-four *runes* of the oldest alphabet. The question as to the date of its introduction is more difficult to settle. The fact that Ulfilas (died 381 A. D.) chose two *runic* characters in devising his Gothic alphabet justifies us in fixing the date with certainty as early as the close of the second century. That this alphabet was common to all Germanic peoples is proven by the corresponding names of the letters and by the inscriptions on three monuments: the Swedish *bracteæ* of Vadstena, with twenty-three signs; the clasp found at Charnay, in Burgundy, with twenty *runes*; and the short sword found in the Thames, containing twenty-eight characters. The first two are the older, and date probably from the seventh century. The latter inscription (about 800 A. D.) slightly deviates from the original order, and shows

on the shores of Lake Ladoga, he and his brothers Sineus and Truvor crossed the Baltic and subjugated this region. He soon extended his dominion to the east and south, and in 862 he established himself in Novgorod and ruled the country as absolute monarch until his death, which occurred about 880. His descendants ruled Russia for more than 700 years until 1598, and Russian princes still trace their pedigrees to Rurik. See RUSSIA; also C. C. Rafn, *Antiquités Russes*.

RASMUS B. ANDERSON.

Rush [M. Eng. *rusche*, *rische* < O. Eng. *risce*. Cf. Lat. *ruscum*, butcher's broom, whence probably the O. Eng. form]; any plant of a family (*Juncaceæ*) of monocotyledonous herbs, of which the genus *Juncus* is the type; also any one of various plants belonging to the *Cyperaceæ* (mostly species of *Scirpus*), with naked, tough, and flexible stems. There are many species, mostly in wet and cold regions. They are employed in making chair-bottoms, mats, etc. Rushes are used in Europe for strewing the floors of cottages instead of carpets. The pith of some kinds is used sometimes for a candle-wick; hence the name rushlight. Most of the numerous species found in the U. S. are also European and Asiatic. *Juncus bulbosus* is the black grass of the salt-marshes, and makes excellent hay. *Scirpus lacustris* is called bulrush in the East, and tule in California, where it covers vast areas of wet land.

Revised by CHARLES E. BESSEY.

Rush, BENJAMIN, M. D., LL. D.: signer of the Declaration of Independence; b. at Byberry, near Philadelphia, Pa., Jan. 4, 1746; graduated at Princeton 1760; studied medicine at Philadelphia, Edinburgh, London, and Paris; began practice at Philadelphia Aug., 1769, being at the same time chosen Professor of Chemistry in the medical college of that city; was a member of the provincial conference of Pennsylvania 1776, in which he moved the resolution to consider the expediency of a declaration of independence; was chosen to the Continental Congress to fill a vacancy in June, and was one of the signers of the Declaration of July 4, 1776. He was surgeon to the Pennsylvania navy 1775-76, was appointed in Apr., 1777, surgeon-general, and in July physician-general, of the military hospitals for the middle department; resigned that post Feb., 1778, and resumed his duties as professor and practitioner in Philadelphia; established in 1785 the first dispensary in the U. S.; was a member of the Pennsylvania convention of 1787 for the ratification of the Federal Constitution; published four letters to the people of Pennsylvania pointing out the defects of the Constitution of 1776; sat in the convention which formed the constitution of 1780; exchanged his professorship for that of the theory and practice of medicine on the death of Dr. John Morgan, Oct., 1789; rendered eminent services to humanity during the yellow-fever epidemic of 1793, which were subsequently recognized by testimonials from the King of Prussia (1805), the Queen of Etruria (1807), and the Emperor of Russia (1811); was one of the founders of Dickinson College, vice-president of the Philadelphia Bible Society and of the American Philosophical Society, president of the Philadelphia Medical Society and of the Society for the Abolition of Slavery, and was treasurer of the U. S. mint from 1799 until his death, in Philadelphia, Apr. 19, 1813. From his nineteenth year he was a frequent writer upon professional, scientific, political, religious, social, and ethical topics. Selections from his productions were republished under the title *Medical Inquiries and Observations* (5 vols., 1789-98; 2d ed., 4 vols., 1804; 3d ed., 4 vols., 1809), and the best of his miscellaneous works were collected by himself into three vols., *Medical Inquiries and Observations upon the Diseases of the Mind* (1812; 5th ed. 1835); *Sixteen Introductory Lectures to Courses of Medicine* (1811); and *Essays, Literary, Moral, and Philosophical* (1798; 2d ed. 1806). He had published an early volume of *Medical Tracts*, and left unfinished a treatise on *The Medicine of the Bible*.

Rush, RICHARD: statesman; son of Dr. Benjamin Rush; b. in Philadelphia, Pa., Aug. 29, 1780; graduated at Princeton 1797; was admitted to the Philadelphia bar 1800; became attorney-general of Pennsylvania Jan., 1811; comptroller of the State treasury Nov., 1811; was Attorney-General of the U. S., Feb. 10, 1814-Dec. 15, 1817, having temporarily acted as Secretary of State in the latter year; was minister to England 1817-25; negotiated treaties respecting the fisheries (1818), the northeastern boundary, the Oregon question, and the slaves carried from the U. S. in British vessels after the Treaty of Ghent; was Secretary of the Treasury under President J. Q. Adams 1825-29; was a

candidate for the vice-presidency on the ticket with Adams 1828; negotiated in Holland a loan for the corporations of the District of Columbia 1829; was a commissioner to adjust the boundary between Ohio and Michigan 1835; went to Great Britain in 1836 as commissioner to lay claim to the chancery court to the Smithsonian legacy (see SMITHSON, JAMES); returned with the money Aug., 1838; was minister in France 1847-51, after which he spent his closing years in retirement at Sydenham, near Philadelphia, where he died July 30, 1859. He wrote much in periodicals in support of the war of 1812, against the U. S. Bank, and on other subjects; superintended the publication of an edition of the laws of the U. S. (5 vols., Philadelphia, 1815); edited a pamphlet, *Washington in Domestic Life, from Original Letters and Manuscripts* (1857), and published two volumes of reminiscences of court life in London. His sons published in 1860 his *Occasional Productions, Political, Diplomatic, and Miscellaneous*.

Rushville: town; capital of Schuyler co., Ill.; on the Chi., Burl. and Quincy Railroad; 11 miles N. W. of Beardstown, 50 miles E. N. E. of Quincy (for location, see map of Illinois, ref. 6-C). It is in a coal-mining, grain, and fruit-growing region, and contains a number of manufactories, a State bank with capital of \$25,000, a private bank, a public library, and a tri-weekly, a monthly, and two weekly periodicals. Pop. (1880) 1,662; (1890) 2,031.

Rushville: city; capital of Rush co., Ind.; on Flat Rock creek, and the Cin., Ham. and Dayton, the Cleve., Cin., Chi. and St. L., the Ft. Wayne, Cin. and Louisv. and the Pitts. Cin., Chi. and St. L. railways; 39 miles E. S. E. of Indianapolis, 84 miles N. W. of Cincinnati (for location, see map of Indiana, ref. 7-F). It is in an agricultural region; has manufactories of flour, lumber, furniture, bent wood, washing-machines, clay-working machinery, drain-pipe, shirts and trousers, extension-tables, and other articles; and contains electric-light and natural-gas plants, 8 churches, 2 national banks with combined capital of \$200,000, a private bank, and a semi-weekly and 2 weekly newspapers. Pop. (1880) 2,515; (1890) 3,475; (1894) estimated, 4,000.

EDITOR OF "REPUBLICAN."

Rushworth, JOHN: historical writer; b. in Northumbria, England, about 1607; educated at Oxford; studied law at Lincoln's Inn; began in 1630 to take notes of proceedings in the higher courts and in Parliament; was assistant clerk to the Long Parliament; became secretary to Lord Fairfax; took an active part in negotiations during the civil war; was for many years a member of Parliament; and afterward secretary to Lord Keeper Bridgman, but becoming involved in debt spent his last years (from 1644) in the King's Bench prison, London, where he died May 12, 1690. In 1659 he began the publication of *Historical Collections of Private Passages of State, Weighty Matters of Law, and Remarkable Proceedings in Five Parliaments* (from 1618 to 1648); issued vols. ii. and iii. in 1680, and in the same year his *Tryall of Thomas, Earl of Strafford*. He left in MS. the materials for vols. iv. and v., which were issued in 1692, and for vols. vi. and vii., completing the work, which appeared in 1701. A new and better edition of the whole, together with the *Tryall*, was reprinted in 1721 (7 vols. folio).

Rusk: town; capital of Cherokee co., Tex.; on the St. Louis S. W. Railway; 16 miles S. E. of Jacksonville (for location, see map of Texas, ref. 3-J). It is in an agricultural and iron-mining region; contains a branch of the State penitentiary, the convicts of which are chiefly employed in developing the iron interests of the vicinity; has an iron furnace at the penitentiary and another between Rusk and New Birmingham, and a national bank with capital of \$50,000, a private bank, and two weekly newspapers. Pop. (1880) 626; (1890) 1,383.

Rusk, JEREMIAH MCCLAIN: agriculturist; b. in Morgantown, O., June 17, 1830; brought up on a farm; at fifteen became a driver of a stage-coach between Zanesville and Newark; removed to Wisconsin 1853, where he managed a farm and drove a stage; elected sheriff 1855; member of Wisconsin Legislature 1861; enlisted in Twenty-fifth Wisconsin Volunteer Infantry 1862; served to the close of the war, obtaining the rank of brigadier-general; elected State bank comptroller of Wisconsin 1865; re-elected 1867; elected to the Forty-second Congress by the Republicans 1870; re-elected to the Forty-third and Forty-fourth Congresses; elected Governor of Wisconsin 1881; twice re-elected. The

Department of Agriculture was created a month before the inauguration of President Harrison (1889), on whose second-year office of secretary of the department was transferred to him, from whom he occupied it until the close of the administration. D. at Virginia, Wis. See 21, 2009. U. S. T.

Rusk, Thomas (JEREMY) U. S. Senator; b. at Camden, N. C. Aug. 8, 1802; became a lawyer in Georgia; and in 1836-37 was a member of the convention that declared Texas independence Mar. 1836; was the first secretary of that body; member of the army at San Antonio after Gen. Houston was wounded; became chief justice of Texas; was member of the convention which effected annexation to the U. S. 1846, and U. S. Senator 1846-50. D. at New Orleans, La., July 29, 1850.

Ruskin, John, an artist, b. in London, England, Feb. 8, 1819; only son of a wealthy wine-merchant, a Scotsman actually from whom he derived an childhood a fondness for art, and from whom he inherited a fortune of £200,000, most of which he has spent in libraries and philanthropic schemes and for the promotion of animal art. He accompanied his father on many of his professional trips through France and Scotland, and afterward on pleasure-tours to France, Switzerland, and Northern Italy, studying architectural remains and mountain scenery, and making drawings after French sketches in Florence and Germany, and the House of the Tower in Rogers's Italy, a copy of which was then presented to him on his fourteenth birthday. In 1839 he entered Christ Church, Oxford, where he graduated in 1842. His first gained the Newdigate prize in 1840 by a poem entitled *Natalis et Elephas*. Up to 1844 he continued to write verse for *The Keepsake*, *Friendship's Offering*, and other annuals and miscellaneous periodicals. A collection of his poems was issued in 1850 and another in 1851, but Ruskin's poetry is amateurish and comparatively unimportant.

The first drew public attention by his *Modern Painters* (4 v., 1840; 11, and 12, 1856; v., 1860). This was a criticism of the superiority of Turner and his school in the art of landscape-painting to all the ancient masters. The discovery of the book, and Ruskin's lifelong message in *Modern Painters*, "simplicity." He attacked academic traditions and the authority of Claude and Poussin, and insisted upon the duty of the artist to render not merely the general but the specific truth of rocks, plants, cloud-shapes, and other landscape details, treating nature with humble and loving study, "admiring nothing, rejecting nothing." In preparation for the later volumes of *Modern Painters* and for the other works that followed the author spent many years in the study of art, residing for protracted periods in Italy, where a great deal of mountain-climbing among the Alps, and during the pastimes with sketches. He is an accomplished draughtsman, but has used his pencil almost entirely for the purpose of illustrating his own books on art, among which are *The Seven Lamps of Architecture* (1849); *The Stones of Venice* (vol. 1, 1851; 11, and 12, 1853); *Practical Treatise* (1851); *Tracts and His Works in Prose* (1851-52); *The Elements of Drawing* (1857); *The Political Economy of Art* (1857); second series of *Notes on the Exhibition of the Royal Academy and the Society of Painters in Water-colours* (1855-56); *The Two Paths* (1859); *The Elements of Perspective* (1859); *Lectures on Art* (1870); *Aratra Pentecostes* (1872); *The Relation between Michael Angelo and Nature* (1873); *The Lure of Power* (1877-78); *The Art of England* (1883); *Verona and other Lectures* (1885); besides many essays, reports, and catalogues of Turner's works and of other collections, numerous addresses, and articles in numerous relating to different branches of the fine arts. He has also delivered a series of lectures on architecture and painting at Edinburgh; was appointed professor at the Edinburgh School of Art in 1859; became Referee Lecturer at Cambridge in 1867; was elected to the Slade professorship in the fine arts at Oxford in 1869, and re-elected in 1873. He resigned the Slade professorship in 1878, was again re-elected in 1883, and resigned it finally at the end of the following year in consequence of the vote following violence in the university, a measure against which he strongly protested. See *The Bishop of Oxford and Prof. Ruskin on Violence* (1880).

The movement known as Pre-Raphaelitism, was largely due to a study of Ruskin's earlier works, and received his moral support. (See PRE-RAPHAELITISM.) In 1871 he gave £1000 for the endowment of a professorship of drawing in the Bodleian Library, Oxford. Since 1880 his writings have taken

a wider range, including speculations in ethics, social science, and political economy, with studies in mythology, botany, and miscellaneous subjects, set forth in a multitude of little volumes under various titles, such as *Unto this Last* (1890); *Modern Painters* (1892-93); *Sesame and Lilies*, one of his most popular works (1895); *The Ethics of the Dust* (1896); *The Crown of Wild Olive* (1896); *The Queen of the Air* (1900); *The Eagle's Nest* (1902); *Lionel Lincoln* (1873), part III, 1891; *Proserpine* (1875-76); *Demselm* (1875-84); *St. Mark's Reef* (1874-84), etc. In these writings the influence of Carlyle is plainly seen. The author denounces competition in trade and the laissez-faire theory in government; approves of paternalism and a modified form of state socialism, and praises the guild system of the Middle Ages; declines against railways, factories, and machinery, and proposes to restore artistic handwork by trained workmen. From 1871 to 1894 he published a series of letters, at first monthly and afterward at irregular intervals, entitled *Fare Thee Forward*, addressed to workmen, in viting them to join him in establishing a fund for resuscitating English country life from the tyranny and enslavement of machinery. In pursuance of this object, the St. George's Guild was formed, Ruskin devoting to it £7,000. Trustees were chosen to administer the fund; a building was bought at Walkley, in the suburbs of Sheffield, for use as a museum; and the money subscribed has been used to promote co-operative experiments in agriculture, manufacturing, and education.

Ruskin is one of the greatest modern masters of English prose, especially in the department of imaginative and poetic description. His influence as a thinker has been impaired by his whims and vagaries, his puzzling contradictions, and his overvolvement of statement. His strong religious feeling has coexisted with heterodox views in theology; his moral earnestness has led him to identify good art with good ethics; while in politics his description of himself as a "knot of men" and a "violent Hilbert" has been means prevented him from holding some very un-Toryish opinions. Of late years he has lived mostly in retirement at Brantwood, a property which he bought in 1871, at Coniston, in the English lake-country. Among his numerous publications should also be mentioned *The King of the Golden River* (1851), a favorite fairy tale which has been through many editions; *Arctura of the Chace* (1880), a collection of his letters in two volumes; and the fascinating but incomplete *Proserpine* (1885-89), an autobiography issued in twenty-eight parts. See also *The Life and Work of John Ruskin*, by W. G. Collingwood (2 vols., Boston and New York, 1899).

H. A. BEERS.

Russell, Charles Russell, Baron; jurist; b. at Newry, Ireland, in 1858; was educated at Trinity College, Dublin, and after graduating became a writer of political articles for a Catholic journal. Admitted to the bar in 1880, he won recognition by his lucidness as a cross-examiner and power as an advocate, and was appointed queen's counsel in 1872. He sat in Parliament in the Liberal interest from 1880 till 1890, when he was appointed Attorney-General in Gladstone's cabinet, and received the honor of knighthood. Among the many famous cases in which he has appeared was the Parnell investigation, in which he acted as Parnell's counsel, and made a marked impression by his eloquence. He also appeared for the defense in a sensational larceny case in 1892. On the return of the Liberals to power in that year, he was again appointed Attorney-General, and on the death of Lord Coleridge in 1894 he was made lord chief justice and created a baron.

Russell, John, R. A.: painter and draughtsman in pastel and crayon; b. at Guildford, Surrey, England, Mar. 29, 1745. He was sent to the studio of Francis Cotes, R. A., in London, and worked under him, as pupil and assistant, until 1767, when he received his first order to paint portraits at Lord Montagu's house at Cowdray. He continued work at Guildford, and returned to London in 1768. At this time he was a most ardent religious reformer. In 1770 he was married, and in 1772 was made an associate of the Royal Academy. Little of his painting of this epoch is preserved or is accessible. From the year of his becoming an A. R. A. he exhibited at the Royal Academy every year until his death, often sending the full number of eight pictures. In 1780 he was made an academician. He enjoyed great popularity as a portrait-painter, and obtained prices equal to those paid to Sir Joshua Reynolds; the first portrait-painter of the time and president of the Royal Academy. He published a

work on oil-painting, and one which had a large circulation on pastel, under the title *Elements of Painting with Crayons*. He was greatly interested in astronomy, and drew and engraved a lunar map and also an elaborate machine called the selenographia, for showing the moon's phases. D. Apr. 20, 1806. In the National Portrait Gallery, London, are portraits in oil-color of *William Wilberforce* when a child, and the *Rev. Dr. Dodd*; also a pastel portrait of *Richard Brinsley Sheridan*, the dramatist and orator. At the Royal Academy permanent exhibition is Russell's diploma picture, *Ruth and Naomi*, in pastel. At the South Kensington Museum are several pastel drawings. In the Louvre is a pastel painted in 1781, *A Child holding Cherries*. The greater number of the pictures known to exist are in private collections. A valuable monograph on the artist and his work, with many illustrations, has been published by George C. Williamson (London, 1894).

RUSSELL STURGIS.

Russell, JOHN RUSSELL, Earl: statesman; third son of the sixth Duke of Bedford; b. in London, England, Aug. 18, 1792; educated at Westminster School and at the University of Edinburgh; traveled in Spain and Portugal during the Peninsular war 1809-10; entered Parliament as a Whig 1813, representing the family borough of Tavistock; displayed great zeal in his opposition to the Tory ministry and in advocacy of Roman Catholic emancipation and parliamentary reform; became intimate with the literary men of the time; published the *Life of his ancestor, William, Lord Russell* (1819), *An Essay on the History of the English Government and Constitution* (1821), *Memoirs of the Affairs of Europe from the Peace of Utrecht* (2 vols., 1824-29), and several other works; was the parliamentary leader of the great movement which effected in 1828 the repeal of the Test and Corporation Acts, in 1829 the emancipation of the Roman Catholics, and in 1832 laid the foundation of the modern era of English history by the long-delayed victory of the Reform Bill. In 1830-34 Lord John Russell was paymaster of the forces in the Grey administration; was Secretary of State for the Home Department 1835-39, and afterward for War and the Colonies (1839-41) in the second Melbourne ministry, of which he was the leader in the House of Commons. He carried several important measures of reform in regard to ecclesiastical and municipal affairs, education, marriage, and civil and criminal law; was returned to Parliament in the election of 1841 for the City of London, which he continued to represent for many years; was the leader of the opposition to the Peel ministry 1841-45; declared in favor of the immediate repeal of the Corn-laws Nov., 1845, upon which basis he was invited to form a ministry Dec., 1845, but failed through the dissensions of Earl Grey and Lord Palmerston, and had to yield to Sir Robert Peel the honor of procuring the enactment of the repeal. Upon the dissolution of the old Tory party in 1846, Lord John Russell became Prime Minister and First Lord of the Treasury, and conducted the affairs of state through the difficult period embracing the Irish famine, the Chartist agitations, and the continental revolutions of 1848-49. His ministry was overthrown in Feb., 1852, but the Earl of Derby having been unsuccessful in his attempt to carry on the government, the Aberdeen cabinet was formed Dec., 1852, in which Lord John Russell accepted the position of Secretary of Foreign Affairs. He introduced a new Reform Bill 1854; became Colonial Secretary in the first Palmerston ministry Feb., 1855, and soon afterward went as commissioner to the Vienna Conference, intending to put an end to the Crimean war, but lost public favor by his support of the Austrian programme, and retired from the cabinet July 16. In June, 1859, he returned to office as Secretary of Foreign Affairs in the second Palmerston ministry; was elevated to the peerage as Earl Russell of Kingston-Russell July, 1861; favored the cause of Italian unity and independence, and protested against the annexation of Nice and Savoy by France; incurred severe criticism by his course toward the U. S. during the civil war, especially in the Trent and Alabama affairs, as also by his fruitless manifestations of sympathy for Poland and Denmark in their struggles with Russia and Germany. On the death of Lord Palmerston, Earl Russell again became Prime Minister, Oct., 1865, Mr. Gladstone being, however, the real leader of the cabinet, which resigned in June, 1866. After that period he accepted no office, but took an active part in the debates of the House of Lords and devoted himself anew to literature. He edited the *Correspondence of John, Fourth Duke of Bedford* (3 vols., 1842-46), the *Memorials and Correspondence of C. J.*

Fox (4 vols., 1853-57), the *Memoirs, Journal, and Correspondence of Thomas Moore* (1852-56) and selections from his own *Speeches and Dispatches* (1870); and wrote the *Life and Times of C. J. Fox* (1859-66), *The Rise and Progress of the Christian Religion in the West of Europe* (1873), and an autobiographical work, *Recollections and Suggestions, 1815-73* (1875). D. at Richmond Park, Surrey, May 28, 1878.

Revised by F. M. COLBY.

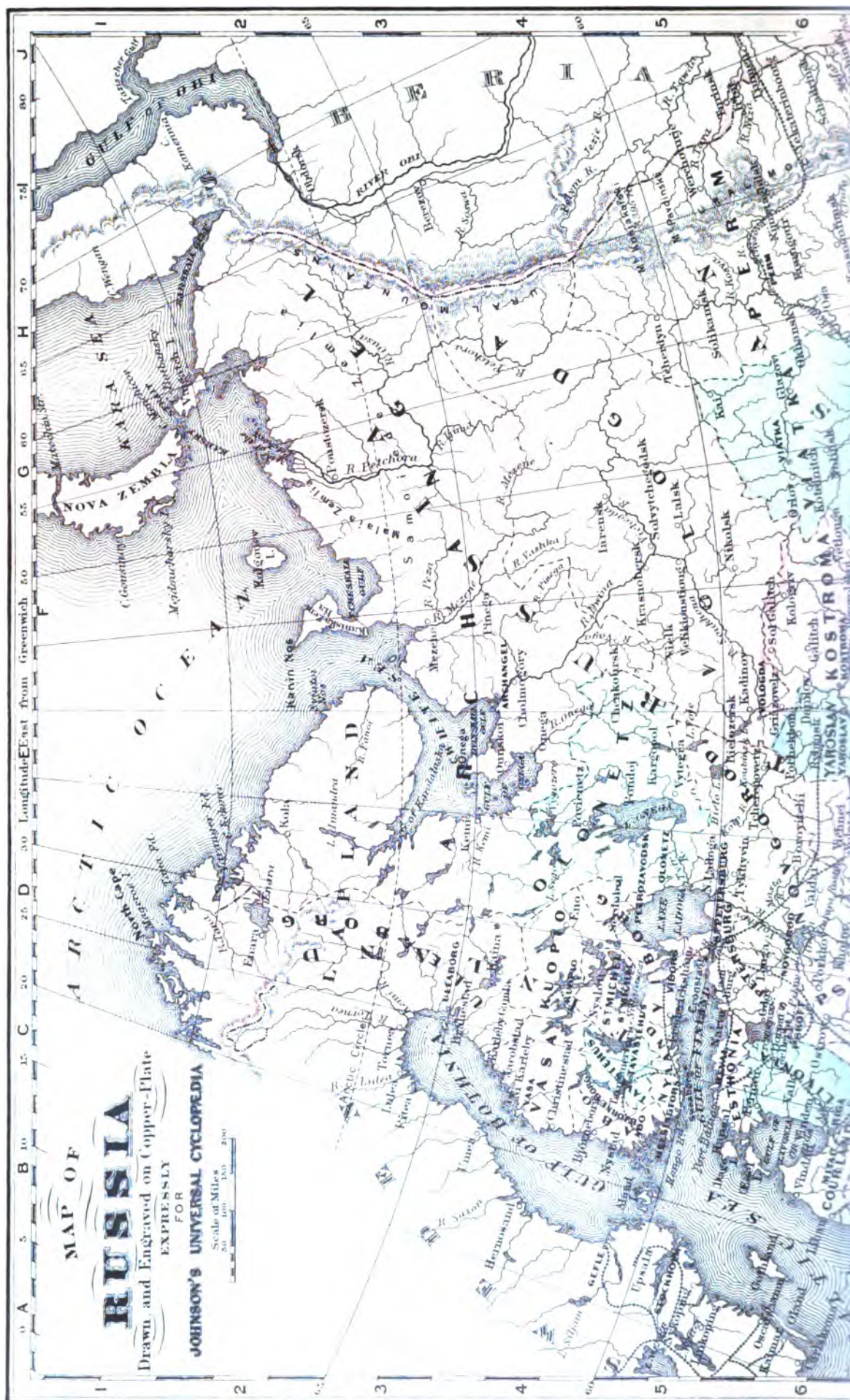
Russell, JOHN SCOTT, F. R. S.: naval engineer; b. in the Vale of Clyde, Scotland, in 1808; studied at the Universities of Edinburgh, St. Andrews, and Glasgow, graduating at the latter 1824; devoted himself to applied mechanics, engineering, and natural philosophy; delivered a course of lectures on the last subject in the University of Edinburgh in 1832; engaged at Edinburgh in the construction of small steam-boats for canal and river navigation, and of steam-carriages which ran upon the common roads between Paisley and Glasgow; introduced the wave system into the construction of ocean steamships 1835; established himself in London 1844 as a builder of the largest class of steamships, and built the Great Eastern, which was designed by Brunel upon his system; read in 1857 to the British Association a paper upon *The Mechanical Structure of the Great Ship*; was one of the founders of the Institution of Naval Architects, of which he was vice-president, and contributed largely to its *Transactions*. He published an elaborate and costly illustrated work, *The Modern System of Naval Architecture for Commerce and War* (1864) and of *Systematic and Technical Education for the English People* (1869). He was well known as a philanthropist. D. in the Isle of Wight, June 8, 1882.

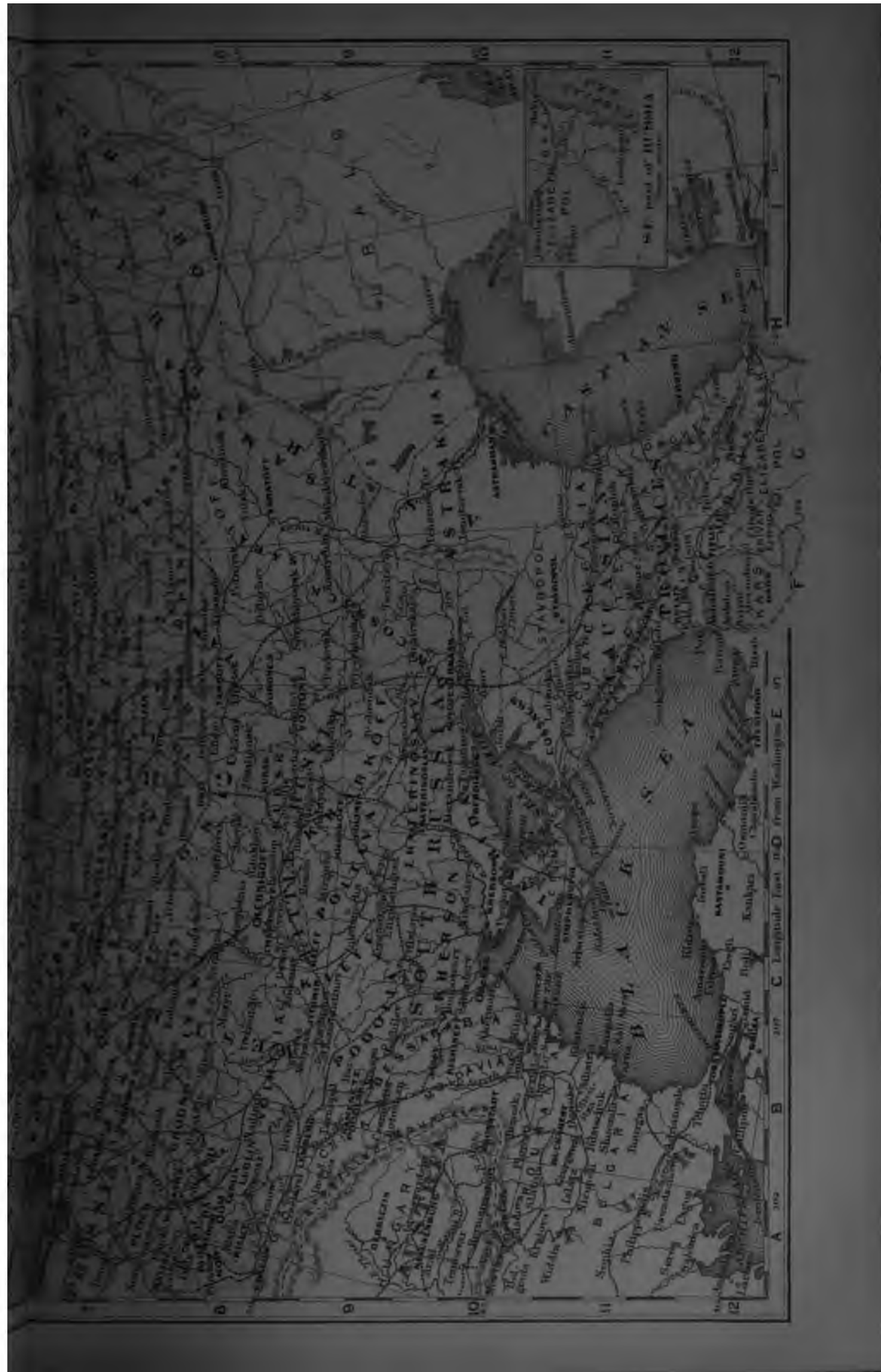
Russell, JONATHAN, J. L. D.: statesman; b. at Providence, R. I., in 1771; graduated at Brown University 1791; studied law, but exchanged its practice for commercial pursuits; was an accomplished and effective writer and an active politician; was U. S. minister to Sweden 1814-18; signed the Treaty of Ghent 1814 as one of the five American commissioners, and was member of Congress 1821-23. D. at Milton, Mass., Feb. 19, 1832.

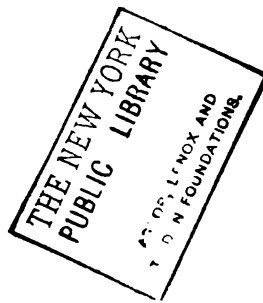
Russell, WILLIAM, Lord: statesman; son of the fifth Earl of Bedford; b. in England, Sept. 29, 1639; educated at Cambridge; entered Parliament 1660; married Lady Rachel, daughter of Thomas Wriothesley, Earl of Southampton, and widow of Lord Francis Vaughan, 1669; first became prominent in 1673 as one of the leaders of the Protestant or "country party," which carried on a vigorous opposition to the unscrupulous measures of the court; proposed in Nov., 1678, the removal of the Duke of York from the royal councils, and on June 16, 1680, appeared before the king's bench in Westminster to present that prince as a recusant, and headed the deputation of 200 members of the House of Commons which carried up to the House of Lords the bill for the exclusion of James as a papist from the succession. When a reaction had set in against the Protestant alarmists, the court determined to be revenged upon Russell, Sidney, and other prominent Whigs, who were accordingly accused by suborned witnesses of participation in the Rye House plot. Arraigned for treason at the Old Bailey, July 13, 1683, Russell was refused counsel, but his wife was permitted to act as his secretary during the trial. Condemned to death and attainted July 14, he was beheaded in Lincoln's Inn Fields July 21, 1683. The trial was in violation of the forms of law, and no evidence was given to prove him guilty of the specific offense charged—i. e. conspiring against the life of the king. His attainder was reversed after the revolution of 1688, and in 1694 his father was made Duke of Bedford, to which title Lord William's son, Wriothesley, succeeded. Lady Russell, born 1636, survived her husband forty years, and died at Southampton House, Sept. 29, 1723. Her *Letters to her husband* were published 1773, became widely popular, and have been often reprinted. See *Life of Lord Russell*, by Lord John Russell, 1819.

Russell, WILLIAM CLARK: novelist; b. of English parents, in New York, Feb. 24, 1844. He spent much of his early life at sea, and afterward resided near Ramsgate, England, and became a contributor, mainly on nautical topics, to London journals. He has published a large number of sea stories and novels, including *The Wreck of the Grosvenor* (1878); *A Sailor's Sweetheart* (1880); *My Watch Below* (1883); *A S. S. Queen* (1883); *Round the Galley Fire* (1883); *Jack's Cruise* (1884); *The Frozen Pirate* (1887); *The Death Ship* (1888); *Marooned* (1889); *The Romance of Jenny Harlow* (1889); and *The Good Ship Mohock* (1895). H. A. BEERS.









BOOTH, WILLIAM HOWARD, LL.D., journalist; b. in London, England, Mar. 28, 1871. He was educated at Trinity College, Hartford, Conn.; came to England in 1892 and after several years as reporter and correspondent to the *London Times*, the *Standard*, *Manchester*, and *Morning Chronicle*, became permanently attached to the staff of *The Times* in 1897. He was special correspondent of that journal in the Crimea (1894-95), in India during the Boer mutiny (1907-09), and in the U. S. during the civil war (1861), where he earned his acquaintance of both Ben. Russell. He was also war correspondent of the *London Times* in the Franco-German war of 1870, and in 1870 became honorary secretary to the League of Wales, whom he accompanied on his visit to India. He has published his *Travels in the Crimea* (1894-95); *My Diary in India*; *My Diary during the Boer Mutiny* (1870); *The Peace of Wales's Time* (1877); *Russians* (1894), etc. In 1900 he established *The Army and Navy Chronicle*. H. A. RABIN.

Russellville, town; Pop. 100; Ark.; on the Burlington and Russellville, and the St. L., Iron Mt. and Southern railroads, 73 miles N. W. of Little Rock, the state capital (for location, see map of Arkansas, ref. 2-4). It contains cotton, wool and grain mills, a national bank with capital of \$250,000, a state bank with capital of \$100,000, and a weekly and a semi-weekly periodical. Pop. (1890) 825; (1900) 1,321.

Russellville, town; capital of Logan co., Ky.; on the Louisville and Nashville Railroad; 23 miles W. S. W. of Bowling Green, 50 miles N. W. of Nashville, Tenn. (for location, see map of Kentucky, ref. 5-16). It contains Bethel College (Baptist, organized in 1824), Logan Female College (Methodist Episcopal church, chartered in 1867), flour-mills, saw-mills, and a lumber factory; 3 main banks with combined capital of \$150,000, and 2 weekly newspapers. Pop. (1890) 1,100; (1900) 2,254.

Russia, the largest continuous empire in the world; covers Eastern Europe and Northern Asia; occupies about one-fourth of the earth's total land-surface, and extends from lat. 36° 30' to 77° 30' N., and from lon. 17° 38' E. to 120° W. It has an extreme length from W. to E. of 6,000 miles, and a width from N. to S. of 2,300 miles. It is bounded N. by the Arctic Ocean, E. by the Pacific, S. by China, S. W. by Persia, Persia, Asia Minor, Turkey, and the Black Sea, W. by Germany, Austria, Germany, the Baltic, and the Scandinavian Peninsula. Area, 8,645,800 sq. miles (including the Sea of Azov, 14,478 sq. miles, of which 6,264,778 belong to Asiatic Russia, including Siberia, Transcaucasia, the entire region of Caucasus (q. v.), and the Trans-Caspian region, and 2,081,031 sq. miles to European Russia, to which this article is mostly restricted).

Physical Features.—European Russia forms one vast plain, broken occasionally by minor table-lands like the Volga hills in Novgorod and Tver, and stretching to the East Mountains on the east and the Caucasus in the southwest, which form the conventional division between Europe and Asia. In the Crimea is the isolated chain of the Taurus Mountains, rising at one point 5,000 feet. In the southwest are some slight spurs of the Carpathian Mountains and in the northwest branches of the Scandinavian range. To the north and northwest the plains are marked by immense forests and numerous lakes; to the south by dry and treeless steppes. In the middle, western, and central southern regions is the fertile wheat land. From a broad central plain the country naturally divides itself into the four great basins of the Arctic Ocean, the Baltic, the Black and the Caspian Seas, traversed by the greatest rivers of Europe, the Volga, Dnieper, and the Arctic is crossed by the Ural, Volga, Mezen, and Pechora. The Baltic receives the Neva, Düna, Niemen, and Vistula. To the Black Sea flow the Pruth, Dniester, Bug, Dniester, and Don, and into the Caspian empty the Don and the Volga, which is the great water highway of Russia.

Geological Structures.—This embraces almost every formation, but inasmuch as these cover one another horizontally it is marked by simplicity and immensity. The Tertiary formations cover much of South Russia and extend to Lithuania and Poland. The Silurian system, concealed in large part by more recent deposits, appears on the surface in the Caucasus, Crimea, and the district of St. Petersburg. In the north the granite and the Permian formations prevail. The chain of the East Mountains exhibits the Silurian group, with evidence of the most ancient period. The Crimea has the Jurassic formation which, with cretaceous rocks, makes the Caucasus. Carboniferous deposits cover

much of Eastern Russia. There are three important coal-bearing regions, the Donetz and Moscow basins and the Ural.

Climate.—Climatic conditions, while exceedingly uniform over wide expanses, nevertheless present great differences in the extremes. Cold winters and hot summers are the rule. The mean temperatures of the hottest and coldest months in the different parts of the country vary as much as 60° in many localities. Fluctuations of temperature exceed those in any other part of the earth's surface. There is a portion of the great domain in which tropical plants can be raised, but there is a small area in the south in which the climate corresponds to that of Central Italy or the eastern shore of Virginia. The mean yearly temperature varies from 28° F. in the far northwest to 50° on the southeastern coast of the Black Sea, and between 30° F. in the government of Perm and 50° on the coast of the Caspian; the January temperature between 32° in the governments of Orenburg and Ekibastuz, and 42° in Crimea; the July temperature from 60° in the southern parts of the governments of Archangel and Ustusky to 77° at Astrakhan. A notable climatic condition of Central Russia is that the winter temperatures rapidly decline from W. to E., as marked is this that N. of 60° the temperature sinks faster from W. to E. than from N. to S. The most favored locality of the whole empire in climate is probably the government of Volhynia and adjacent regions.

Soil.—In regard to the composition, properties, and fertility of the soil, Russia may be divided into two vast regions by a boundary taking in the main a direction from S. W. to N. E., from Bessarabia to Ufa, presenting, however, considerable deviations, the soil of the southern region sometimes encroaching upon the northern, and vice versa, and in places each appearing in isolated patches in the midst of the other. The southeastern half is commonly called the region of the Chernozem or "black earth," the northwestern half of the non-Chernozem lands. In a botanical-geographical sense this difference in soils corresponds almost exactly to the division of Russia into the steppe (Chernozem) region and the forest-land region. Within the Chernozem region there occur considerable areas of gray forest land, also of lime soil, the largest of the latter being in the valley of the Volga below Samarkand. Salt-marshes occur in patches, and vary in amount of their saline ingredients to such an extent that while some are unproductively fertile others are entirely barren. In the northern region, the non-Chernozem, all possible soils are found, beginning with a heavy clay and ending with fine sand, including soils so rocky that their cultivation is impossible until after the removal of the stone. Formerly all of this region was covered by forest, and owing to this condition it has undergone less change than that of Southern Russia.

Agriculture.—In the greater portion of Russia the conditions of climate and soil permit of agricultural development. Cotton and rice are among the productions of the empire, and are to be found growing farther N. than in the U. S., or perhaps any other part of the world, appearing above 45° in the Trans-Caucasian region. The cereals can also be cultivated much farther N. than elsewhere on the globe, except Scandinavia. The most valuable portion of the empire is that S. of the Volga hills and of Moscow, extending to the Volga on the E. and to the frontier of Galicia on the W., and including the country of the Don almost to the Sea of Azov. The wheat grown in this region is exported in vast quantities to Europe and Asia, and also distributed to the less fertile parts of Russia. Besides wheat, rye, oats, barley, and maize are pretty generally grown, and the products far exceed the home consumption. In the Baltic provinces flax, hemp, and hops are cultivated. In Bessarabia and the Crimea vineyards are maintained with great success, and the vine is much grown in districts far more northern, even where it has to be laid upon the ground and covered in winter. The potato is everywhere raised, and the cultivation of the beetroot, for the manufacture of sugar, has become a very important branch of agriculture. Excellent apples, pears, apricots, peaches, plums, and cherries are grown in Bessarabia, the Crimea, and Taurida. Tobacco is cultivated along the Volga and the Don and in Bessarabia to the average annual amount of 1,280,000 cwt. The amount of the principal crops of European Russia (exclusive of Finland) for the year 1892 was, in quarters: Wheat, 31,515,000; rye, 78,000,000; barley, 25,730,000; oats, 38,087,000; potatoes, 83,307,000; various other crops, 20,000,000. For 1894, according to the estimates of the Minis-

ter of Agriculture, the production was, in bushels, wheat, 272,000,000; rye, 792,000,000; oats, 672,000,000; and barley, 176,000,000.

The ownership of the 1,098,507,780 acres of land (exclusive of Arctic islands and of 40,925,060 acres forming the pasture-grounds of the Kalmucks and Kirghiz) comprising European Russia proper was in 1892 distributed as follows: The state, 410,801,867; the imperial family, 19,890,835; the peasants, 373,310,496; private owners, 294,504,582. The area unfit for cultivation, in roads, etc., was 210,058,770 acres (19.1 per cent.). The amount of arable land was 287,969,552 acres (26.2 per cent.), orchards, meadows, grazing, etc., 174,958,734 (15.9 per cent.), forest, etc., 425,520,714 (38.8 per cent.).

The raising of stock constitutes a very important branch of farming, sometimes intimately related to agriculture and sometimes an independent and exclusive occupation of the peasant. In the northwestern governments, in the Baltic provinces, and in Finland, the most important branch is the dairy and the fattening of cattle for slaughter. In the southeastern districts and in Bessarabia work cattle and horses are of great importance, but sheep-breeding for wool is also a profitable industry. In Northeastern Russia the breeding of horses for work purposes heads the other departments of stock-raising, but milch cows are also largely raised for the production of high-grade butter and cheese. In the central region the fertility of the soil precludes profitable herding on a large scale, but the breeding of milch cows, the fattening of fine heaves and hogs, and the raising of good trotters and of large draft horses are much developed. In the southern and southeastern steppe districts, and also in the region of the Don, herding is of great importance, owing to the great amount of pasture land, but the most extensive branch there is that of herding fine-wool merino sheep, exclusively confined to rich estates, the peasants raising as a rule only horned cattle. Horse-breeding is also centralized in this region. In 1888 European Russia, including Finland, but not Poland, had 21,156,000 horses, 29,190,000 cattle, 49,252,000 sheep, 10,928,000 swine, 26,000 camels, 1,409,000 goats, and 335,000 stags. The wide range of stock-raising in Russia is indicative of the vastness of the country and the extremes of its climate. Thus while reindeer are largely kept in the north, camels are extensively herded in Caucasasia and Turkestan. Of wild animals the ermine, sable, marten, bear, etc., are found in the north (Poland and Lithuania), the wolf, deer, and fox everywhere, and the average annual value of the export of furs is almost \$3,000,000.

Forests.—Of the total area of Russia about one-third is forest. The decrease since the nineteenth century began has been about 23 per cent. An important measure was taken by the Government in 1888 for the protection of forests, most of which have been placed under a special committee appointed in each province. The total area of forest in European Russia, Poland, Finland, and Caucasasia is 498,177,000 acres. In this forest region of the north there are immense districts in which the only roads are the rivers flowing between interminable walls of trees. The predominating species in this region are the conifers, the pine, and the fir, while in the lesser forests of the south the oak is most commonly to be seen, plentifully interspersed in the east with the linden and in the extreme west and the Crimea with the beech.

Mining and Metallurgy.—The mineral resources are exceedingly great, and the mining industry is carried on with advanced scientific system and very successfully. Prior to the time of Peter the Great only the most primitive beginnings of a metallurgical and salt industry existed, but that monarch gave origin and impetus to the development of the present extensive system, establishing in 1700 the first separate official mining administration, known as the Prikase of Mining Affairs. He founded the mining-college in 1719, and in every way unceasingly fostered the industry. From that time to the reign of Alexander II. the metal interests of the empire underwent various vicissitudes of rise and decadence, and were finally revolutionized by the liberation of the serfs and the consequent modifications of economic conditions. The direction of mining affairs in the empire (exclusive of Finland) is now mainly concentrated in the mining department of the University of State Domains, and this administration directs not only the raising of ores, but also their mechanical, metallurgical, and chemical treatment. The vast salt and petroleum producing industries are excepted from the direction of this department. In the most important branches of mining the figures of produc-

tion and value were for the year 1890 (and in some cases 1892) as follows:

PRODUCTS.	Pounds.	Tons.	Value.
Gold.....	77,580	.....	\$25,492,175
Silver.....	36,896	.....	665,550
Platinum.....	6,228	.....	510,000
Copper.....	.....	* 4,109	2,480,500
Lead.....	.....	825	38,250
Zinc.....	.....	* 5,059	414,750
Mercury.....	733,624	.....	474,000
Tin.....	23,800	.....	6,000
Pig iron.....	.....	* 995,000	16,968,000
Coal.....	.....	* 6,800,000	9,648,000
Salt.....	.....	* 1,405,000	2,546,725
Petroleum.....	.....	* 4,490,000	7,290,575
Manganese ore.....	.....	300,566	292,425
Sulphur.....	.....	352,800	4,125
Total value.....	.....	.....	\$66,763,775

* Amount for 1892.

The number of men employed in mining industries in 1890 was 435,700, showing an increase in twenty years of almost 100 per cent. The coal-mining industry on the Don has grown rapidly, and the district, which produces about one-half the total output of the empire, increased its output more than 100 per cent. from 1884 to 1892. Besides the output of the Don—viz., 3,507,000 tons in the latter year—Poland produced 2,837,300, the Ural region 230,000, Moscow 176,800, and Altai 19,200 tons. The Caspian naphtha (petroleum) industry has also extended rapidly, the output of crude naphtha more than doubling from 1887 to 1892, with a correspondingly great advance in refining.

Manufacturing.—It is only in very recent years that Russia has exhibited strength as a manufacturing nation at all commensurate with her importance in other respects. The patriarchal state of domestic economy under which each family was its own producer and consumer longer held sway here than in most other countries of Europe, and in many places the breaking away was not noticeable until about the middle of the nineteenth century. But the vast and vigorous growth of manufacture began in the decade following the emancipation of the serfs (1861), expanding in the succeeding one in which railway-building was begun on a colossal scale. Manufactures (including mining industries) amounted in value to 905,000,000 roubles (\$452,500,000) in 1878, and in 1890 the total valuation of the output reached 1,656,000,000 roubles (\$828,000,000), irrespective of the smaller industries, of which statistics are unobtainable. First place among the manufactures of Russia is held by cotton, of which the manufactured output not only supplies the home demand, but furnishes a considerable amount for export. The enormous increase has brought cotton almost into the position of a staple crop in Southeastern Russia in Europe and the Southern Asian regions of the empire, notably Turkestan. The total valuation of the output of this industry in 1890 was 487,100,000 roubles (\$243,550,000). The number of spindles in Russia is about one-fourth those of continental Europe and about one-seventh those of England.

The petroleum-refining industry affords perhaps the most interesting figures. Customs protection was granted in the sixties. In 1876 Russia imported a large amount of petroleum products from the U. S., 2,666,666 pounds (95,999,876 lb. of illuminating oil alone. In the eighties the importation ceased, but the export increased, reaching in 1890 1,724,000,000 lb., and the home consumption, which, owing to the high price, reached only 144,000,000 lb. in 1876, rose to more than 1,080,000,000 lb. in 1890 owing to the rapid fall of price.

The beet-sugar industry has reached considerable proportions. In 1891 the growth of beets amounted to 80,000,000 cwt. The manufacture of woollens is sufficiently developed to clothe the army and satisfy the home demand for low-grade goods. Silk is manufactured to the value of \$6,957,000; paper, \$9,000,000; tannery products, \$19,000,000. Of beer there were brewed 99,606,087 gal. Tobacco-manufactures amounted to 34,202,000 lb. (of which 5,882,400 lb. was in cigarettes). The number of flour-mills in the empire in 1890 was 7,003, and they produced 2,462,569 tons of flour valued at \$73,000,000. The total number of manufactures in Russia (exclusive of Poland and Finland) is 65,000, employing about 1,000,000 work-people; Poland has 21,000, employing 142,900; Finland (1890), 6,496 manufactories, employing 59,176.

Trade and Commerce.—The exports of the empire have

including the ministers who have seats *ex officio* and several members of the imperial family. It is a consultative body in legislation, and its chief function is to review projects of laws presented by the ministers, and to consider the annual budget. It is divided into the three departments of legislation, administration, and finance, with a special department for the discussion of appeals to the emperor from decisions of the senate. The third of the councils is the ruling senate, whose members are appointed by the emperor chiefly from persons of high rank or office. While the council of the empire is consultative in its nature, the senate is partly executive and partly judicial. It promulgates the laws and constitutes the high court of justice. Seven of its nine departments are administrative, and two are courts of cassation. The former examine into the general administration, review the acts of governors and settle disputes with the *zemstvos*. A special department of seven members passes judgment in political offenses. The fourth council is the holy synod, which is composed of the metropolitans and bishops of the Church, and has the superintendence of religious affairs.

For administrative purposes the empire is divided into governments and districts. European Russia proper contains fifty governments, each of which is subdivided into districts varying from eight to fifteen. Poland, Finland, Moscow, Kioff, and Vilna constitute general governments, each composed of a number of the minor governments. Asiatic Russia embraces four general governments, Caucasus, Turkestan, Stepnoye, and Amur, comprising about thirty governments and territories, besides a number of districts which are treated as distinct. Each general government has a governor-general representing the czar, who has supreme direction of civil and military affairs. In the minor governments the governor is assisted by a council of regency, to which all measures must be referred. A council of control is also provided, depending directly on the ministry or Department of General Control. In the frontier provinces military as well as civil governors are established.

In European Russia the local administration is largely in the hands of the people. They do not dwell on scattered farms but are grouped in villages, and each of these villages constitutes a commune or mir, which is the unit of political organization. The number of communes reaches 107,493. The land held by a village is regarded as belonging to the whole community, and is apportioned among the families according to the number of their working units. The communal assembly is composed of all the householders, who elect one of their own number elder (*starosta*) or executive, and consider and decide all communal affairs. The communes are united into *volosts*, each containing about 2,000 householders. The *volost* assembly is composed of delegates from the village communes, one for every ten houses, who elect a *volost* elder (*starshina*), and who have the same powers for the *volost* which the communal assembly have for the commune. Their freedom is, however, restricted by the supervision of an imperial official. The *volost* assemblies also choose a peasants' tribunal of several judges, who have jurisdiction of offenses of all classes and of property disputes involving not over 100 roubles. Disputes of larger amount come under chiefs of the districts who are taken from the nobility, and have a certain control over the peasants' tribunals. The system of local self-government is extended measurably to the district and province, where the administration of economical affairs is placed in the hands of an assembly called the *zemstvo*, made up of nobles possessing a certain amount of land and delegates elected by other landed proprietors, by the householders in the towns, and the peasantry. The executive power rests with the *uprava*, who is nominated by the delegates. The powers of the *zemstvos* extend to matters of education, roads, railways, public health, taxation, etc., and in many cases they have done valuable work and shown a progressive spirit; but their independence is affected by the supervision exercised by the governor as the representative of the imperial government. Of the votes which elect the *zemstvos*, 64 per cent. belong to the peasants, 12 per cent. to nobles, and the remainder to the clergy, merchants, and artisan classes. Of the delegates elected 48 per cent. by the latest statute belong to the peasants, and 35 per cent. to the nobles. In central Russia two-thirds of the executives are nobles, and in East Russia two-thirds are peasants.

The *zemstvos* and *volosts* have a method of organization similar to that of the *zemstvos*. All house owners and taxpayers are grouped according to their assessment, and are

then divided into three classes, each class holding a proportion of the total valuation, and each electing a number of representatives to the *duma*, or municipal assembly. The *duma* chooses the *uprava*, or executive.

The annual revenue of the imperial government is 1,100,000,000 roubles, or \$550,000,000, and the expenditure about the same. The chief sources of revenue are on spirits (about \$135,000,000), tobacco and sugar duties (about \$75,000,000) and stamp duties, and on state domains. The direct land and personal taxes of the imperial treasury amount to about \$25,000,000. The receipts of the *zemstvos*, or provincial assemblies, amount to \$25,000,000, of which the bulk is in land taxes. The paying the tax pays an average of 96 copesks, or 48 cents per acre. The aggregate expenses of the *zemstvos* on last accessible accounts averaged 1.6 roubles, or 80 cents, per male of population. The expenses of the village *zemstvos* average 1.16 roubles, or 58 cents, per male. The direct taxes annually paid by the peasants to the treasury amounts to 118,000,000 roubles, of which 47,000,000 are for the redemption of debt for the purchase of land about 5 roubles per head of adult males.

Theoretically, each able-bodied male in European Russia (with the exception of doctors, teachers, clergymen) should serve five years in the active army, three years in the reserve, and five years in the second reserve. In practice, however, over two-thirds are enlisted in the reserves, which drill six weeks twice a year. The footing for the entire empire is nearly 900,000 men and 160,000 horses; the war footing is over 2,500,000 men and 575,000 horses. The navy embraces powerful fleets on the Baltic and on the Black Sea, and smaller ones on the Caspian and on the Pacific coast of Siberia. See *NAVY*.

Religion and Education.—The established religion of the empire is that of the Greek Church, or Orthodox Catholic faith. There are no very accurate figures as to membership in this Church and other sects, but estimates made with care for 1888 show the number as follows: For Russia proper, Greek Church (army and navy), 69,808,407; Roman Catholics, 8,700,000; Protestants, 2,350,000; Jews, 3,000,000; Mohammedans, 2,000,000; United Church and Armenians, 55,000; pagans, 25,000. Poland the adherents in 1890 were: Roman Catholics, 504; Jews, 1,134,268; Protestants, 445,013; Greek Church (without army), 318,855. The number of Dissenters is estimated to be at least 12,000,000, and it is probable that many of them are wrongly accredited to the Greek Church. They have felt, like the Jews, but far less rigorously, the restrictions of the state and society. With the exception of two bodies all religions enjoy freedom from restriction. Affairs of the Roman Catholic Church are centered in the legation, and those of the Lutheran Church in a consistory, both located in St. Petersburg. The Protestants are Lutherans, who came into the empire originally from many and are mostly settled in the provinces of the north. The preponderance of the Roman Catholics is in the west, the Jews inhabit mostly the towns and villages of the Western and Southwestern Russia, while the Mohammedans are in the eastern and southern part of the empire. Besides these there are a great number of small sects, embodying almost every conceivable variety of fanaticism. See *RASKOLNICKS*.

The schools of the empire are for the most part under the ministry of Public Instruction, and the empire is divided into fourteen educational districts, corresponding to large cities, but some special schools are under other ministries. The money contributed for education in the budget for 1893 was \$31,000,000. The school system is as yet only in a formative condition, and though a beginning has been made and many excellent schools of the higher class—universities and special schools—have been opened, the general level of education is low. There are not numerous outside of St. Petersburg, Moscow, and Warsaw, but there are valuable ones in the provinces. The Imperial Library in the capital is one of the best in the world. In the arts, sciences, and literature Russia has developed much that is admirable and exciting, and has the finest fruits of genius, sometimes starting at a bound and nearly always vigorous and virile. The production of an immense production of books—9,588 in 1892, exclusive of periodicals, with an aggregate of 1,000,000 copies, the preponderance in Russian (7188), and in the Polish, Hebrew, German, Latvian, and

nian languages. Periodicals numbered 743 in 1892 (exclusive of Finland), of which 589 were in the Russian language. The separate publications for 1893 (exclusive of Finland) reached 10,242, of which 33,875,200 copies were printed, and in 1894 there were 779 periodicals.

History.—It was not until the advent of Peter the Great (1689-1725) that Russia really entered the arena of modern civilization, and became a forceful factor in Europe. Its origin lies in obscurity, and for centuries its history consists of faintly traced migrations and conflicts of primitive and rude nomadic tribes and fragments of nations. Four centuries before Christ the Greeks founded commercial stations among semi-savages called Scythians and Sarmatians, whom they discovered upon the northern coast of the Black Sea along the Sea of Azov, and in the Crimea. There, for 500 years, this barbarous horde hung upon the boundaries of an unknown expanse and the frontiers of the Greek and Roman world. But in the fourth century came other masses of semi-savages, the Goths and Huns, Avars and Alans, who swept over them in successive waves. Then in the sixth century the Slavs appeared on the pages of history. Believed to have been related to the Sarmatians, they occupied the country as far N. as the upper Volga. Encountering the Finns, they drove the major portion toward the Baltic and Arctic, and, absorbing the remainder, developed the composite Russian type with sallow complexion and flaxen hair. Flourishing in power the Slavs founded Kieff and Novgorod, each the capital in time of a principality. After the lapse of a century, which is a blank in their annals, they were overrun by a tribe of the Northmen, the Varangians, called by the Slavs the Rus, from whom the name Russian was derived, first appearing in the ninth century. The Rus dominated both the Finns and Slavs, but the latter, after throwing off the yoke, long suffered from outward attack and internal dissension, and at a crucial moment, to avert anarchy, importuned the Rus or Varangian chief Rurik to become their ruler. He went to Novgorod in 862, and it was he who laid the foundation of the Russian empire, over which his family reigned seven centuries. His cousin and successor, Oleg (879-912), a powerful and wise ruler, conquered Kieff, thus greatly enlarging his dominion, defeated various bordering tribes, and even attacked, with 900 vessels, the Emperor of Constantinople, with whom he concluded in 911 an advantageous peace. Igor, the son of Rurik (912-945), added to the country by conquest, made unsuccessful war against the Emperor of Constantinople in 941, and was killed in battle against the Drevlians, a Slavonic tribe. His widow, Olga, whose name to this day is a national word with the Russians, reigned during the minority of her son Sviatoslaff, and introduced Christianity into the country, she herself being baptized in Constantinople in 957. Sviatoslaff (945-973) remained a pagan, extended the borders of the empire to the Sea of Azov, and in 970 divided it among his three sons, Yaropolk I. (973-980), Oleg, and Vladimir. War arising between the brothers, Oleg was slain, Vladimir fled, and Yaropolk, originally ruling Kieff, reunited the empire, only to be reconquered and put to death by Vladimir, who returned in 980 with a horde of the Rus or Varangians, and became the sole ruler of all Russia. Surnamed The Great because of his conquests and his beneficent measures, he made Christianity the official religion of the empire, founded churches, schools, and new towns, and divided the empire among his twelve sons, who engaged in fratricidal war before the death of their father, after which Sviatopolk (son of Yaropolk I., but adopted by Vladimir) ascended the throne after murdering three of his brothers, only to be deposed in war with another brother, Yaroslaff (1019-54), who succeeded in reuniting and extending the empire by successful wars, and emulated his father's example in reforms. During the next three centuries events led to an ultimate enlargement of dominion, and a more thorough organization of the government, preceded by the breaking of the Russian monarchy into a confederacy, its restoration, the constant struggle of internecine war, and the capture of large regions of Western Russia by the Poles, Lithuanians, Danes, and the Teutonic knights. The early part of the period was nevertheless one of general progress, and important cities were founded, among them Tver and Moscow, the latter in 1147. But in the beginning of the thirteenth century came the sweeping Mongol invasion from Eastern Asia under Genghis Khan, which the Russians, save at Moscow, could not withstand. This was followed by internal strife, famine, and pestilence. In 1230 30,000 men died of the plague in Smolensk, and 42,000 in Novgorod. Then

came another Mongol horde demanding tribute, and putting to fire and sword all who failed to render it. In the next century the Russians had gathered strength, and under the Prince of Moscow, Dmitri Donskoi, they repelled the incursions of 1378 and 1380, only to be overwhelmed by the numbers of the invaders in 1382, when Moscow was burned and 24,000 of its people slain. Ivan the Great (1462-1505) so built up the power of arms that the Mongols were defeated, and, decay having set in among them, an era of freedom from their assaults was entered upon, greatly to the relief of the Russians, who began to extend their dominion to the E., conquering Kazan in 1469 and parts of Siberia in 1499. It was under this ruler that one of the fixed features of the "Russian policy," a jealous regard for Constantinople, had its inception. Russia looked to Constantinople as its model of civilization, and took its initiatives in art, especially architecture, in literature, in religion, and in the externals of life, and when that city fell into the hands of the Turks in 1453 Ivan became the devotee of the Byzantine policy, which has influenced all subsequent Russian statesmanship. Ivan IV., The Terrible (1533-84), conquered Astrakhan (1556), the region of the Don Cossacks (1570), and a portion of Siberia (1581), opened a road to Archangelsk, established a printing-press in Moscow in 1569, and did many meritorious acts and a single infamous one, which gave him the surname of The Terrible, namely, the slaying and torture of 60,000 citizens of Novgorod, that city having revolted from his iron rule in 1570. The house of Rurik ceased to exist with the death of Ivan's son Feodor I. (1584-98), believed to have been poisoned, and, after the brief reigns of several rulers and much intrigue, revolution, war, and among other evils a great famine in 1601 by which 100,000 people perished in Moscow alone, the first of the Romanoffs, Michael Feodorovitch, was elected czar by the boyars or noblemen in 1613. He promoted the internal prosperity of the country, revived the long prostrate commerce, and in 1639 extended the borders of the Asiatic possessions to the Pacific. He was succeeded by his son Alexis (1645-76), and his son Feodor III. (1676-82), whose reigns were signalized by many important reforms; and then, after intrigue and conspiracy, in which his sister Sophia sought the rulership, and in fact exercised a regency which her brother overthrew, there ascended the throne as czar the most colossal figure in Russian history, Peter the Great. Within a few years under his guidance Russia became the most powerful nation of Northern Europe, and was recognized as a potent member in the political system of the Continent. Peter was the first to bear the proud title of Emperor of Russia. In 1703 he founded St. Petersburg as the new capital of the empire. In 1696 he took Azov from the Turks; in 1709, by his decisive victory at Poltava over Charles XII., he ended an arduous campaign in the destruction of Sweden's supremacy; in 1721, by the peace of Nystadt, he added Ingria and parts of Karelia, Esthonia, and Livonia to his realm, and in 1723, by his prowess and shrewd diplomacy, secured the provinces of Daghestan and other territory on the Caspian, ceded by Persia. Besides all this he introduced varied internal reforms and improvements of vast extent and importance. His surpassing service, however, was in opening the door of Russia to Western Europe, and putting his people in touch with a civilization superior to the Byzantine standard, which they had long accepted. Never probably in the history of the world were so obdurate and refractory a people absolutely impelled by the will of one man to so great an advance as that which the Russians made under the virile sway of Peter the Great. He died Feb. 8, 1725, but the reforms he instituted, the great public works he began, and the policy he introduced, were carried forward by his successors, for they and the people seemed to have become infused with something of his spirit and energy. Thus Catherine I. (1725-27), Peter II. (1727-30), Anne (1730-41), Elizabeth (1741-62), each contributed something to progress, the last named founding in Moscow the first Russian university, and Catherine II. (1762-96), more than all combined. Catherine was the most picturesque of the rulers of Russia, shrewd, brilliant, capricious, of lax morals and large intellect, cultivating the arts and letters, given to show and also to great enterprises. While surrounding herself with an imposing array of statesmen, soldiers, and courtiers of doubtful repute, she was the professed patron of public morality, and founded innumerable churches, schools, and benevolent institutions; more imperiously despotic than any of her immediate predecessors, she nevertheless convoked an assembly of delegates from all the districts to frame a new and more

including the ministers who have seats *ex officio* and several members of the imperial family. It is a consultative body in legislation, and its chief function is to review projects of laws presented by the ministers, and to consider the annual budget. It is divided into the three departments of legislation, administration, and finance, with a special department for the discussion of appeals to the emperor from decisions of the senate. The third of the councils is the ruling senate, whose members are appointed by the emperor chiefly from persons of high rank or office. While the council of the empire is consultative in its nature, the senate is partly executive and partly judicial. It promulgates the laws and constitutes the high court of justice. Seven of its nine departments are administrative, and two are courts of cassation. The former examine into the general administration, review the acts of governors and settle disputes with the zemstvos. A special department of seven members passes judgment in political offenses. The fourth council is the holy synod, which is composed of the metropolitans and bishops of the Church, and has the superintendence of religious affairs.

For administrative purposes the empire is divided into governments and districts. European Russia proper contains fifty governments, each of which is subdivided into districts varying from eight to fifteen. Poland, Finland, Moscow, Kieff, and Vilna constitute general governments, each composed of a number of the minor governments. Asiatic Russia embraces four general governments, Caucasus, Turkestan, Stepnoye, and Amur, comprising about thirty governments and territories, besides a number of districts which are treated as distinct. Each general government has a governor-general representing the czar, who has supreme direction of civil and military affairs. In the minor governments the governor is assisted by a council of regency, to which all measures must be referred. A council of control is also provided, depending directly on the ministry or Department of General Control. In the frontier provinces military as well as civil governors are established.

In European Russia the local administration is largely in the hands of the people. They do not dwell on scattered farms but are grouped in villages, and each of these villages constitutes a commune or mir, which is the unit of political organization. The number of communes reaches 107,493. The land held by a village is regarded as belonging to the whole community, and is apportioned among the families according to the number of their working units. The communal assembly is composed of all the householders, who elect one of their own number elder (starosta) or executive, and consider and decide all communal affairs. The communes are united into volosts, each containing about 2,000 householders. The volost assembly is composed of delegates from the village communes, one for every ten houses, who elect a volost elder (starshina), and who have the same powers for the volost which the communal assemblies have for the commune. Their freedom is, however, restricted by the supervision of an imperial official. The volost assemblies also choose a peasants' tribunal of several judges, who have jurisdiction of offenses of all classes and of property disputes involving not over 100 roubles. Disputes of larger amount come under chiefs of the districts who are taken from the nobility, and have a certain control over the peasants' tribunals. The system of local self-government is extended measurably to the district and province where the administration of economical affairs is placed in the hands of an assembly called the zemstvo, made up of nobles possessing a certain amount of land and delegates elected by other landed proprietors, by the householders in the towns, and the peasantry. The executive power rests with the uprava, who is nominated by the delegates. The powers of the zemstvos extend to matters of education, roads, saloons, public health, taxation, etc., and in many cases they have done valuable work and shown a progressive spirit; but their independence is affected by the supervision exercised by the governor as the representative of the imperial Government. Of the votes which elect the zemstvos, 64 per cent. belong to the peasants, 12 per cent. to nobles, and the remainder to the clergy, merchant, and artisan classes. Of the delegates elected 38 per cent. by the latest statistics belong to the peasants, and 35 per cent. to the nobles. In Central Russia two-thirds of the executives are nobles and in East Russia two-thirds are peasants.

The cities and towns have a municipal organization similar to that of the zemstvos. All houseowners and taxpayers are enrolled according to their assessment, and are

then divided into three classes, each class holding an equal proportion of the total valuation, and each electing an equal number of representatives to the дума, or municipal assembly. The дума chooses the uprava, or executive.

The annual revenue of the imperial Government is about 1,100,000,000 roubles, or \$550,000,000; and the expenditures about the same. The chief sources of revenue are the excise on spirits (about \$135,000,000), tobacco and sugar, the customs (about \$75,000,000) and stamp duties, and returns from state domains. The direct land and personal taxes for the imperial treasury amount to about \$25,000,000. The annual receipts of the zemstvos, or provincial assemblies, approach \$25,000,000, of which the bulk is in land taxes. The land paying the tax pays an average of 9-6 copecks, or 4-8 cents, per acre. The aggregate expenses of the zemstvos at the last accessible accounts averaged 1-6 roubles, or 80 cents, per male of population. The expenses of the village communes average 1-16 roubles, or 58 cents, per male. The total sum of direct taxes annually paid by the peasants to the imperial treasury amounts to 118,000,000 roubles, of which 41,000,000 are for the redemption of debt for the purchase of land, or about 5 roubles per head of adult males.

Theoretically, each able-bodied male in European Russia (with the exception of doctors, teachers, clergymen, etc.) should serve five years in the active army, thirteen years in the reserve, and five years in the second reserve (Zapas); in practice, however, over two-thirds are enlisted directly in the reserves, which drill six weeks twice a year. The peace footing for the entire empire is nearly 900,000 men and about 160,000 horses; the war footing is over 2,500,000 combatants and 575,000 horses. The navy embraces powerful flotillas on the Baltic and on the Black Sea, and smaller ones on the Caspian and on the Pacific coast of Siberia. See SHIPS OF WAR.

Religion and Education.—The established and official religion of the empire is that of the GREEK CHURCH (*q. v.*) or Orthodox Catholic faith. There are no very accurate figures as to membership in this Church and the various sects, but estimates made with care for 1888 show the number as follows: For Russia proper, Greek Church (without army and navy), 69,808,407; Roman Catholics, 8,300,000; Protestants, 2,950,000; Jews, 3,000,000; Mohammedans, 2,600,000; United Church and Armenians, 55,000; pagans, 26,000. In Poland the adherents in 1890 were: Roman Catholics, 6,214,504; Jews, 1,134,268; Protestants, 445,013; Greek Church (without army), 398,855. The number of Dissenters is estimated to be at least 12,000,000, and it is probable that many of them are wrongly accredited to the Greek Church. They have felt, like the Jews, but far less rigorously, the persecutions of the state and society. With the exception of these two bodies all religions enjoy freedom from restraint. The affairs of the Roman Catholic Church are centered in a collegium, and those of the Lutheran Church in a consistory, both located in St. Petersburg. The Protestants are mainly Lutherans, who came into the empire originally from Germany and are mostly settled in the provinces of the Baltic. The preponderance of the Roman Catholics is in Poland, the Jews inhabit mostly the towns and villages of Poland and Western and Southwestern Russia, while the Mohammedans are in the eastern and southern part of the empire. Besides these there are a great number of small sects, embodying almost every conceivable variety of fantastic fanaticism. See RASKOLNIKS.

The schools of the empire are for the most part under the ministry of Public Instruction, and the empire is divided into fourteen educational districts, corresponding to the large cities, but some special schools are under separate ministries. The money contributed for education in the budget for 1893 was \$31,000,000. The educational system is as yet only in a formative condition, and though a good beginning has been made and many excellent schools of the higher class—universities and special schools—are in existence, the general level of education is low. Libraries are not numerous outside of St. Petersburg, Moscow, and Warsaw, but there are valuable ones in those cities, and the Imperial Library in the capital is one of the richest in the world. In the arts, sciences, and literature Russia has developed much that is admirable and exhibited occasionally the finest fruits of genius, sometimes startling and strange, and nearly always vigorous and virile. The press pours forth an immense production of books—9,588 in the year 1892 (exclusive of Finland), with an aggregate of 30,639,550 copies, the preponderance in Russian (7,188), and the remainder in the Polish, Hebrew, German, Lettish, and Esth-

and languages. Periodicals numbered 748 in 1860 (exclusive of 3 columns of which 682 were in the Russian language). The newspaper publications for 1860 exclusive of Finland numbered 10,242, of which 70,705,200 copies were printed, and in 1894 there were 129 periodicals.

History.—It was not until the advent of Peter the Great (1682-1725) that Russia really entered the arena of modern civilization, and became a powerful factor in Europe. Its early life is obscure, and for centuries its history consisted of hardly traced migrations and hordes of primitive and semi-savagistic tribes and fragments of nations. Four centuries before Christ the Greek finished commercial stations among semi-savagistic called Scythians and Sarmatians, where they discovered upon the northern coast of the Black Sea, being the Sea of Azov, and in the Crimea. There, for many years, this location made long upon the boundaries of an unknown empire and the frontiers of the Greek and Roman world. But in the fourth century came other waves of semi-savagistic, the Goths and Huns, Avars and Slavs, who swept over them in successive waves. Then in the sixth century the Slavs appeared on the pages of history, believed to have been related to the Sarmatians; they occupied this country as far N. as the upper Volga. Remembering the Slavs, they drove the major portion forward the Baltic and Arctic, and absorbing the remainder developed the successive Russian type with yellow complexion and black hair. Flourishing in power the Slavs founded Kieff and Novgorod, made the capital in time of a princely dynasty. Thus the type of a century, which is a mark in their annals. Along were overrun by a tribe of the Northmen, the Varangians, called by the Slavs the Rus, from whom the name Russian was derived, first appearing in the ninth century. The Rus dominated both the Finns and Slavs, but the latter, after throwing off the yoke, long suffered from constant attack and internal dissension, and at a crucial moment, to exert authority, imperious the Rus or Varangians had to be to become their ruler. He went to Novgorod in 882, and it was he who laid the foundation of the Russian empire, over which his family reigned seven centuries. His name, and name, Oleg (879-912), a powerful and war ruler, conquered Kieff, thus greatly enlarging his domain, subjected various bordering tribes, and even attacked, and 988 made the Emperor of Constantinople, with whom he concluded in 911 an advantageous peace. Igor, the son of Oleg (912-945), added to the country by conquest, made successful war against the Emperor of Constantinople in 941, and was killed in battle against the Drevlians, a Slavonic tribe. His widow, Olga, whose name to this day is a respected word with the Russians, reigned during the minority of her son Sviatoslav, and introduced Christianity into the country, she herself being baptized in Constantinople in 957. Sviatoslav (945-972) remained a pagan, extended the borders of his empire to the Sea of Azov, and in 970 secured it among his three sons, Yaropolk I. (972-989), Oleg, and Vladimir. War arising between the brothers, Oleg was slain, Vladimir fled, and Yaropolk, originally ruling Kieff, besieged the empire, only to be reconquered and put to death by Vladimir, who returned in 989 with a horde of the Rus or Varangians, and became the sole ruler of all Russia. Permeated the Great because of his conquests and his beneficent measures, he made Christianity the official religion of the empire, founded churches, schools, and new laws, and divided the empire among his twelve sons, who reigned in feudality before the death of their father, after which Sviatoslav's son, Yaropolk I., but adopted by Vladimir, succeeded the throne after murdering three of his brothers, only to be deposed in war with another brother, Yaroslav (1019-54), who succeeded in reunifying and extending the empire by successful wars, and emulated his father's example of reforms. During the next three centuries events led to an automatic enlargement of dominion, and a more thorough organization of the government, preceded by the breaking of the Russian monarchy into a confederacy, its reorganization, the constant struggle of internecine war, and the seizure of large regions of Western Russia by the Poles, Lithuanians, Germans, and the Teutonic knights. The early part of this period was nevertheless one of general progress, and important cities were founded, among them Tver and Moscow, last being in 1447. But in the beginning of the thirteenth century came the sweeping Mongol invasion from Eastern Asia under Temüsh Khan, which the Russians, save at Moscow, could not withstand. This was followed by internal war, famine, and pestilence. In 1299 30,000 men died of the plague in Vladimir, and 42,000 in Novgorod. Then

came another Mongol horde demanding tribute, and putting to fire and sword all who failed to render it. In the next century the Russians had gathered strength, and under the Prince of Moscow, Dmitri Donskoi, they repelled the invasions of 1376 and 1380, only to be overwhelmed by the hordes of the invaders in 1392, when Moscow was burned and 94,000 of its people slain. Even the Great (1402-1505) so built up the power of arms that the Mongols were defeated, and, being having set in among them, an era of freedom from their assaults was entered upon, greatly to the relief of the Russians, who began to extend their dominion to the E., conquering Kazan in 1500 and parts of Siberia in 1400. It was under this ruler that one of the fixed features of the "Russian policy," a jealous regard for Constantinople, had its inception. Russia looked to Constantinople as its model of civilization, and took its initiatives in art, especially architecture, in literature, in religion, and in the externals of life, and when that city fell into the hands of the Turks in 1453 Ivan became the devotee of the Byzantine policy, which has influenced all subsequent Russian statesmanship. Ivan IV., The Terrible (1533-84), conquered Astrakhan (1556), the region of the Don Cossacks (1570), and a portion of Siberia (1581), opened a road to Archangel, established a printing-press in Moscow in 1560, and did many meritorious acts and a single infamous one, which gave him the surname of The Terrible, namely, the slaying and torture of 60,000 citizens of Novgorod, that city having revolted from his iron rule in 1570. The house of Rurik ceased to exist with the death of Ivan's son Feodor I. (1584-98), believed to have been poisoned, and, after the brief reigns of several rulers and much intrigue, revolution, war, and among other evils a great famine in 1601 by which 100,000 people perished in Moscow alone, the first of the Romanoffs, Michael Feodorovich, was elected czar by the boyars or noblemen in 1613. He promoted the internal prosperity of the country, revived the long prostrate commerce, and in 1640 extended the borders of the Asiatic possessions to the Pacific. He was succeeded by his son Alexis (1645-76), and his son Feodor III. (1676-82), whose reigns were signalized by many important reforms; and then, after intrigue and conspiracy, in which his sister Sophia sought the rulership, and in fact exercised a regency which her brother overthrew, there ascended the throne as czar the most colossal figure in Russian history, Peter the Great. Within a few years under his guidance Russia became the most powerful nation of Northern Europe, and was recognized as a potent member in the political system of the Continent. Peter was the first to bear the proud title of Emperor of Russia. In 1703 he founded St. Petersburg as the new capital of the empire. In 1696 he took Azov from the Turks; in 1709, by his decisive victory at Poltava over Charles XII., he ended an arduous campaign in the destruction of Sweden's supremacy; in 1721, by the peace of Nystadt, he added Ingria and parts of Karelia, Esthonia, and Livonia to his realm, and in 1723, by his prowess and shrewd diplomacy, secured the provinces of Daghestan and other territory on the Caspian, ceded by Persia. Besides all this he introduced varied internal reforms and improvements of vast extent and importance. His surpassing service, however, was in opening the door of Russia to Western Europe, and putting his people in touch with a civilization superior to the Byzantine standard, which they had long accepted. Never probably in the history of the world were so obdurate and refractory a people absolutely impelled by the will of one man to so great an advance as that which the Russians made under the virile sway of Peter the Great. He died Feb. 8, 1725, but the reforms he instituted, the great public works he began, and the policy he introduced, were carried forward by his successors, for they and the people seemed to have become infused with something of his spirit and energy. Thus Catherine I. (1725-27), Peter II. (1727-30), Anna (1730-41), Elizabeth (1741-62), each contributed something to progress, the last named founding in Moscow the first Russian university, and Catherine II. (1762-96), more than all combined. Catherine was the most picturesque of the rulers of Russia, shrewd, brilliant, capricious, of lax morals and large intellect, cultivating the arts and letters, given to show and also to great enterprises. While surrounding herself with an imposing array of statesmen, soldiers, and courtiers of doubtful repute, she was the professed patron of public morality, and founded innumerable churches, schools, and benevolent institutions; more imperiously despotic than any of her immediate predecessors, she nevertheless convoked an assembly of delegates from all the districts to frame a new and more

liberal code of laws; apparently absorbed in the sensual pleasures of a sumptuous life, and the petty personal intrigues of a corrupt court, she yet accomplished such solidly practical works as bringing 50,000 high-class German and Swiss immigrants into the country. By wars, and by diplomacy which compelled admiration, she acquired 225,000 sq. miles of territory, carrying on simultaneously an immense internal improvement and elaboration of the plan of government. In several successful wars she took from the Turks the Crimea and Azov, with other territories, and in the final dismemberment of Poland (1796) secured to the empire two-thirds of that kingdom. Under her rule Russia made signal advance as an influential power in Europe. Her son Paul (1796-1801) joined the coalition against the French republic, but after the victories of Suwaroff in Italy, followed by disasters on crossing the Alps, the fickle monarch veered to the side of Napoleon. But his rule was unbearable, and he was assassinated. Alexander I. (1801-25), through the shifting scenes of the long Napoleonic struggle, played a leading rôle in the European drama, and raised Russia to the foremost place in the continental balance of power. Ardent, impulsive, and impressionable, he conceived large policies, and his imagination was easily moved. Entering the third coalition against Napoleon he shared with Austria the defeat at Austerlitz (1805), where he was present on the field. The fourth coalition with Prussia followed, and after the sanguinary and indecisive battle of Eylau (1807) and the conclusive defeat of the allies at Friedland, Alexander accepted the peace of Tilsit (July 7, 1807), by which he allied himself with his former adversary, and closed the ports of Russia to Great Britain. The two monarchs proceeded as if dividing the world between them, Napoleon to take the West and Alexander the East. Alexander moved against Persia and gained Shirvan. By the peace of Frederikshamn (1809) he acquired Finland from Sweden, and after a war with Turkey added Bessarabia to his possessions. Growing restive under the continental blockade, he broke with Napoleon, and the memorable invasion of Russia in 1812 followed. At the head of more than half a million men Napoleon defeated Alexander at Smolensk, again at Borodino, and entered Moscow, which the Russians themselves then fired and well-nigh burned to the ground. Vainly seeking to negotiate peace he turned in hasty retreat, and began the disordered and appalling winter flight which destroyed his great army. In 1813 Prussia and Austria joined Russia in war against France, and the battle of Leipzig decided the contest, leaving Alexander foremost among the victorious sovereigns, and acclaimed as the liberator of Europe. In the reorganization of European politics through the congresses of Vienna and Aix-la-Chapelle his influence was dominant. He founded the Holy Alliance and became the pillar of reaction against the progressive tendencies of the age. His internal policy experienced a similar change. During his earlier years he had shown a liberal disposition. He sought to improve public education, founded universities, advanced the condition of the serfs, fostered industrial and commercial enterprises, and relaxed harsh political and judicial methods. In his later years, suppression, censorship, and police rigor became the rule. Detested ministers aroused general hostility, and secret societies multiplied. The gay hero of other days became the conscious object of wide discontent, and sank into a morose and dejected state. His death quickened the outbreak of a revolutionary conspiracy, which found its immediate occasion in the change of succession from the elder to the next brother; but the new sovereign, Nicholas I. (1825-55), suppressed it with great vigor, and sternly executed or exiled the chief conspirators. Throughout his reign Nicholas displayed reactionary tendencies. Commanding, imperious, and autocratic, he upheld the principle of absolutism with a resolute hand. In a war with Persia, from 1826 to 1828, Russia completely triumphed, and gained the provinces of Erivan and Nakhitchevan, a heavy indemnity, and the exclusive control of the Caspian Sea. Next came war with Turkey in defense of the struggling Greeks. The alliance of Russia, France, and Great Britain led to the victory of Navarino (1827), annihilating the Turkish fleet. Russia continued the contest, achieved full success, and forced Turkey, through the peace of Adrianople, to cede the mouths of the Danube and pay indemnity. The heroic Polish insurrection of 1831 was energetically suppressed, and followed by measures which reduced the kingdom to a province, stripped of the distinct constitution granted by Alexander, of its own diet and its own army. The policy of Russianizing these and other alien fragments

of the empire into a homogeneous people became one of the features of Nicholas's reign. The revolutionary epoch of 1848 emphasized his reactionary spirit. In 1849 he sent a Russian army to aid Austria in crushing the Hungarian revolt. In 1853 Russia's demands for the protection of Greek Christians in Turkey precipitated the Crimean war, wherein Great Britain, France, and Sardinia joined Turkey upon the plea that Russia's demands covered the design of Turkish dismemberment. The defeats of the Alma, Balaclava, and Inkermann, and the siege of Sebastopol, deeply chagrined Nicholas, who died in disappointment, and left the war as a legacy to his son Alexander II. (1855-81), who hastened to bring it to a conclusion.

By the treaty of Paris (1856) Russia relinquished the right to keep war-vessels on the Black Sea, and lost a part of Bessarabia. But during the Franco-German war (1870), when no resistance could be made, she announced her resumption of supremacy on the Black Sea, and Bessarabia was restored by the treaty of Berlin (1878). From the first, Alexander evinced liberal tendencies. He opened the empire more than ever before to the arts, ideas, and civilization of the West. In 1861 he gained the title of The Liberator, by decreeing the emancipation of the serfs. This great reform reconstructed the economic and political relations of the people. The state indemnified the landlords, and the peasants became the collective possessors of the communal land. In 1863 a fresh Polish insurrection was suppressed by Mouravieff with great rigor. Aside from this severity, the reign was signalized by liberal progress and unprecedented material development. Conspicuous among its features was the prosecution of the Russian advance into Asia. In 1858, by treaty with China, Russia acquired all the left bank of the Amur. The capture of Schamyl in 1859 ended the persistent revolt in the Caucasus. A double advance into Central Asia was made in 1863, and in the period from 1865 to 1868 Tashkend, Khojend, and Samarcand successively fell into Russian hands. The Khiva expedition of 1873, ending in the capture of Khokan in 1875, completed the conquest of Central Asia. Outbreaks of the Slavonic Christians within the sultan's domains led Russia in 1877 to war with Turkey. The treaty of San Stefano (1878), which crowned Russia's triumph, modified by the Congress of Berlin, liberated and readjusted the Balkan principalities, enlarging Servia, making Roumania independent, and creating free Bulgaria subject to Turkish suzerainty. The later years of Alexander's reign were marked by the rapid development of Nihilism. His progressive policy, however, continued, and under the influence of the liberal minister Loris Melikoff a constitutional project providing for a consultative assembly of delegates elected by the provincial zemstvos had been signed and was about to be proclaimed by the emperor, when, after four attempts had failed, he was assassinated Mar. 1 (13), 1881. His son and successor, Alexander III. (1881-94), had been consulted as to the proposed project, and had assented, but upon his accession other influences prevailed, and the reform which would have been the first step toward parliamentary government was not promulgated. Melikoff gave place to Ignatieff, and reactionary forces became dominant. Pan Slavism asserted itself with new vigor. Violent anti-Semitic outbreaks occurred in different parts of the empire, and were followed by the May laws of 1882, which restricted the Jews to the pale of settlement, consisting of fifteen provinces of the southwest, and imposed other restraints upon them. After a short period these laws became obsolete, but in 1890 measures were again taken for their partial enforcement, until the public opinion of other countries remonstrated. Except in minor and spasmodic clashes in Central Asia, the reign of Alexander III. was free from war. In foreign relations he sedulously cultivated peace, and came to be known as the peace-keeper of Europe. He threw off the subservieny to Germany which had marked much of Russian statecraft, and without alienating the friendship of the powers of the Triple Alliance he encouraged France as a counterpoise for peace. In Bulgaria his hand rested heavily on Prince Alexander, who finally abdicated. In contrast with the policy of his predecessor, he discouraged Western influence, and devoted himself to developing the national spirit of his own people. He was a Russian of Russians. Well-meaning and conscientious, he sympathized with the spirit of political and religious reaction, and it stamped the character of his reign. He died Nov. 1, 1894. His son and successor, Nicholas II., mounting the throne at twenty-six years of age, was married immediately after his accession to Princess Alix of Hesse.

Thus in Gr. Russ. the datives of *nogá, ruká* are *nog'é, ruk'é* (pron. *noǵjé, rukjé*), while L. Russ. *noz'í, ruc'í* abide by the old Slavic *nozě, rucě*. Gr. Russ. locative of *duch* is *duch'é* (pron. *duchje*): L. Russ. *duš'i*. Gr. Russ. imperative of *ljagú* is *ljagi*: L. Russ. *ljaz'*. The Gr. Russ. has lost the vocat. sing. masc. and femin., while the L. Russ. has kept it; thus Gr. Russ. *drug moj, syn moj*, but L. Russ. *družé moj, synu moj*; Gr. Russ. *duša moja*: L. Russ. *dušo mojá*.

On the whole, Great Russian has been more conservative than Little Russian, in part owing to the fact that the former has been more uninterruptedly and strongly influenced by the Church Slavonic. Although the Little Russians, like the Great Russians, are adherents of the Greek confession (only a fragment of the Little Russian—namely, in Galicia—holds to Rome), and use the same Church Slavonic in the liturgy, yet under the influence of the Roman Catholic Poles and their higher civilization, which lasted for centuries, the prestige of the Church Slavonic yielded much earlier than with the Great Russians, and even as early as the sixteenth century the folk-speech acquired some recognition. This is particularly true of the Ruthenian dialect in Galicia, which was recognized in the schools and in official use. In vocabulary and syntax it has been strongly influenced by the Polish, and differs in many points from the much purer and more original Ukrain dialect.

The rivers Pripet and Desna, emptying into the Dnieper, form the northern boundary of Little Russian against the White Russian and Great Russian. The northern line extends on to the Don below the cities Kursk and Voronej, whose vicinity is South Great Russian. S. of this line dwell the Little Russians, stretching W. even beyond the boundaries of Russia into Galicia, and even over the Carpathians into Northeastern Hungary. Farther to the S. they border in Bessarabia upon the Roumanians, the Black Sea forming their southern boundary. They extend on the E. as far as the Don, though here mixed with the Great Russians. They also occupy, mixed with Great Russians, the districts of Kuban and Tschernomorie to the E. of the Sea of Azov.

The South or Little Russian dialect consists of several closely related varieties. Of greatest extent is the Ukrain variety which covers Podolia and Bessarabia, the provinces of Kieff, Poltava, Kherson, Kharkoff, Ekaterinoslaf, Taurida, part of Voronej, and the lower valley of the Don. N. of this extends the Polesje variety, occupying a part of Volhynia and the province Chernigoff. W. of the Ukrain appears the so-called Red Russian (called in Galicia Ruthenian), covering Podolia, Galicia into the Carpathians, and on thence into Hungary, and Bukovina.

The Great Russian in its widest sense includes the Great Russian proper and the White Russian. The latter forms in some sense a transition to the Little Russian, and is therefore by some authorities regarded as a branch of Little Russian, while others prefer to treat the White Russian as a third main division. The linguistic facts favor, in the opinion of the writer, the reference of White Russian to the Great Russian group. The characteristic peculiarities of White Russian are, in the vocalism, the spread of the vowel *a* or *ia* not only to displace *o*, but also *e*, generally in unaccented syllables: *zjaljóny* (for *zeljóny*), *bjarjóza* (for *berjoza*), *sjalcó* (for *selcú*), etc.; in consonantism, the pronunciation of soft *d* and *t*, as *dž, ts*, as *tsérem* for *térem*, *džérjats* for *djevjat'*, etc.

The White Russians occupy the provinces of Vilna, Vitebsk, Minsk, Moghilev, and also extend into the provinces of Pskoff, Tver, and Smolensk. Physically they are the weakest and most unenergetic of the Russian race, and until recent years were entirely subject to the dominating influence of the Poles.

The Great Russians proper, the most numerous, the strongest, and the most enterprising Russian tribe, early effected from old Novgorod the colonization of the north, and later from Moscow secured the control of all European and Asiatic Russia. They are divided into two groups on the basis of the pronunciation of the unaccented *o*-vowel—an *o*-group (northern) and an *a*-group (southern), the former called North Great Russian, the latter South Great Russian. The North Great Russians occupy the entire north of European Russia down to the province of Tver, the greater part of which speaks *o*, then on to the province of Moscow, where only a small territory in the extreme north speaks *o*. Almost the whole of the province of Vladimir and the northern parts of Nijni-Novgorod and Kazan are included in the *o*-group; so also the Ural region and parts of Siberia.

The South Great Russians, or the *a*-speakers, occupy parts of the province of Smolensk, almost all of Moscow, all of Kaluga, Tula, Orel, Ryazan, Tamboff, Kursk, Voronej (so far as it is Great Russian), the southern parts of Nijni-Novgorod, and Kazan, the province of Penza, and also Simbirsk, Samara, and Saratoff.

The chief difference between the North Great Russians and the South Great Russians lies in the pronunciation of *o* as *o* by the former, and as *a* (either pure or as *a'*, i. e. midway between *a* and *o*) by the latter. This applies only to unaccented syllables. Cf. N. Gr. Russ. *slóvo, másto, zachót'*: S. Gr. Russ. *slóva, másla, zychat'él*. The *a*-speakers are distinguished by a broad pronunciation, whereas among the *o*-speakers the sound *o* is often close, almost like *u*. They are therefore called also the Low Great Russians. A further difference between the two varieties is that unaccented *e* in South Great Russian generally, except at the end of words, is pronounced almost as *i*—e. g. *p'iró* for *p'eró*, *v'izú* for *v'ézú*, *p'irichód* for *p'erechód*—whereas in North Great Russian this same unaccented *e* is freely rendered as *jo*—e. g. *pjoró, vjozú, sjoló, bjodró* (S. Gr. Russ. *s'iló, b'idró*): cf. N. Gr. Russ. *javó* (for *jegó*): S. Gr. Russ. *jivó*. The North Great Russian exhibits furthermore two features lacking in South Great Russian: (1) Primitive Slavic *ě*, which usually becomes soft *e* in Great Russian, is occasionally pronounced in North Great Russian as a soft *ě*, just as in Little Russian *s'ěno* for *s'ěno*, *sv'ěka* for *sv'ěka*, etc.; (2) the widely spread pronunciation of *č* as *c* and *c* as *č*: *cort* for *čort*, *color'ek* for *čolov'ek*, *car* for *čar*, *čerkov* for *cerkov*. The confusion of the consonants is universal in the northern provinces, the old territory of the republic of Novgorod, whereas their correct use is limited to the southern provinces of the North Great Russian territory, viz., Tver, Vladimir, Yaroslav, Kostroma, Nijni-Novgorod, and Kazan.

The Standard or Literary Russian.—Until near the end of the seventeenth century, and especially since the establishment of Moscow as a political and religious center, it was a generally accepted principle that the language of the Church should be regarded as the medium of literature and of all that belonged to the intellectual or higher life. Its poverty in the means of expression occasioned, when it was applied to profane purposes—as in civil documents, laws, and later, too, in narrative literature—the adoption of popular expressions, construction, and phrases, even to the face of protest from individual writers. A dualism was not felt and not recognized, even though it may have actually existed. It remained for Russia's great reformer, Peter the Great, to determine the separation of the profane from the sacred literature, and to give it outward indication through the form of the alphabet. As early as 1697, during his residence at Amsterdam, Peter awarded a Dutch bookseller the privilege of printing Russian books in a style of type varying from the alphabet then used in Russia, and distinguished by a smoothness and roundness of form evidently borrowed from the Latin alphabet. This same form of letter was later introduced (1707) into Russia itself, and was there (Moscow) reproduced in a successful manner by the type-founder M. Jefremov. The first book printed in Russia in this new "civil type" appeared in 1708 at Moscow—a work on geometry. The czar approved so heartily of the undertaking that in 1710 he examined a collected list of letter-symbols and struck out with his own hand those which he did not approve, and gave orders that from that time those which had been approved should be used in the printing of books on historical and general subjects. The secularization of the Russian literature in speech and print was thus sanctioned through the all-powerful will of the autocrat. The language was nevertheless for some time subject to great confusion; every man wrote or translated according as knowledge or caprice might admit. Fortunately there arose soon after Peter the Great a second man of genius, who extended to the narrower field of literature and science the work begun in the larger field. This literary Peter the Great was a peasant's son from the high north, the academician, poet, physicist, grammarian, and historian, Lomonosov. He rendered to the language a service the value of which can not be easily overrated. He appreciated how to lead the confused and normless language into the right courses, into a healthy popular form tempered by historical traditions, and, while carrying out the principle of Peter the Great, he avoided laying the ban of interdiction upon the hitherto revered language of the Church. He conceived it as desirable that the language should not cease to draw its nourishment from the rich sources of

the second literature. This conservatism, founded as it was on the golden bridge between the old and the new, and aimed to prevent a radical break in the continuity between the old literature and the new, thus saving the Russian literature from the dangers of dialectal disintegration. A further advance toward the rationalization of the Russian language was made at the end of the eighteenth century through the work of the famous imperial historian Vasiliev, especially in the character as writer of language and construction of words. Contemporaneous with him was, among others, the gifted story-teller Karamzin. Later phases in the development of the Russian language as well as literature were marked by the famous post-romantic Pushkin and Lermontov, the great humorist Gogol, the exquisite writer Turgenev, the unexcelled plastic Don-buys, to mention only the most eminent among those no longer living. Thanks to the immense progress made in the nineteenth century, the Russian literary language has become a more coherent trait of Great Russian and national, but at the same time has kept itself by a reasonable adherence to the graphic representation of individual words as historically developed, from descending into the vulgar types of the coarsest folk-dialects. As written language it appears the form suited to coordinate the differences of dialects, to overcome the inheritance of tradition, and so to adapt itself to the simplicity and understanding of all. Through this combination of the traditional form for the eye with the spoken form for the ear a relation was established between the written and spoken language similar to that now existing in French and English. Pronunciation is still removed from orthography. The pronunciation follows the recognized Moscow standard, while the written form is based upon traditions that are centuries old—e.g. the masculine pronunciation of the word *ox* is *oxel*, though *oxel* and *oxel* are also heard, so *fox* is pronounced *foch*, or also *foch* and *foch*; *obox* is pronounced *oboxen*, or also *oboxen*, *oboxen*; and the words *lyby*, *oxy* are pronounced *lybki*.

From what has been said it can be readily understood how the separate letters of the Cyrillic alphabet, which were originally adapted to the Old Church Slavonic and then into Russian, were forced into the service of representing the Russian sounds, have with time come to possess a positive and often highly coordinated value or function. For example, after a word ending in a consonant there is still written an *o* denoting by early tradition a vowel which now represents no sound whatever, but at most indicates the hard pronunciation of the preceding consonant, which even without this letter would be unmistakable. This is customarily called the "hard sign," in distinction from another letter which formerly indicated a narrow vowel between *e* and *i*, but serves as a sign of the palatalization of the preceding consonant. Thus the words *dukh*, *bagh*, *rodik*, *zash* are pronounced *dukh*, *bagh*, *rod* and *zash*, *zash*, *zash* as *dukh*, *bagh*, *rod*, *zash*. The vowel-sign *o*, *i* denotes a soft *o*, *i* affecting the pronunciation of the preceding consonant. The combinations *do*, *de*, *di*, *do* are not common in pronunciation; *do* and *de* have a hard sound, while *di* and *di* are pronounced nearly as *di*, *di*, or more exactly, *di*, *di*.

The language is still very rich in forms, especially in declension, where six cases are still preserved. The vocative has been gradually eliminated from the literary idiom. In the superlative the last case-forms for agent and instrument are replaced by fully differentiated verbal stems: thus "I speak" is *ya govoru*, and, with change of stem, "I read to a book" is *ya govoru*. The Russian has in reality no personal base, which may be made to represent the future as the present (e.g. *idit*, "I go"); *idit*, command of *idit* and *idit*, is future, "I shall go not"; and a personal inflected in number and gender, which, without the addition of an auxiliary, expresses the perfect; thus *ya govoru* "I have written" (*imay*, *ya pishu*, "I have written"). Besides these the Russian possesses only the feminine second sing. and second plur. the infinitive, and several participles. It is in close correspondence to the personal proper of the Slavic mind that the verb shows a lack in all the various subjective modal-signs, in which regard it is akin to the Hittite and Teutonic languages. In other respects the Russian syntax is finely elaborated and unique, and rich in many marvellous turns and combinations of expression. The modern Russian style, fashioned as it is by Pushkin, is brief and mobile.

V. JANÉ.

Translated by HELEN THE WRIGHT.

Russian Literature: literature in the language of the Russians. In her literature as in her history Russia has been a late comer into the family of nations and for the same reason. At one time, and little behind the rest of Europe, she was cut off from the communion of thought and new life of the West by her conversion through force majeure to the Greek Orthodox form of Christian belief, while her conquest by the Tartars made her a part of Asia, checked or destroyed her beginnings of civilization, profoundly modified her character, and, when the yoke was at length thrown off, left her so far in the rear of other lands that to this day she has not been able to make up all of the lost ground. After the conversion of the country to Christianity the language of the Church was the old Slavonic, a dialect of Bulgarian origin into which Cyril and Methodius, the apostles to the Slavs, had translated the Scriptures, and in and which they had created the Cyrillic alphabet. This alphabet was taken chiefly from the Greek, with the addition of a few Coptic, Armenian, and Hebrew characters. With modifications it has remained that of the Russians, Serbians, and Bulgarians, and the old Church Slavonic has not only influenced but continues the language of Russia, but is still used for the liturgy. From Greece and Bulgaria a large number of loan-words and legends were adopted, but the first independent native work which we possess, though it doubtless had predecessors, is the invaluable *Chronicle of Nestor* (later part of the eleventh century), and this was followed by chronicles of *Nepriyat*, *Two*, *Monks*, etc., of a similar nature, by the lives of *Saints Boris and Gleb* and of *The Fathers of Kiev*, the *Will of Vladimir Monomachus* (twelfth century), and the *Memorial of Daniel Zaitchuk* (the Prisoner), etc., not to mention the famous *Tale of the People of Igor*, of doubtful authenticity. At this time, so far ago after, there existed among the people a great number of poetical tales and legends called *byliny*, most of them revolving about the person of the mythical national hero, the Minamoto, while others have reference to various historical or legendary events, even as late as the invasion of Napoleon. These *byliny*, handed down from one to another by a succession of peasant bards, now nearly extinct, first attracted the attention of literary men about the beginning of the nineteenth century. They have been collected and published in large numbers, though they must differ greatly from their original versions.

During the disastrous period of Tartar domination Russian literature almost disappeared, only gradually struggling into new existence with the liberation of the country. The most important monuments of the time are the *Nadankina*, an epic poem describing the victory of Dmitri of the Don at Kulikovo (1380), and the *Dumskoye* (Housekeeper's Manual) of the monk Silvester, the counselor of Ivan IV., the Terrible. Ivan III. had protected the establishment of the first printing-press at Moscow, which began its activity with the Acts of the Apostles and the Epistles of Paul (1564), and in 1581 the Bible was printed in Little Russian at Ostrog in Lithuania. The controversy between Ivan IV. and Prince Kurbski, the works of the Great monk Krizhanich, written in a mongrel jargon meant to be comprehensible to all Slav peoples (about 1665), and a description of Russia by Kotchik (about 1666-67), a fugitive secretary from the foreign office, are works of much historical and some literary importance. Meanwhile that part of the country which had been severed from the rest and with the Kingdom of Lithuania united to Poland awoke to fresher active life under the influence of the more advanced Polish civilization. Polish attempts to convert the Orthodox to Roman Catholicism, and particularly the propaganda of the Jesuits, led in self-defense and reaction to a study of the Russian language, to the foundation of Russian schools, and to controversial theological works, whose authors could hope to compete with their adversaries only after careful study and training. When in 1667 Kiev was conquered by the Czar Alexis the greater civilization and enlightenment that prevailed there gradually made their influence felt at Moscow. The three chief theologians of the time of Peter the Great—Simion of Polotsk (d. 1682), Dmitri of Rostov (d. 1709), and Feofan Prokhorovich (1681-1706)—were all Little Russians.

Peter himself favored literature, especially when it had practical aims, as an ally in his reforms. He modified and improved the alphabet, encouraged the printing of Russian books, both original and translations, and he even occasionally contributed to the *St. Petersburg Gazette*, the first Russian newspaper, founded under his auspices in 1793.

With his reign the history of modern ideas in his country begins. The peasant Pososhkov (1670-1726) was at the same time an old-fashioned theologian and a liberal political economist. Prince Antioch Kantemir (1708-44), who passed much of his life abroad, turned out satires in the style of Boileau, which even had the honor of being rendered into French. Vasilii Tatistchev (1685-1750) wrote the first history of Russia; Trediakovskii (1703-69) translated much and made a guide to versification, while unable to write good poetry himself. Far more important than any of these was Lomonosov (1711-65), not so much as an author, although he tried his talents at literature of many sorts, but as a grammarian and literary lawgiver. The language of Russian books was still under the yoke of the church Slavonic, and teemed with archaic expressions, while Western words, brought in with Western ideas, added to the general confusion in which there were no accepted models to follow. Lomonosov, in his grammar (1755), laid down the laws for all to obey, his own varied works served as examples of at least grammatical correctness, and by his successful introduction of tonic instead of the previous syllabic versification he brought Russian poetry back to the form suited to the natural genius of the language. The period that followed was very creditable, although few of the works then written are read to-day or possess originality. French influence and taste, then dominant in all Europe, were nowhere more supreme than at St. Petersburg. Sumarokov (1718-77), the first in his country to have no other profession than that of author, besides shorter poems, composed many stiff tragedies in alexandrine verse; Kniashnin (1742-91), Kheraskov (1733-1807), and others followed in the same vein, and the last named likewise composed a ponderous epic, the *Rossiada*; von Vizin (1744-92) wrote two really good comedies, *Nedorosl* (the Minor) and *Brigadier*; Kniashnin, with his *Khvastun* (the Boaster), etc., Kapnist (1757-1824), with his *Iabeda* (Calumny), succeeded nearly as well; and the Empress Catherine II. herself showed cleverness in one or two light satirical plays. Khemnitser (1745-84), and later Dmitriev (1760-1837), were successful writers of fables; Bogdanovich (1743-1803) gained a great reputation by his poem of *Dushenka*, though he ranks below Derzhavin (1743-1816), the greatest lyric poet of Russia of his time, and entitled to an honorable place among European writers of the century. He is best known for his stately if frigid odes, one of which, the *Ode to God*, was translated into many languages, including Chinese and Japanese, and hung up in a temple at Peking. The most important prose-writers of the same date were the Freemason publisher and bookseller Novikov (1744-1818), and Radistchev (1749-1802), author of the *Journey from St. Petersburg to Moscow*.

The last years of Catherine's reign were marked by a reaction against everything that savored of liberalism, and from then till after the fall of Napoleon the literary movement was less active. The most important figure was Karamzin (1766-1826), who did for Russian style much what Lomonosov had done for grammar, discarding antique forms, clumsy expressions, and foreign interpolations, besides furnishing by his own productions models for others to study and profit by. He was a many-sided writer, whose most famous works are his *Letters of a Traveler*, his sentimental novel *Bednata* (Poor) *Luisa*, and especially his great *History of Russia*. He also founded the *Vestnik Evropy* (Messenger of Europe), still perhaps the best magazine in the empire. In his political ideas he was national and conservative, and may be looked on as an ancestor of the modern Slavophiles. In this same transition period we find the dramatist Ozerov (1770-1816), whose plays, though still following for the most part the approved rules of classical tragedy, show the beginnings of the new romantic spirit.

The Romantic School.—The romantic school arose at about the same time in Russia as in other countries. The impulse to it came from abroad, especially from Germany and England. Goethe, Schiller, Shakspeare, and later, above all, Byron, displaced the French models of the previous generation. The great champion and genius of the new movement was Alexander Pushkin (1799-1838), the initiator was his friend Zhukovskii (1783-1852), who has left comparatively few original works, but a great number of excellent translations, which made known to his countrymen many of the masterpieces of foreign literature. His friend Kozlov (1779-1840) did much the same thing with less success, while Batiushkov (1788-1855), who early became insane, was the author of a few remarkable poems that imitate the plastic perfection of classic masters. Griboedov (murdered

in 1829 when ambassador at Teheran) left behind a comedy, *Gore of Uma* (Trouble from Cleverness), which ranks with the first of its kind in all literature. The war against Napoleon had caused a general awakening that usually took on a patriotic or liberal form. The former characteristic brought about the discovery and study of the old national *byliny*; the latter led to the December rising at the accession of Nicholas I. The young poet Ryleev (1795-1826) was hanged with others of the chief conspirators, while his friends, the critic and story-teller Bestuzhev (pseudonym *Marlinskii*, 1795-1837) and the poet Prince Odoyevskii (1802-39), were banished to Siberia and the Caucasus. Only a fortunate absence from St. Petersburg preserved Pushkin from being in the plot. He, too, had to suffer banishment from the capital on account of his liberal ideas, but his genius gained by the change of scene and particularly by his visit to the Caucasus. His first poem, *Ruslan and Liudmila*, like Victor Hugo's *Hernani*, in France, started a great controversy which resulted in the complete triumph of the romantic school. Pushkin's style both in prose and poetry approaches perfection. His shorter poems were the delight of his own and succeeding generations; his *Kapitanskata Doch* (The Captain's Daughter) served as a model of a story; his *Boris Godunov* (Eng. trans. of parts by N. H. Dole in *Poet Lore*, Boston, No. 2, 1899; Nos. 3 and 11, 1890; Nos. 8 and 11, 1891) founded genuine Russian tragedy; his *Evgenii Onegin* (Eng. trans. by Lieut.-Col. Spalding, London, 1881) is a long poem recalling *Don Juan* and *Beppo*, with passages of great beauty and still oftener of brilliant wit, and has a hero who can be looked on as the ancestor of the realistic characters of later writers. Around Pushkin gathered his friends and disciples, the poets Delvig (1798-1831), Baratynskii (1800-44), Iazykov (1803-46), Venevitinov (1805-27), Gnedich (1784-1833), the translator of the *Iliad*, and the unfortunate Polezhaev (1807-38). The greatest of Pushkin's successors was the passionate and unhappy Lermontov (1814-41), the embodiment of the Byronic spirit, which he did not live long enough to outgrow. The most combative member of the romantic school was N. Polevoi (1796-1846); its great critic Belinskii (1810-48). The poet Tiuchev (1808-73) was its last distinguished survivor. Contemporary with it, but not belonging to it, were the peasant poet Koltsov (1809-42), and the writer of fables Krylov (1768-1844), who has no equal of his kind except La Fontaine.

The realistic movement begins with Gogol (1809-52), the first of the great Russian novelists. His comedy the *Revizor*, his shorter stories, and his *Mertvye Dushi* (Dead Souls) are among the masterpieces of literature. No countries, except Great Britain and France, can compare with Russia for the number and genius of her novelists and story-tellers of both the first and the second rank. Almost contemporary with Gogol we find the later Nihilist Alexander Herzen (1812-70), whose chief novel, *Kto Vinovat?* (Whose Fault?), is a plea for free love; and the series of novelists continues uninterrupted to the present day. Three names stand out above all others: Turgenev (1818-83), Dostoevskii (1822-81), and Lev Tolstol (b. 1828). Not far behind them come Goncharov (1814-91), the author of *Obломov*, *Obyknovennaya Istoriia* (A Common Story), etc., and Pisemskii (1820-81), from whose works all traces of ideal have disappeared; and then numerous men of second rank like Pisarev (1840-68), Vasilii Krestovskii (b. 1840), Potekhin (b. 1829), etc. Most of them have also written short stories. Among the many especial story-tellers mention might be made of Sollogub and Gleb Uspenskii. As a satirical writer Soltykov (pseudonym *Slashedin*, 1826-89) has no rival but Heine in the nineteenth century. Chernyshevskii's famous romance *Shto Delat?* (What is to be done?) has less literary worth than value as the gospel of the earlier Nihilists. Among the most recent writers are Garshin—a disciple of Tolstol—and the Little Russian Korolenko. The poets of the latter part of the nineteenth century have not equaled those of the earlier. The greatest of them was Nekrasov (1822-77), a champion of the poor and oppressed. Many of the most recent ones, however, without attaining the first rank, have written fine things. Among them are Khomiakov (1804-60), the Panslavist; Maikov (b. 1821), distinguished by the beautiful finish of his verse; Shershshin (pseudonym *Fel*, b. 1820), a singer of love and nature; the melancholy Polonskii (b. 1820); the peasant poet Nikitin (1824-61); Mei (1822-62); Stecherbina (1821-69); Plestchev (1825-93), etc. One of the most promising of the younger poets to-day is the Grand Duke Konstantin Konstantinovich, who writes over the signature K. R. In tragedy the

but since believed in the *Colony* in the *Death of Ivan the Terrible*, by Andrei Tolstoy (1875-76) and in two typical examples of Malinovsky (1884-85) has been the most successful and fruitful of the dramatists of popular life, as Pushkin, Turgenev, Ley Valov, and others have also not succeeded in this way. The literature of translation has also gone on increasing, almost every Russian poet having added his poems until it is doubtful if any other European possesses such fine reproductions of the works of foreign writers.

History.—In the domain of history Karamzin has found better successors, when it they have not equaled him in mastery of style, have attained greater scientific accuracy. Russian historians have not as yet distinguished themselves much in treating of other countries, but they have thoroughly conscientious and satisfactorily closed the story of their own, in spite of the tedious restraint of the censor, whereas they come to deal with anything like recent times. Karamzin (1761-26) was perhaps the oldest of them, his largest work being his unfinished *History of Russia in Chronography* (1811-16). Schöcher (1829-70) left ready-made volumes, which will serve as a guide to future historians rather than as a book for the use of the public. Lantsov and Semakovsky have likewise written good works, and many others have taken up particular subjects. Geography, ethnography, law, and scientific topics have attracted an increasing number of talents, and many longer works in all these fields have been translated. Ley Valov and others have dealt on religion and morals. P. Malov, A. Miller, Melnikoff, Pypin, etc., have treated of the history of languages and literature.

Journalism.—In spite of the rigid watch of the censors, which, however, has varied very much in intensity at different times, Russian journalism has had a vigorous and exuberant life. In the newspapers and still more in the magazines all the literary and many of the political questions of the day have been ably and hotly discussed, the two great parties to the main have been the Slavophiles, who have tended to ultra-nationalism in Church and state, or Pan-Slavism, to disarm of Western Europe, and the Westerns, or Westerners, whose name indicates their more liberal and liberal tendencies. The former have usually had the upper hand. Between 1855 and 1860 the *Kulak* (Akers Belf), published in London by the Nihilist Alexander Herzen, the poet Ogarev, and others, penetrated into France by secret means in great numbers, and exercised much influence, even in the palace of the emperor. It lost its influence by exposing the cause of the Polish rebels in 1862, when the position of leadership of public opinion was taken by the editor of the *Moskovskaya Vedomosti*, Katkov, the greatest of reaction and nationalism. The Pan-Slavist front of the *Travnik* Aleksey, followed in the main the same line, and it was they who succeeded in forcing the Government into the war of 1876. Among the most important journals or Russian today are the *Novoe Vremya* (New Times), Moscow (Nevsky), *Pravda* (Truth) (Moscow), *Petersburgskaya Vedomosti* (Petersburg), *Iskrennost*, and the weekly *Nedelny* (Week), ed. by St. Petersburg; and the *Moskovskaya Vedomosti* and *Moskovskoye* (Moscow), both in Moscow. Perhaps the two best magazines are the *Vestnik Evropy* (Messenger of Europe) and the *Russkoye Vostok* (Russian Messenger).

The literature of Little Russia coincides in its best period with that of Great Russia, and the separate existence begins only with the annexation of Little Russia to Lithuania and Poland. In its second stage it was represented by historical writings, mysteries, educational works, annals, etc., and a mass of popular songs and legends; Russia and Poland shared themselves usually hostile to it. The last and present period is hardly older than the nineteenth century. Avak Kotliarskiy (1769-1899) was the first to make a systematic literature. He was the author of a tragedy on the *Almond* and two dramas, *Natalia Potomkin* (Natalie of Poland) and *Moskva Gromozna* (The Soldier as a Magician), 1872-1889, but novel *Shchegol*, *Woywod*, *Kulak* in 1890, and numerous others continued the work, but the greatest of all was the poet *Nikolayevich* (p. v.; 1814-81). In 1890 the Imperial Government entirely forbade the printing of books in Little Russian, since which time literary productions in that tongue have been confined to the Austrian provinces of Galicia, whose western part is inhabited by members of one nationality. They have produced many writers, some some of extended reputation. The popular poetry of the Little Russians is among the richest and most interesting in the world. The first place belongs to the *Dumy*

or historical songs which tell of the heroic times of Cossack adventure. Tales, legends, proverbs, etc., are also numerous, and many of them have been collected. See, above all, the first volume of the *History of Russian Literature*, by Pypin and Spasskoff (1870 in Russian, German transl., 1890).

The literature of White Russia consists of scarcely more than a few songs and proverbs.

See in Russian the works of Belinskiy, Gdalkov, P. Polov, and many others. The last complete history of Russian literature in any Western language is that of Reinhold in German (Leipzig, 1890); the little French one of Courrière (1874) is not without value. Specimens of many kinds with biographical notes can be found in *Les Littératures Russes*, by L. Lévy, 1890. For the earlier times, Rastaisky's *The Songs of the Russian People* (1870); Miss Hapgood's *Best Songs of Russia* (1890); Morfil's *Russian Literature* (1888); and Gdalkov's *Russian Lyrics* (1876) may be consulted, for a few modern novels, Melnikoff's *Yegor*, *Le Roman Russe*, and Ch. Dumy, *Great Masters of Russian Literature* (King, trans. by N. H. Dole, 1889). For examples of poetry, see Browning's *Russian Poets* (Oxford, 1821-23), *Russian Lyrics in English Verse* by C. T. Wilson (1897), *Rhymes from the Russian*, by John Polson (1893), and Lermontov's *Demian*, by P. Storey (1894); for Pushkin alone, *The Pushkinian*, *Fontaine* (trans. by W. D. Lewis, Philadelphia, 1840), Ivan Putin's *The Poems of Alexander Pushkin*, and articles in *Blackwood's Magazine* (June, July, and Aug., 1845), and in *The Westminster Review* (Apr., 1888). Turgenev, Pasternak, and L. Tolstoy have been translated into English, as have a few prose-works of other writers, but more authors have been rendered into French or German.

ARVIDAHL VARY COLLEGE.

Russ'niaks, or Red Russians: See RUTHENIANS.

Russo-Turkish War: a conflict between Russia and Turkey in the years 1877 and 1878.

Cause.—The true cause of the war was Russia's long-cherished desire to acquire territory in the Balkan peninsula, with a view to bringing her nearer to the ultimate object of her Eastern policy, the possession of Constantinople. The proximate cause, however, was the trouble between the Porte and its Christian subjects. In the summer of 1875 Turkish oppression provoked a revolt of the Christians of Bosnia and Herzegovina, who were privately aided by Serbia and Montenegro. Disturbed by these troubles on her frontier, and sympathizing with the Christians, Austria negotiated with Russia and Germany for the adoption of a common policy toward the Porte, and the three powers agreed to demand of Turkey the introduction of important reforms in her government of the Christian provinces, and the formation of a commission composed equally of Christians and Mohammedans to see to the execution of these reforms. These demands, embodied in the so-called Andrassy note, which was supported by Great Britain and France, were accepted in all essentials by the Porte, but the insurgents, distrusting all promises till steps were taken toward their fulfillment, continued under arms. The conflict was renewed, and the famished fury of the Turks showed itself not only against their Christian subjects but against the foreigner. While another conference of the three Eastern powers was in session in Berlin, news arrived of the murder of the French and German consuls at Salonica by the Turks. Angered by this outrage, the conference drew up the Berlin memorandum demanding an armistice of two months and the immediate appointment of the commission described in the Andrassy note. France and Italy concurred in this action, but Great Britain refused it her support. The Turkish massacres in Bulgaria, involving, it was said, not less than 12,000 victims, raised universal sympathy with the Christians, and caused a revolution of feeling in Great Britain; but Bismarck kept his Government from favoring any project for forcing reforms upon the Porte. Serbia and Montenegro declared war. Russia, determined on war if the concerted action of the powers failed of effect, formed the Treaty of Reichenbach with Austria (July 8, 1876), stipulating that the latter power should liberate Bosnia and Herzegovina if Russia undertook to liberate Bulgaria. At the instance of Great Britain another conference was held at Constantinople, demanding of the Porte the execution of the reforms, but Turkey still remained obstinate. One final effort was made by the powers in the London protocol Mar. 13, 1877, and upon the Porte's rejection of this Russia declared war Apr. 24, 1877.

The War.—Underestimating the strength of their enemy the Russians entered upon the campaign with inadequate

forces. After gaining a few successes in Armenia they were forced to retreat toward their own frontier. In the Balkan peninsula they divided their forces in Bulgaria, and though they gained possession of Nicopolis, Lovatz, and other places, garrisoned them by weak detachments, and allowed the approach of a Turkish army, 35,000 strong, under Osman Pasha, to escape their notice. In the first battle of Plevna (July 20) the Russians were defeated with considerable loss; in the second (July 30) they fared still worse, leaving a fifth of their number on the field. Gourko, who had led a Russian division beyond the Balkans, was forced to fall back upon Shipka Pass, where he was attacked by superior forces, and saved only by the timely arrival of re-enforcements. Russia now raised fresh troops and obtained aid from Roumania. After regaining Lovatz the allied Russians and Roumanians attacked Plevna, but though they succeeded in capturing one of the fortresses the attack on the inner line of defense was repulsed with enormous losses (Sept. 11-12). Public opinion laid the blame of these disasters upon the Russian headquarters, for both officers and men had acquitted themselves well on the field of battle. Todleben, the defender of Sebastopol, was now placed in control of the operations around Plevna. Cut off from all supplies, the Turks made a last desperate effort to break through the Russian lines on Dec. 10, but failed, and were forced to surrender. The victors crossed the Balkans, captured one Turkish army at Shipka, routed another on their way to Adrianople, and entered the latter city on Jan. 22, 1878. The Porte had already begun to negotiate for peace, and on Jan. 31 an armistice was granted by the Russians.

Results of the War.—Great Britain's dread of Russian designs on Constantinople led to the dispatch of a British fleet to that city, and brought the two nations to the verge of war. Nor were matters improved when the terms of the treaty of San Stefano (Mar. 3, 1878) between Russia and Turkey became known. By these, Bulgaria, with its territory enlarged so as to include the greater part of European Turkey, was to constitute an autonomous tributary principality, whose prince, elected by the people, was to be confirmed by the Porte. A Russian commissioner, holding office for two years, was to superintend the introduction of the new system, and a Russian army was to occupy the country for the same period. Improvements were to be introduced in the administration of Epirus, Thessaly, and the other parts of European Turkey for which the treaty did not provide a special constitution; also in Armenia, whose inhabitants were to be guaranteed security from Kurds and Circassians. In lieu of part of the war indemnity claimed by Russia she was to receive the districts of Kars, Ardahan, Batoum, and Bayazid in Asia, and the Dobrukscha in Europe, but the last-named district was to be ceded to Roumania in return for Bessarabia. Russia still claimed a balance of 3,000,000 rubles. A European congress was proposed, to be held in Berlin, but, to the chagrin of Great Britain, Russia denied the right of such a congress to decide finally upon the articles of the treaty. War seemed more imminent than ever, but at length Russia consented to certain modifications of the treaty, and the congress was opened on June 13. The work of the congress was embodied in the Treaty of Berlin (July 13), by which Bulgaria was limited to the country N. of the Balkans, the Russian commissioner was shorn of his powers, the portion of Bulgaria S. of the Balkans was formed into the autonomous province of Eastern Roumelia, subject to the direct authority of the sultan, and the Russian occupation was limited to nine months. Austria gained Bosnia and Herzegovina, and Turkey retained Bayazid. The powers recommended that Turkey should cede Thessaly and part of Epirus to Greece, a recommendation subsequently acted upon by the Porte. In other respects but slight changes were made in the provisions of the former treaty. See BERLIN CONGRESS and EASTERN QUESTION.

F. M. COLBY.

Rustam, or Rustem, rūstēm: a great hero in the mythical times of ancient Iran. He was the son of Zal and Rudābah, and his feats of gigantic prowess and prodigious strength play a romantic rôle in the great Persian epic, the *Shāh-Nāmāh*. (See FIRDŪSĪ.) The *haft khān*, or seven labors of Rustam, rival those of Hercules. The sad story of his slaying his own son Sohrāb, in single combat, forms one of the most pathetic episodes in the *Shāh-Nāmāh*, and has parallels in other literatures; for example, in the old Germanic story of Hildebrand and Hadubrand and in the Celtic tale of Cucullin and Conloch. A. V. WILLIAMS JACKSON.

Rustchuk, roost-chook': town of Bulgaria, on the Danube; 40 miles by rail S. by W. of Bucharest (see map of Turkey, ref. 3-1); the northwestern corner of the Bulgarian quadrilateral. (See QUADRILATERAL.) It has played an important part in the wars between Russia and the Ottoman empire. Captured by the Russians in 1810, it was held by them till 1812. The fortifications then destroyed were rapidly rebuilt, but razed to the ground again in 1829 in accordance with the Treaty of Adrianople. They were once more erected in 1853. Rustchuk escaped capture in the Russo-Turkish war of 1877. Since the creation of the semi-independent principality of Bulgaria, the city has rapidly improved in appearance and business activity has developed. Pop. (1893) 28,121. E. A. GROSVENOR.

Rüstow, rüstō, WILHELM: soldier and writer on military subjects; b. at Brandenburg, Prussia, May 25, 1821; entered the Prussian army in 1838; was arrested and indicted in 1850 for his *Der Deutsche Militärstaat vor und während der Revolution* (1850), but escaped; settled at Zurich; became a celebrated military author; found practical employment in the Swiss army, and took part with distinction in the campaigns of Garibaldi in Sicily and Naples in 1860. Besides his *Geschichte des Griechischen Kriegswesens* (1852; supp. 1854-55) and *Heerwesen und Kriegführung Julius Cäsars* (1855), he published critical representations of all the recent European wars, and a number of theoretical works on tactics, strategy, elementary military organization and education: *Die Feldherrnkunst des 19ten Jahrhunderts* (Zurich, 1857; 3d ed. 1877); *Geschichte der Infanterie* (2 vols., Gotha, 1857-58; 3d ed. Leipzig, 1884); *Allgemeine Taktik* (Zurich, 1858); *Militärisches Handwörterbuch* (2 vols., Zurich, 1859); *Strategie und Taktik der neuesten Zeit* (3 vols., 1872-75). D. at Zurich, Aug. 14, 1878.

Rusts: the popular name for various parasitic fungi, especially for those which produce reddish or brownish discolorations upon the plants which they attack. Botanists are inclined to restrict the term to the UREDINEÆ (q. v.), which include the rusts of wheat and other cereals, besides many species attacking other plants of little or no economic importance. One of the species affecting wheat is the *Puccinia graminis* (Fig. 1), whose first stage develops in the

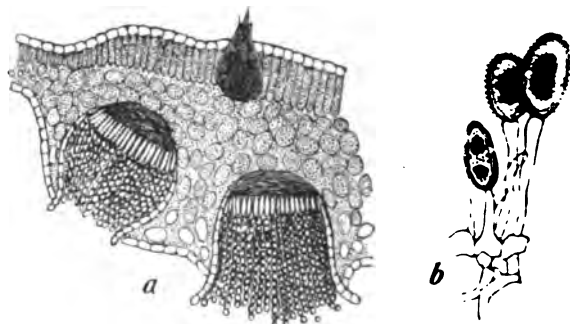


FIG. 1.—Wheat-rust: a, first stage, on barberry; b, second stage, red rust, on wheat (highly magnified).

leaves of the barberry, where it forms many bead-like rows of spores (*conidia*) in masses which are at first internal, but eventually burst through the epidermis in the form of minute cups (Fig. 1, a). The yellow spores of this "cluster-cup" stage germinate upon and penetrate the leaves of the wheat, where the threads of the parasite produce clusters of reddish-yellow spores (Fig. 1, b), which burst through the epidermis in elongated patches. This is the "red-rust" stage, so common when the wheat is about full-grown. The red-rust spores (called *uredospores*, or *stylospores*) serve to propagate the fungus still further; each one falling upon a wheat leaf and finding sufficient moisture germinates, and penetrates the epidermis, giving rise to another growth of parasitic threads, and another mass of red-rust spores. Somewhat later, the fungus forms small, dark-colored sporesacs, each containing two relatively large spores (Fig. 2), which burst through the epidermis as elongated black patches. These spores (black-rust spores, or teleutospores) being thick-walled, are capable of remaining on the straw without injury during the winter, and in the following spring germinate in the moisture of the rotting straw, each spore forming a short thread upon which are borne a few very minute spores (*sporidia*). When the latter fall upon a

young leaf of the hawthorn they germinate and penetrate its tissue, getting first to the cluster-cups then described, and thus completing the round of life.



FIG. 3. *Uromyces thalictricis*, showing cluster-cups on hawthorn.

cluster-cups were other leaf-plants, as in the wheat-rust described, but in some species attacking dicotyledons, and some gymnosperms, all the stages are upon the same host. For a long time it was thought by botanists that the two stages of rust were distinct kinds of fungi, and were given even different names. Thus the cluster-cups were regarded as spores of the genus *Ecdium*, the red rust as spores of the genus *Uredo*, and the black rust as spores of *Puccinia*. Accordingly, we still speak of the first stage as the aecidial stage, and its spores as aecidiospores; and the second stage is often called the uredial stage, and its spores the urediospores.

Another wheat-rust, usually much more common than the one described above, is *Puccinia rubigo-vera*. Upon the Great Plains of the central part of the U. S. it appears to live seasonally in the uredial stage, without the intervention of the aecidial stage. At all times in the year, in some areas from the region stretching from the Rio Grande to the Saskatchewan, the aecidial stage is to be found upon wheat and other cereals, and many grasses; and from this affected area it spreads from field to field every year. In the spring the aecidial stage advances with the season from the southern portion of the region to the northern. In Europe the aecidial stage, which occurs on *Secernus*, is well known, but in North America, if it occurs at all, it is very rare.

The two wheat-rusts may be distinguished in the uredial stage on the shape and size of the spores, which in *P. graminis* are elliptical, ovate, or pear-shaped, 24 to 45 microns in length by 14 to 21 wide, and with two opposite germ-pores; while in *P. rubigo-vera* they are globose, or sub-20 to 32 microns in length by 17 to 24 wide, and with three or four germ-pores.

No remedy or preventive is known for the wheat-rusts.



Apple-rust is a common disease of the apple-tree, in which the leaves become affected by yellow swollen patches. It is caused by a fungus of the order *Uromyces*, and is in fact the aecidial stage of one of the species of *Gymnosporangium*, a genus closely related to *Puccinia*. Experiments have shown that the spores of the aecidium taken from the leaves of the apple may be made to produce the diseased growths on cedar-trees known as cedar-apples, and microscopic examinations show that the latter consist of masses of teliospores imbedded in a gelatinous matter. Here, as in the case of the wheat-rust, it was for a long time not known that the apple-rust had any connection with the cedar-apples, but the matter is now settled conclusively. The former was called *Rustelia pyrida*, and



FIG. 5. A specimen of the cedar-apple (natural size); B, spores highly magnified.

The yellow *Gymnosporangium* from *Uromyces*, which name both fungi have been given.

The best remedy is the destruction of every cedar-apple which may be a source of infection.

The white rusts differ greatly from the foregoing *Uromyces*, and are more relatives of the *Blumeria* (q. v.), with which they agree in mode of sexual reproduction. A common example is the white rust of the cabbage (*Blumeria caulicola*), in which the parasite grows in the interior of the leaves of the host, eventually producing myriads of spores (*oospores*) which burst through the epidermis in white pustule-like patches. These spores are blown to other leaves, which they infect, and thus spread the disease. Later the interior threads produce large, thick-walled resting-spores, which germinate in the following spring, and thus start the disease again.

This species attacks many other kinds of cruciferous plants, as radish, mustard, pepper-grass, shepherd's purse, etc. Other species attack various *Compositae*, *Portulacae*, *Amaranthaceae*, etc.

The *oospore* of the raspberry and blackberry (otherwise called the raspberry anthracnose) is a toombesome disease, producing white patches upon the stems and eventually causing their death (Fig. 9, 4). It is due to a minute parasite belonging to the so-called imperfect fungi, and is known as *Uromyces ascomycetorum*. Its threads penetrate the tissue of the bark, and its spores are borne upon very minute erect threads in the white patches (Fig. 3, 4). The early removal and destruction of the affected stems, and the application of a strong solution of copper sulphate before the buds open in the spring, will reduce the disease.

CHARLES F. BESSEY.

Rutabaga: the Swedish turnip, a highly important root crop, believed to be an artificial variety of *Brassica napus*. It has many sub-varieties, some of which are among the most valued of the turnips. See TURNIP.

Ruta'cea (Mod. Lat., named from *Ruta*, one of the genera, from *ruta*, rue): a family of dicotyledonous trees, shrubs, and herbs. Rue, huchua, and the prickly ash (*Xanthoxylum*) are representative plants. Botanists have recently attached the *Aurantaceae* (orange, lemon, citron, etc.) to this family, which numbers nearly 600 species.

Revised by CHARLES F. BESSEY.

Rutebenf, rut bēf: one of the most original French poets of the thirteenth century. Little is known about his life except that he was a poor minstrel, lived at Paris, was twice married, made but a precarious living, kept bad company, and died about 1280. His *Miracles de Thérèse*, his two *Vies de Sainte*, and his *Complaintes funèbres* are rather perfunctory performances, but in his lyric poems and *ballades* he shows great sincerity, power of realistic observation, and keen satire, especially against the clergy. Jubinal has given an edition of his *Œuvres* (3 vols., Paris, 1874-75); see also L. Châlat, *Rutebenf* (Paris, 1891).

A. G. CANNON.

Rutgers, HENRY: soldier and philanthropist; b. in New York, Oct. 1, 1745; graduated at Columbia College 1766; was a captain during the war of the Revolution, and subsequently a colonel of militia. He was a wealthy citizen of New York, a prominent member of the Reformed Dutch Church, and an active politician; was several times a member of the New York Assembly and a regent of the University of New York from 1802 to 1826. D. in New York, Feb. 17, 1830. Rutgers (originally Queen's) College took his name in consequence of a donation of \$5,000, and several important charities in New York were recipients of his bounty.

Rutgers College: an institution at New Brunswick, N. J. In 1766 Gov. William Franklin of New Jersey granted a charter for a college to be called Queen's College, which was to be primarily an institution for the education of young men for the ministry in the Reformed Dutch denomination, and secondarily to instruct all who might resort to it in all the branches of a collegiate education. An amended charter was granted in 1779, under which the college went into active operation. The first president was the Rev. Jacob R. Hardenbergh, D. D. His successors have been Rev. John B. Livingston, D. D., Rev. Philip Milledoler, D. D., Hon. A. Bruyn Hasbrouck, LL. D., Hon. Theodore Frelinghuysen, LL. D., Rev. William H. Campbell, D. D., LL. D., Merrill F. Gates, Ph. D., LL. D., Austin Scott, Ph. D., LL. D. The president is required by the charter to be a communicant in the Reformed (Dutch) Church in America, but no sectarian religious instruction is given, and students of all denominations have always been found in this college. Its history for a long time is that of a struggle with various difficulties, especially pov-

erty, and for a time its exercises were suspended. In 1825 it was revived under the name of Rutgers, in honor of its benefactor, Col. Henry Rutgers, of New York. Since then its work has been carried on uninterruptedly and successfully, its resources and facilities having been greatly increased. In 1863 Rutgers Scientific School was organized, and in 1864 was designated by the State as the New Jersey State College "for the benefit of agriculture and the mechanic arts," with which, as a department, the college experiment station is connected. In 1894-95 the number of students in the classical and scientific departments was 237, and of professors and instructors 30.

AUSTIN SCOTT.

Ruth, Book of [*Ruth* is from Heb., liter., appearance, beauty]: a canonical book of the Old Testament. It is a beautiful pastoral story, relating the love of Ruth, a young Moabitess, the widow of a Hebrew, for her mother-in-law, Naomi, and the subsequent marriage of Ruth to Boaz, a rich husbandman of Bethlehem-Judah. It is a picture of domestic virtue and happiness amid the troubled times of the Judges, when might was right. Ruth was the great-grandmother of King David. The date and authorship of the book must be inferred solely from its contents and from its position in the canon. It has an Aramaic tinge, and in the Hebrew Bibles is classified as one of the five little rolls of the Hagiographa; and from these facts some have inferred its post-exilic origin. English Bibles, however, following the Septuagint, place it as one of the five consecutive stories of the times of the Judges (Jud. xiii. 2-xvi.; xvii.-xviii.; xix.-xxi.; Ruth; 1. Sam. i.-iv. 1, first clause), and such testimony as that of Josephus and Origen shows that this is the more ancient classification. There is no reason for dating any of these stories later than the reign of David. David's conquests over Damascus-Syria and other Aramaean peoples doubtless had an Aramaizing effect in Israel, equally with the later events of the times of the exile. See Stephen H. Tyng, *The Rich Kinsman* (1856); C. H. H. Wright, *The Book of Ruth in Hebrew and Chaldean* (London, 1864); R. W. Bush, *Popular Introduction to the Book of Ruth* (London, 1883); Paulus Cassel in the *Schaff-Lange Commentary*; James Morison in the *Pulpit Commentary*; J. Glentworth Butler's *Bible Work*, vol. iii., 1889. Goethe pronounces the book of Ruth "the loveliest thing in the shape of an epic or idyl which has come down to us."

Revised by W. J. BEECHER.

Ruthe'nian Rite: a branch of the Roman Catholic Church, consisting of the United Greeks of Austria, Hungary, and Poland, who, as a rule, speak the Russniak language, a Slavic tongue resembling the Polish. They have in Austria an archbishopric (Lemberg, with two united sees of Sanok and Sambor) and two bishoprics (Przemysl and Stanislawów). Their number is 2,653,567. They have 2,376 priests, who care for 1,535 parishes. In 1830, by an act of fraud and violence, the Ruthenians dwelling on the soil of Russian Poland were separated from the Roman Church. See EASTERN RITE, and *Annales Ecclesiæ Ruthenæ*, etc., Leopoli (1862); Pelesz, *Geschichte der Union der ruthenischen Kirche mit Rom von den ältesten Zeiten* (1881); Jordan, *Schematismus der gesammten Katholischen Kirche Oesterreich-Ungarns* (1887); Werner, S. J., *Orbis Terrarum Catholicus* (Freiburg, 1890).

J. J. KEANE.

Ruthenians, or Russniaks, sometimes called **Red Russians**: the Russian inhabitants of Austria-Hungary, some 3,500,000 in number, who are usually classed with the Little Russians, from whom they are distinguished by a few slight differences of dialect. Most of them are found in Western Galicia and the Bukovina, but about 400,000 are settled on the other side of the Carpathians, in Northern Hungary. Owing to their long subjection to Poland they are chiefly a nation of peasants, as the aristocracy is Polish or Polonized. They are intelligent, quiet, and peaceful, but backward in civilization, poor, and addicted to drunkenness. The centuries of political and religious subjection that they underwent at the hands of their masters have engendered bitter hatreds, which have shown themselves by cruel massacres of the nobles during Polish revolts in the nineteenth century. Despite their numbers they have succeeded in electing but few members to the Austrian Reichsrath, though they are beginning to gain ground. As a rule they belong to the United Greek Church, but their political sympathies are apt to be with their brethren in Russia. Their literature, like the Little Russian, of which it forms a part, is particularly rich in folk-lore and songs. For specimens see Vaclav, *Piesni Polski i Ruskie* (1833). They translated

the Bible in 1581. They have a theater and several schools and newspapers. Those in Hungary have made less progress, owing to the crushing policy of Magyarization of the Government at Budapest. A German grammar of the language was published by Levicki in 1833, and a catalogue of Ruthenian literature by Kotula (Lemberg, 1878). See also BIERMANN, *Die ungarischen Ruthenen* (2 vols., Innsbruck, 1861-68); Szujski, *Die Polen und Ruthenen in Galizien* (Teschen, 1882); Kupeczanko, *Die Schicksale der Ruthenen* (Leipzig, 1887). See RUSSIAN LANGUAGE.

A. C. COOLIDGE.

Ruthe'nium [Mod. Lat., named from Ruthenia, a name of Russia, where it was first found]: a metal discovered in association with native platinum by Claus in 1846. It occurs chiefly in the hard grains of iridosmine in small proportion, not above 6 per cent. Its extraction is difficult and tedious. The metal is obtained as a white spongy mass, density 8.6, by calcining the ammonio-chloride. Next to osmium it is the most infusible known metal, but Deville and Debray fused it, and found a density of 11.4. It is scarcely attacked by aqua regia, but easily oxidized by fusion with hydrate of potash, more easily with saltpeter. Chlorine attacks it at incandescence. It forms three chlorides, $RuCl_3$, $RuCl_4$, and $RuCl_5$; six oxides, RuO , Ru_2O_3 , RuO_2 , Ru_3O_4 , Ru_2O_5 , and RuO_4 ; and two sulphides, Ru_2S_3 and RuS_2 . Its fumes are not poisonous.

Revised by IRA REMSEN.

Rutherford: borough; Bergen co., N. J.; near the Passaic river, on the N. Y., Lake Erie and W. Railroad; 7 miles S. E. of Paterson, 8 miles N. by W. of Jersey City (for location, see map of New Jersey, ref. 2-E). It is an attractive residential place, built up chiefly by New York business men, and contains several churches, public schools, school-district library, and three weekly newspapers. Pop. (1880) 2,299; (1890) 2,293.

Rutherford, SAMUEL: theologian and controversialist; b. at Nisbet, Roxburghshire, Scotland, about 1600; graduated M. A. from the University of Edinburgh 1621; became minister of Anwoth 1627; was deprived by the high commission court of Galloway 1630, and silenced for preaching against the Articles of Perth and banished to Aberdeen 1636; was restored to Anwoth in 1638; was a delegate to the General Assembly Nov., 1638; Professor of Divinity in New College, St. Andrews, Oct., 1639; principal of that college 1647, and rector of the university; was commissioner to the Westminster Assembly 1643-47, but was deprived of his posts 1660, and cited to appear before the next Parliament on the charge of high treason. During the four years of his service on the commission he wrote *The Due Right of Presbyteries* (1644); *Lex Rex* (1645), which was burned under his windows at St. Andrews in 1661; *The Trial and Triumph of Faith* (1645); and *Christ Dying and Drawing Sinners to Himself* (1647). D. in Edinburgh, Mar. 29, 1661. He was prominent among the Presbyterian divines of his time, and author of a large number of theological treatises, which were highly esteemed; among them were a reply to Rev. Thomas Hooker's *Summe of Church Discipline; Covenant of Life* (1655); *Civil Policy* (1657); *Life of Grace* (1659), etc. There have been reissued *Twelve Communion Sermons* (1876) and *Quaint Sermons* (edited by A. A. Bonar, 1885). See A. A. Bonar, *Letters of Rev. Samuel Rutherford*, with a sketch of his life (1851; new and revised ed. London, 1894; another ed. of his *Letters* (New York, 1891), and the *Life* by Andrew Thomson (London, 1884; 2d ed. 1891).

Revised by S. M. JACKSON.

Rutherford, LEWIS MORRIS: astronomer; b. at Morrisania, N. Y., Nov. 25, 1816; graduated at Williams College in 1834; admitted to the bar in 1837; retired from practice in 1849 to devote himself to travel and study, especially of astronomy. He was the first to apply photography to accurate celestial measurements. In 1864 he had a large telescope especially constructed for photographic purposes, and his pictures of celestial objects taken with this instrument have not yet been surpassed. In 1883 he retired from active astronomical work, and presented his instruments to Columbia College. D. at Tranquillity, N. J., May 30, 1892.

S. NEWCOMB.

Rutherglen, rū'g'lēn: town of Lanarkshire, Scotland; on the Clyde, 3 miles S. E. of Glasgow (see map of Scotland, ref. 12-G). It was formerly a place of great importance, but is now dependent on its connections with Glasgow for both its trade and its manufactures. Pop. (1891) 13,361.

Rutile [from Lat. *rutillus*, red, golden red]: a native oxide of titanium used to color porcelains and artificial teeth

rine piratical squadron off the port of Salé, and subsequently distinguished himself still more in the war between Holland and England, 1652, and in the Danish service. In 1667 he sailed up the Thames, destroyed the shipping at Sheerness, and burned a number of English men-of-war; in 1672 he attacked the English and French fleets, and compelled England to conclude the Peace of Breda. In the war with France he commanded in the Mediterranean, but was defeated off the eastern coast of Sicily by Admiral du Quesne. He succeeded in conducting his fleet safely into the harbor of Syracuse, where he died next day, Apr. 29, 1676.

Ryan, HARRIS JOSEPH, M. E.: electrical engineer; b. at Powell's Valley, Pa., Jan. 8, 1866; educated at Baltimore City College, Lebanon Valley College, and Cornell University, graduating at the last named in 1887; instructor in physics, Cornell University, 1888-89; appointed Associate professor of Electrical Engineering, Cornell University, 1889. Prof. Ryan is the author of various papers on electrical machinery read before the American Institute of Electrical Engineers, of which he is a member, and is a contributor to *The Electrical World*, *The Electrical Engineer*, *The Sibley Journal of Engineering*, and numerous other U. S. and European electrical journals. C. H. T.

Ryan, STEPHEN VINCENT, D. D.: bishop; b. near Almonet, Upper Canada, Jan. 1, 1825; was taken when a child to Pennsylvania; was educated at St. Charles's Seminary, Philadelphia, Pa.; completed his theological studies at St. Mary's Seminary, Barrens, Mo.; was ordained priest June 24, 1849, in St. Louis, Mo.; was prefect and professor for some years at St. Mary's Seminary, and afterward at St. Vincent's College, Cape Girardeau, Mo., of which institution he became president about the year 1856; was named provincial visitor of the Congregation of the Mission in 1857; appointed by the Holy See second Bishop of Buffalo Mar. 3, 1868, and was consecrated Nov. 8 of the same year. Revised by J. J. KEANE.

Ryazan: See RIAZAN.

Rybinsk': town of Russia, government of Yaroslav; on the Volga; 48 miles N. W. of Yaroslav (see map of Russia, ref. 6-E). It is one of the most important centers of internal commerce in the empire, and is at the head of the Mariinskaia and Tikhvinskala Canals which unite the basins of the Volga and the Neva and Dwina, and thus the Caspian with the Baltic. It has a large transit trade in cereals, flax and hemp and their seeds, lard, spirits, metals, cloths, and other manufactures, and the Volga is open on an average 219 days per year. The town is an ancient one, first mentioned in history in 1137; became important in the middle of the eighteenth century, when the canals were finished. Pop. (1890) 32,111. MARK W. HARRINGTON.

Rydberg, rid'bärch, ABRAHAM VICTOR: author; b. at Jönköping, Sweden, Dec. 18, 1829; educated in the Latin school of Wexjö, studied at the University of Lund, and was for many years editor of *Göteborgs Handels- och Sjöfartstidning*, one of the most influential papers of Scandinavia. He has published several translations (Goethe's *Faust*) and novels, among which *Den siste Athenaren* (The Last of the Athenians, 1859), a picture of the last contests between Greek paganism and Christianity, was translated into German and English; several poems characterized by finish and originality; a number of æsthetical and historical studies, *Venus från Milo* (1874), *Romerska dagar* (1875-77), etc.; and a series of works belonging to the philosophy of religion—*Bibels lära om Kristus* (The Teaching of the Bible about Christ, 1862), *Medeltidens magi* (Magic of the Middle Ages, 1864), *Romerska sagnar om Apostlarin Paulus och Petrus* (Romish Legends about the Apostles Peter and Paul, 1871), *Urpatriarkernas tafla i Genesis* (The Primitive Patriarchs' Tables in Genesis, 1873), etc. His *Undersökningar i germanisk Mythologi* (1886; Eng. trans. 1889, under the title *Teutonic Mythology*) is a brilliant but wholly unscientific work. Revised by D. K. DODGE.

Ryde: town of England; on the northeast coast of the Isle of Wight, opposite Portsmouth, at the other side of the Spithead roadstead (see map of England, ref. 14-1). It is a fashionable watering-place; it consists of Upper and Lower Ryde—the former being on the site of an ancient village (La Rye or La Riche), while the latter is of recent construction. Pop. (1891) 10,952.

Rydqvist, rid'kwist, JOHAN ERIK: scholar; b. at Gothenburg, Sweden, Oct. 20, 1800; was editor of a literary journal,

Heimdal (1828-32); became a royal librarian; was elected a member of the Swedish Academy. His *Svenska språkets lagar* (Principles of the Swedish Language, 5 vols., 1850-74) is still, in spite of the many changes in linguistics, the authoritative work on that subject. He was also the author of a study of the early Scandinavian drama *Nordens äldsta skådespel*, and the translator of a number of Moore's poems. D. at Stockholm, 1878. D. K. DODGE.

Rye: a cereal plant (*Secale cereale*), native of the country about the Caspian Sea. It is largely cultivated in Central and Northern Europe, where the grain is the chief breadstuff and the straw is largely used for thatching. Rye grows well in a cold climate, and will thrive on poor sandy soils better than wheat. Rye is not so nutritious as wheat, and makes an inferior and darker-colored bread. An average analysis of rye grown in the U. S. gives: Water, 11.6; ash, 1.9; protein, 10.6; fiber, 1.7; carbohydrates, 72.5; fat, 1.7. Fertilizer analyses give for grain a percentage of 1.76 nitrogen, 0.82 phosphoric acid, 0.54 potash; and for straw a percentage of 3.25 ash, 0.46 nitrogen, 0.28 phosphoric acid, 0.79 potash.

In the U. S. about 80,000,000 bush. are produced annually. In the eastern States the straw is often of as much value as the grain. Machinery has been devised for threshing the grain without breaking the straw, which is used largely for matting, mattresses, and saddlery. Whisky is extensively distilled from rye in the U. S., gin in Holland, and a liquor called kvass in Russia. GEORGE C. WATSON.

Rye-grass: the *Lolium perenne*, a European grass naturalized in the U. S. In Europe it is highly esteemed both for hay and pasture, and is the most important of all forage plants, but in the U. S. it is not very highly valued. The Italian rye-grass (*L. italicum*) is also greatly valued in Great Britain. For the *Lolium temulentum* see DARNEL.

Rye House Plot: a scheme devised by some English Whigs to kill King Charles II. while on his way from Newmarket, and to give the crown to the Duke of Monmouth. It was so called from the Rye House, a farm near Newmarket, where the murder of the king was to be undertaken. The plot was discovered, and many leading Whigs, including Algernon Sydney and Lord Russell, were sent to the block, and many others were severely punished.

Rye, Spurred: See ERGOT.

Ryleev, ril'-yef, KONDRATI F. FEDOROVICH: poet; b. in Russia, Sept. 18, 1796, the son of a retired officer. He was brought up in the first corps of cadets, was in the artillery during the campaign of 1814, and withdrew from the army four years later. In St. Petersburg, where he took up his residence, he served as a Government official and then as secretary of the Russian American Company. At the same time he was active in literature and politics. He published poems in different papers, and with his friend A. Bestuzhev was editor of the *Svernata Zvezda* (North Star), an organ of the romantic school. He was one of the chiefs of the band of conspirators who brought about the futile military rising at the accession of the Emperor Nicholas I., although convinced that success was impossible, and was hanged with four of his comrades July 26, 1826. His character seems to have been exceedingly pure, and his patriotism of the highest kind. His complete works were published at St. Petersburg, 1872. See *The Poems of K. F. Relaiëff*, translated by F. Hart-Davies (London, 1887). A. C. COOLIDGE.

Rymer, or Rymour, THOMAS: historiographer; b. at Northallerton, Yorkshire, England, about 1641; educated at Sidney-Sussex College, Cambridge; studied law at Gray's Inn; became historiographer to William III. in 1692; now chiefly remembered for the vast Latin collection of English historical and diplomatic documents known as *Rymer's Fœdera* (20 vols. folio, 1704-35, of which 15 were edited by himself and the remainder by Robert Sanderson). D. in London, Dec. 14, 1713. Rymer left 58 MS. vols. of important historical documents, now in the British Museum. A *Syllabus* (in English) of the *Fœdera* was published by Sir Thomas Duffus Hardy (8 vols., 1869-86).

Rymour, THOMAS: See RHYMER, THOMAS.

Ryswick, riz'wik: small town of the Netherlands, province of South Holland; 2 miles S. E. of The Hague (see map of Holland and Belgium, ref. 6-E). It is famous for the treaty of peace between France and the allies, Germany, Holland, England, and Spain, signed here Sept. 20, 1697.

Rzhef: See RSHEF.

years according to Herodotus, ii., 137). His reign in Egypt was mild, and he left monumental remains in Thebes. Hoshea of Israel (2 Kings xvii. 4) asked his aid against Shalmaneser of Assyria in vain, and later other Syrian princes made alliance with him against Assyria. Sargon, who defeated Sabaka at Raphia, S. of Gaza, and afterward exacted tribute of him, calls him a "prince," and his cartouche, found at Nineveh, shows him wearing the crown of Lower Egypt. Stade considers him to have been simply a petty local ruler.

CHARLES R. GILLET.

Sabal Palmetto: See PALMETTO.

Sabanilla, sãa-bãa-neel'yãa, or Savanilla: seaport of the department of Bolivar, Colombia; on a bay 7 miles W. of the delta of the river Magdalena (see map of South America, ref. 1-B). It is connected by railway with Barranquilla, on the river, and is the maritime port of that place, and consequently of the greater part of the republic. The bay is shallow, and vessels anchor in a roadstead several miles below. The population is small.

H. H. S.

Sabbath [from Heb. *shabbâth*, rest, sabbath, deriv. of *shabâth*, rest from labor]: the weekly day of religious rest. The observance of a weekly rest-day is very widely held to have a natural basis in the constitution of man. The persistency with which such an institution has been maintained for many ages among Jews, Christians, Mohammedans, and even some pagan nations, supports this view. Inquiries instituted by a commission of the British Parliament in 1832, the testimony of 641 medical men of London in a petition to Parliament in 1853, and of a great number of medical societies, physicians, physiologists, political economists, and managers of industrial establishments, go to prove that in the case of men engaged in ordinary bodily or mental labor the rest of the night does not fully restore the waste of energies during the day, and that to maintain a condition of vigor a supplementary rest of about one day in seven is needed. This view is confirmed by the experience of France during the Revolution, when the decade was substituted for the week, and each tenth day devoted to rest—a proportion of time which was found to be insufficient. The need of a weekly respite from daily toil appears also in the social nature and relations of man as a member of the family and of the state. These aspects of the weekly rest have been ably illustrated by Pierre Proudhon, the French radical philosopher, in his essay *La Célébration du Dimanche*, and more fully in papers presented at the Sunday Rest Congress in connection with the Paris Exposition of 1889; and in papers read at the Chicago Sunday Rest Congress in 1893, published as *The Sunday Problem* (New York, 1894).

The week of seven days may be traced to the dawn of human history, and it is probable that wherever the week existed it was marked by the observance of sabbath or rest-days. A weekly Sabbath was known to the Semitic Assyrians and Babylonians, and it is claimed that the name *Sabattu* is found in the inscriptions, where it is defined as "a day of rest for the heart." It seems also to have been known to the Accado-Sumerians, the aboriginal inhabitants of Chaldaea, and their equivalent term for Sabbath is explained to mean "a day of completion of labor." (Sayce, *Hibbert Lectures for 1887 and Social Life among the Assyrians*, 1893.) The Assyrian Sabbath differed widely from that of the Hebrews, and the connection between the two is as yet uncertain. See Francis Brown's *Assyriology* and J. D. Davis's *Genesis and Semitic Tradition*.

The first mention in the Bible of such an institution is in Gen. ii. 2, 3—a passage which forms the close of the earliest of the records of which the Mosaic history, according to the theory of many biblical scholars, is composed. The seventh day is consecrated by the Creator, who, having finished the creative work of six days, or periods, blessed and hallowed the seventh because he rested therein. The natural meaning of the passage is the establishment of a holy rest-day after every six days of labor for the race just created. The natural law of periodic rest was thus lifted out of the sphere of mere physical necessities into that of intellectual and spiritual privilege and enjoyment, as befitting a creature made in the image of the Creator and capable of holding fellowship with him. Its connection with the Creation shows that, with the family constitution, it was intended to lie at the basis of the development of all human life, inclusive of all human conditions, and not merely for any sect or age. As to the observance of the Sabbath in the patriarchal period, the Mosaic narrative, which is very brief and meager, gives us no knowledge save what may be inferred

from the occasional intimations of the division of time by weeks (Gen. xxix. 27; viii. 10, 12; iv. 10, etc.).

The first mention of the Sabbath by name occurs in Ex. xvi. 23, *seq.*, where its observance is not introduced with the formalities with which an institution of such importance would be inaugurated for the first time, but in language which seems to imply that it was not wholly unknown to the people. It next appears among the Ten Commandments, which were distinguished from the rest of the Jewish law by the circumstances of peculiar solemnity under which they were spoken on Mt. Sinai and given to Moses engraved on stone tablets by the hand of God (Ex. xx. 8). Its observance was enforced by gratitude for deliverance from bondage (Deut. v. 15), and was constituted a sign of covenant between God and the Jews. Like other of these great commands, the law of the Sabbath reappears in the Jewish municipal and ceremonial code with special prescriptions and penalties, all of which show the importance attached to its observance and the great care taken—as by the prohibition of servile work, gathering of sticks, kindling fires, etc.—that all alike, servants as well as masters, strangers as well as members of the congregation, should enjoy its benefits. A single instance is recorded of the punishment of death being inflicted upon a presumptuous transgressor (Num. xv. 30, *seq.*). Connected with the weekly Sabbath there was ordained in the Jewish municipal and ceremonial law a system of sabbatical years of local and national significance and use (Lev. xxv.). The Sabbath also, in its leisure and opportunity for social intercourse and holy convocation (Lev. xxiii. 3), sustained an important relation to the free republican institutions of the Jews. In later periods of the Jewish history, Isaiah (lviii. 13) and Jeremiah (xvii. 21, *seq.*) enforced its observance with threatenings and promises; Ezekiel (xx. 12, *seq.*) put its violation foremost among the national sins; Nehemiah (x. 31; xiii. 15) narrates the public efforts at reformation after the return from the Babylonish captivity. Henceforward the Sabbath was kept with scrupulous care, and gradually to the time of Christ became burdened with self-enforced severities and ridiculous prohibitions.

Christ, while observing the Sabbath, sought by his example and teachings to rescue it from the puerile superstitions by which it had come to be degraded. He performed miracles of healing, and with his disciples gathered ears of grain for food as he passed through the fields on the Sabbath, and justified his conduct by showing that such works of necessity and mercy were not violations of its true law. He taught that the Sabbath was made for man, for his benefit, and not man for the Sabbath, and that He, the Son of man, the one in whom all humanity is represented in its perfection, was so the Lord of the Sabbath as rightfully to define and prescribe its true obligation and use (Mark ii. 27, 28).

The resurrection of Christ and his subsequent appearances to his disciples till his ascension, and the miraculous descent of the Holy Spirit on the first day of the week, led to that day being set apart for the special religious assemblies of the Christians and for the simple services of their faith. For a time the Jewish converts observed both the seventh day, to which the name Sabbath continued to be given exclusively, and the first day, which came to be called the Lord's Day. St. Paul sought to relieve the consciences of the Gentile Christians from the obligation of keeping the Jewish Sabbath, and warned them that such observance might even be an evidence of backsliding (Col. ii. 16; Gal. iv. 10). Within a century after the death of the last of the apostles we find the observance of the first day of the week, under the name of the Lord's Day, established as a universal custom of the Church, according to the testimony of the *Didache*, and of Barnabas, Ignatius, Pliny, Justin Martyr, and Tertullian. It was regarded not as a continuation of the Jewish Sabbath—which was denounced, together with circumcision and other Jewish and anti-Christian practices (*Apology of Aristides*, A. D. 125)—but rather as a substitute for it; and naturally its observance was based on the resurrection of Christ rather than on the Creation rest-day or the Sabbath of the Decalogue. Tertullian (about 200), in saying that Sunday was given to joy, and enjoining abstinence from secular care and labor on it, makes it evident that the Lord's Day was regarded as taking the true place of the original seventh-day Sabbath. But the position of the early Church, struggling into existence, exposed to persecution, and with many of its members slaves of heathen masters, would prevent unbroken regularity of worship and a general cessation of labor, until in the time of

Christianity (1831): the observance of Sunday as the weekly rest-day was presented by law. Later in the history of the church the connection between the Lord's Day and the original Sabbath became rapidly recognized. The second Council of Nicaea (325), in forbidding secular work on that day, and declaring that it was occupied with the hymns and praise of God, said: "For this is the day of perpetual rest; this is marked out to us by the seventh day in the Law and the prophets." At the Reformation, Luther, Kewigh, Calvin, and others at first expressed the abolition of all holy days but the Lord's Day; but their antagonism to what they considered the Judaizing legends of Rome, and their zeal for evangelized heathens, led them at times to deny the scriptural obligation of a weekly festival. They were not, however, always consistent with themselves. Luther says of the Sabbath, "Keep it free for the most noble birth to body and soul, but if anything the day is made holy for the mere day's sake, if anything any one sets up its observance upon a Jewish foundation, then I exhort you to work on it, to take on it, to dance on it, to feast on it, to do anything that shall improve this sanctification on the Christian spirit and liberty." Calvin has represented the observance of Sunday as "good and necessary," and defends the Ten Commandments as still binding on Christians. Upon the Continent, since the Reformation, both among Roman Catholics and Protestants, the observance of the Sabbath was until later years commonly based upon ecclesiastical authority. A different view was obtained in Great Britain, and there and in the U. S. the prevalent doctrine recognizes the weekly rest-day as founded in the nature of man, consecrated by the example of rest at the Creation, authoritatively promulgated in the Jewish Commandment, confirmed by Christ, and, with transferred from the seventh to the first day of the week and invested with new significance, perpetuated in the Fourth Day of the Christian Church. See Robt. Cox, *Literature of the Sabbath Question* (1895); Huxley, *Dauphin Lecture Series* (1896); *Order, Text of Old Test.*; E. J. Proudhon, *La Liberté des Dimanches*; Philip Schaff, *Hist. of the Apostolic Age and Church Hist.*; Taylor Lewis, *Commentary on the words of Luther's Catechism*, ch. 1, § 3, *Sabb. Comm. Dec. 26*; *Eight Studies of the Lord's Day*; *The Sunday Problem, Its Present-day Aspects*. See **Lord's Day** and **SUNDAY**.

W. W. ATTERBURY.

Sabbathal' Lewi', or Shabbatal Tseri: See **Jews** (*In their good the Levites*).

Sabbatical Festivals: four festivals enjoined by the law of Moses. These were: (1) The Sabbath day, (2) The Sabbath month, which was Tishri, the seventh in the Hebrew year, corresponding with our October. It opened with the Feast of Trumpets, contained the Day of Atonement (10th), and the Feast of Tabernacles (15th to 22d). (3) The Sabbath year, which in Exodus (xxiii, 10, 11) has an agricultural aspect (the land is to rest from culture); in Deuteronomy (xv, 1-6) has a commercial aspect (debtors were either to be redeemed or held in servitude); and in Leviticus (xxv, 1-7) a religious aspect ("for the Lord"). Every seventh year was thus consecrated to secular and selfish uses; but before the Christian era the ordinance appears not to have been well observed, as may be gathered from Jer. xlv, 11, 12, compared with 2 Chron. xxxvi, 31. After the Captivity it was different. Alexander, who conquered Syria 332 B. C., treated the tribute of the Jews every seventh year, "that they might enjoy the laws of their forefathers" (Josephus, *Ant.* xii, 8, 10). Julius Cæsar afterward did the same (*Ant.* xiv, 10, 16). According to Jewish reckoning, the year from 389, 1889, to 400, 1899, was a sabbatical year. (4) The Year of Jubilee, which was not, as some say, every forty-ninth, but every fiftieth year, so that there were then two successive years of rest. In that year every Hebrew servant was to return to freedom, and landed property to revert to the respective original proprietors.

Revised by S. M. JACKSON.

Sabellian Languages: See **ITALIC LANGUAGES**.

Sabellius, ecclesiastic: b. in Africa about 180 A. D.; was active in Rome until his excommunication by Pope Calixtus about 217 A. D. He turns up later in Egypt, and was excommunicated by Bishop Dionysius of Alexandria (260). The heresy which bears his name, called Sabellianism, is essentially the same as that styled Patripassianism in the Western Church. It teaches that the Trinity of God consists of not a Trinity of persons, but of manifestations and periods in the history of revelation. God is essentially one in person, but reveals himself in a threefold

aspect as Father, Son, and Holy Spirit in the works of creation, redemption, and sanctification. For his heresies see M. J. Roth, *Religions Science*.

Revised by S. M. JACKSON.

Sabine, sir, Sir EDWARD, D. C. L., F. R. S., physician; b. in Dublin, Ireland, Oct. 14, 1756; entered the British army as second lieutenant of artillery 1808; became captain 1811; took part in the campaign on the Niagara frontier, commanding the batteries at the siege of Fort Erie, 1814; accompanied the Arctic expedition of Ross and Parry 1818, and that of Parry 1819-20, when he made important researches in terrestrial magnetism, which were communicated to the Royal Society; aided in the preparation of the *Natural History of Parry's first expedition* (1824); made a series of voyages, ranging from the equator to the Arctic Circle (1821-25), in quest of data concerning the variations of the magnetic needle, the figure of the earth, and other problems in meteorology and terrestrial physics; published *An Account of Experiments to determine the Figure of the Earth* (1825); and *The Variability of the Intensity of Magnetism upon Many Parts of the Globe* (1826); edited the records of magnetic observations made at Cape Town, Toronto, St. Helena, Hobart, and other colonial observatories in several large volumes (1843-60), and contributed numerous memoirs to the Royal Society; was made a Knight of the Bath 1869; D. at Richmond, Surrey, June 20, 1893.

Sabine Dialect: See **ITALIC LANGUAGES**.

Sabine (old-been) Pass: the mouth of Sabine river and lake; it has a muddy bar, with shoal water and a narrow channel. Dredging and jetty-building have been undertaken to improve this pass. There is a brick light-house on Hawk Point, the east side, lat. 29° 43' 55" N., lon. 93° 50' 10" W., with a flashing dioptric light of the third order. The Southern Pacific Railroad (Sabine and East Texas Division) extends to the harbor, which is from 25 to 40 feet deep.

Sabine River: a stream which rises in Hunt Co., Tex., flows S. E. to the western boundary of Louisiana, and then turns southward, forming throughout the rest of its course the boundary between Texas and Louisiana for 250 miles. It is 500 miles long, is navigable in its lower course, and after traversing Sabine Lake enters the Gulf of Mexico through Sabine Pass, its mouth.

Sabines (Lat. *Sabini*): the ancient inhabitants of a tract of Central Italy lying E. and N. of Rome. They were a confederation of communities, of which Corus maintained a sort of headship, the most important other places being Reate (birthplace of Varro) and Amerinum. These municipalities were, however, of no commercial importance, and were indeed little more than peasant villages. As a people the Sabines were engaged in agriculture and grazing, and, from the simplicity of their life and their physical prowess, they obtained a reputation like that of the Spartans for severity of discipline and sturdiness of character. The narrow limits of the Sabine territory made emigration necessary, and probably in this way they came in contact with the growing power of Rome, to which the story of the joint rule of Romulus and Titus Tatius points, and the fact that Numa was of Sabine origin. They were not finally subdued by Rome until 299 B. C., and some twenty years later they were admitted to citizenship.

G. I. HERNANDEZ.

Sabinus, Marcus: a famous jurist of the reign of Tiberius, pupil of Capito, and founder of the school of Sabinian. He was the author of several works, the most important being *Libri vii. Juris Civilis*, which was much used and commented upon by later jurists, but is not extant. See Huschke, *Jurisprudentia Antiquissima* (5th ed. Leipzig, 1886, pp. 125-126).

M. W.

Sabism, or Zabism: the religious system of the Sābiān (Hapists), a Christian sect in Mesopotamia and North Arabia who adhered to much of their original nature-worship, but were known chiefly for their frequent washings. For this reason they have been wrongly identified with the *Margānās* (q. v.), with other sects in South Babylonia, with the Jewish *Margānās*, and with a certain Samaritan sect. They are, perhaps, the same as the *Elkasaites*. Mohammed and his first followers were called Sābiān by the heathen Arabs. Mohammed had only a vague idea who they were, but in the Koran mentions them favorably together with Jews and Christians. Under Al-Ma'mūn 833 A. D., the inhabitants of Harrān, whose religion was a fusion of heathenism and Neoplatonic ideas, but who still worshiped stars and offered sacrifices, shielded themselves by declaring that they were the

Sábians mentioned in the Koran. They even asserted that they were descendants of one Sábī, son of Seth or Adam. See Chwoson, *Die Saabier* (St. Petersburg, 1856); Wellhausen, *Skizzen*, iii., p. 206; Dozy, *Nouveaux documents pour l'étude de la religion des Harraniens in Actes du sixième congrès des Orientalistes* (Leyden, 1885, ii., 1, p. 281).

RICHARD GOTTHEIL.

Sable [from O. Fr. *sable*; cf. Fr. *zibeline*, *soble*, Ital. *zibellino*, Germ. *zobel*; loan-word from Russ. *sobolj*]: a name given to species of the family *Mustelidæ* and genus *Mustela*. The animals in external appearance resemble the weasel, but they are considerably larger and their bodies are not so elongated. In summer the color is reddish or brownish yellow, clouded with black, and becoming lighter toward the head; in winter it is dark. The length of the body in well-grown sables does not vary much from 17 inches from the snout to the tail, while the tail is from 7 to 10 inches long. The Old World form (*Mustela zibellina*) inhabits Northern Europe and Asia. The sable furs are chiefly obtained in Siberia. This Siberian form in winter often has the whole body covered with lustrous blackish-brown or sometimes quite black hairs, but with these are generally intermingled white ones. The posterior tubercular grinder of the upper jaw is oblong, and nearly twice as long on the inner as on the outer side. The American sable (*Mustela americana*) is most abundant in British America, and the furs in the markets are chiefly obtained by the Hudson Bay Company. It is distinguished from the Siberian species by the posterior tubercular grinder of the upper jaw being quadrate, and rather longer on the inner than on the outer side. The furs of both species are held in high esteem.

Revised by F. A. LUCAS.

Sable, Cape: See CAPE SABLE.

Sable Island [Fr. *sable*, sand]: an island 104 miles S. E. of Cape Canso, in Nova Scotia. It is a dependency of Nova Scotia, and is an arc 34 miles long, convex to the S., and from 1½ to 5 miles in breadth. It is composed of grass-covered sand-hills, inclosing a lake 11 miles long with a maximum depth of 12 feet. Lat. of east point, 43° 59' N., lon. 59° 47' W.; lat. of west point, 43° 57' N., lon. 60° 8' W. Many ponies are bred here. The island has a life-saving station, it being surrounded by extensive and very dangerous shoals. It is in the regular course of ships from Europe to Southern Nova Scotia and New Brunswick. It is said to be slowly growing smaller. It was colonized in 1598 by forty French convicts, but five years later only twelve survived, and the colony was broken up. The island should not be confounded with Cape Sable island. See CAPE SABLE.

Revised by M. W. HARRINGTON.

Sables, or Les Sables d'Olonne, lā'saab'l'dō'lōn': town; in the department of Vendée, France; on the Bay of Biscay; 50 miles S. by W. of Nantes (see map of France, ref. 5-C). It was founded by Louis XI., who built its harbor and constructed its fortifications. It is a favorite watering-place, and carries on extensive fisheries and a large export trade in grain, wine, wood, salt, and fish. Pop. (1891) 10,293.

Sabri'na: a celebrated temporary volcanic islet of the Azores, a short distance S. W. of Cape Ferraria, the western point of San Miguel island. It appeared in 1811, and the process was watched by the crew of the British frigate *Sabrina*, from which its name is derived. Sixteen days after the eruption the cone attained its greatest dimensions—215 feet in height and 6,000 in circumference. It was composed of ashes and scoria without cohesion, and was gradually washed away until in 1850 the lead showed a depth of 15 fathoms where it had formerly stood.

M. W. H.

Sacaline: a forage plant (*Polygonum sachalinense*) from the island of Saghalin, on the Russian shore of the Pacific, introduced in the U. S. in 1894. It is a perennial woody herb, growing 6 to 12 feet high. It is said to be relished by live stock, and the shoots and leaves are recommended as a kitchen vegetable. The plant is supposed to resist severe drouth.

L. H. B.

Saccar'do, PIETRO ANDREA, Ph. D.: botanist; b. at Treviso, Italy, Apr. 23, 1845; Professor of Botany in the University of Padua, and author of many works on the fungi, the most important of which are *Fungi Italici* (1877-86) and the *Sylloge Fungorum Omnium huc usque Cognitorum* (10 vols., 1882-92), containing descriptions of 39,663 species. He has made a distribution of specimens under the title of *Mycotheca Veneta*.

C. E. B.

Saccas: See AMMONIUS.

Saccharim'etry [Lat. *saccharum*, sugar + Gr. *μέτρον*, measure]: the process of ascertaining the proportion of sugar dissolved in a liquid. This can be effected by using the hydrometers of Brix or Balling, sometimes called saccharimeters, which are specially constructed so as to indicate the percentage of sugar in an aqueous solution. (See HYDROMETER.) But the means generally adopted is by utilizing the optical properties of sugar. All sugars and their solutions have the power of rotating the plane of polarization of light; some, such as cane-sugar and grape-sugar, rotate the plane to the right, while levulose rotates the plane to the left. (See OPTICS and POLARIZATION.) If θ is the angle of rotation, l the length of solution traversed, and p the number of units of weight of dry sugar present in a certain volume of solution, $\theta = lpa$, where a is positive or negative according to the species of sugar, and has a determinate value for a given temperature. The latter quantity, which is the angle of rotation for $l = 1$, $p = 1$, is called the specific rotatory power. Hence l being assigned, and θ and a being obtained by experiment, the value of p , giving the percentage of sugar, is calculated. The experiments are carried out by means of a saccharimeter, an instrument of which there is a considerable number of varieties. These are divided into two classes. One measures the angle of rotation directly, while the other determines the rotation by the contrary rotation caused by a thin plate of quartz. The latter are called shadow saccharimeters, from the principle involved. The original instrument of this kind was due to Prof. Jellet, of Dublin, but it has been greatly improved upon by Duboscq and Cornu. Another somewhat different form, devised by Laurent, has been adopted by the French Government. The distinguishing feature is that for certain positions of the optical parts of the instrument the field, one half of which is covered with a half-wave plate of quartz or mica, appears divided into two half disks, one bright and the other dark, and in another position as a uniform shadow without a dividing line. In the latter case the instrument is adjusted for use. Then if the observation tube is filled with a solution of sugar and placed in the saccharimeter between two Nicol prisms, a polarizer and an analyzer, so that the light passes through it before reaching the latter prism, the equality of tone in the two half disks is annulled. The analyzer is then made to revolve in the proper direction until the inequality disappears. The angle of rotation is shown by a scale indicating angular degrees, while another scale gives the corresponding percentage of sugar.

R. A. ROBERTS.

Saccharomy'ces: a genus of fungi, including the yeast-plant. See FERMENTATION.

Sacchini, sāk-kee'nē, ANTONIO MARIA GASPARO: composer; b. at Pozzuoli, near Naples, July 23, 1734; was educated in the conservatory of Sant' Onofrio at Naples; achieved a great success at Rome in 1762 by his opera *Semiramide*, and at Venice in 1768 by his *Alessandro nell'Indie*; after composing about fifty operas for Italian theaters, went to Germany in 1771; repaired next year to London, where he was very successful with his operas, but whence he at last was compelled to flee in 1782 on account of debt; found employment in Paris, but only one of his operas, *Edipe à Colone*, performed after his death, made any great impression. D. in Paris, Oct. 7, 1786.

Sac City: city: capital of Sac co., Ia.; on the north fork of the Raccoon river, and the Chicago and N. W. Railway; 45 miles W. by S. of Fort Dodge (for location, see map of Iowa, ref. 4-E). It is in an agricultural and dairying region, is an important trading and shipping point, and derives good power for manufacturing from the river. There are 6 churches, graded public schools, Sac City Institute (Baptist, founded in 1894), a national bank with capital of \$50,000, a State bank with capital of \$75,000, a monthly and 2 weekly periodicals, flour-mill, and windmill and lightning-rod factories. Pop. (1880) 595; (1890) 1,249; (1894) 1,825.

ERROR OF "SUN."

Sacomys'idæ [Mod. Lat., named from *Sacomys*, the typical genus; Gr. *σάκος*, sack + *μῦς*, mouse]: a family of mouse-like rodents peculiar to North America; distinguished by the hind limbs being much longer than the fore, and hence adapted for leaping; the presence of large external cheek-pouches not connected with the mouth, and lined with fur within; and the development of a long tail. The skull is thin, with the interorbital space rather broad; the tympanics inflated and vestibular; the petrosals approximated; the squamosals more or less restricted to the orbit; the mastoids roofing over in part the cerebral cavity; the nasals

or protruded forward beyond the line of the incisors; the mandibular series are very slender; and no special anterior dentition is developed. In the dental series the median set is 3 x 4. The species are confined to the western and southern coasts of the U. S. and Middle America. They are in size, some being smaller than the ordinary house-wren, while others are nearly as large as a cat. They proceed slowly by long leaps in the fashion of the kangaroo ordinary jumping-frog. *Revised by D. S. JORDAN.*

Sauropharyx'side (Mus. Lat., named from *Sauropharyx*, the typical genus; Gr. *sauros*, snake + *pharyx*, throat); a series of fishes supposed to be related to the eels. The second vertebra of the body is extremely elongated, band-like, and bears into an advanced dorsal-like extremity; the skin is like and dissimilar of scales; the head is very large; the eyes short, pointed, fleshy, and like an appendage overhanging the gape; the nose directed forward; the mouth a fleshy jaw-bow; the teeth slender, curved, with small directed inward; dorsal and anal fins rudimentary, the former more so than the latter, and indicated by a groove furnished by a whitish line on each side; ventral line none. The skeleton has thin soft bones, delicate in structure, and connected by a lax, easily torn fibrous tissue; the stomach is dilatoid in an extraordinary degree so that these fishes can swallow larger ones, and when full are a bag-like form, which is alluded to in the name. It recently has been instituted for the reception of two or three species of deep-sea fishes, of which the body is so soft and a comparative study of the species is difficult. The word *Sauropharyx* has been framed by Dr. Gill for the reception of these species. Its place is probably near the eels, but this is uncertain. *Revised by D. S. JORDAN.*

Saxell'na (Mus. Lat., from Lat. *Saxellus*, a little sax); a genus of prothornicids (see *Comptosia*) often mentioned as a synonym of *Thysanotus* (q. v.).

Saxo'logia, MARTIN PETER: a Roman grammar of the first century, whose three books treating of grammar and words are printed in Keil's *Grammatical Latin*, vol. VI, pp. 403-408.

Sax-Fungi: see *ASCOMYCETES*.

Sachsen, KARL EDUARD: Orientalist; b. at Neudamm, Pomerania, July 20, 1845; studied at Kiel and Leipzig; Professor extraordinary of Semitic Languages at the University of Vienna 1869; ordinary professor 1872; Professor of Semitic Languages in the University of Berlin 1877; member of the Royal Prussian Academy of Sciences June 25, 1887. He is the founder and director of the Seminary for living Oriental Languages. (*See Bericht über die Zeitung des Seminars*, Berlin, 1888.) Among his numerous works are *Facile Kyrena* (Vienna, 1870); *Chronologie Orientalischer Völker von Abraham* (Leipzig, 1876); *Kurzgefasste Kyrenische Handschriften* (Berlin, 1885); *Al-Buhārī's India* (Göttingen, 1887-88); *Judo-Arabisches Studien Buch* (1888); and *Die Inschrift des Königs Pansama von Sogdian* (Berlin, 1890). *RICHARD GORTTEL.*

Sachse, MAXIMILIAN: b. at Wittenberg, Saxony; novelist; b. at Leubsdorf, Saxony, Jan. 27, 1836; studied at Prague; was formerly first a teacher of history at Göttingen, and settled at Vienna, devoting himself entirely to literature. He has composed a great number of novels, of which especially the *Lebensroman* (*The Life, Das Eigenheim*, etc.) attracted much attention. His more recent publications have added little to the reputation which he gained by the same occupation. *Revised by JULIUS GOSSEL.*

Sacher'swell, HENRY, D. D.: pulpit orator; b. at Marlborough, Wiltshire, England, about 1672; educated at Magdalen College, Oxford, where he became a fellow; took orders in the Church of England; received the living of Canonick, Wiltshire; appointed preacher at St. Saviour's, Southwark, 1704; preached a sermon at Derby assizes Aug. 15, and another twice the lord mayor of London at St. Paul's Nov. 2, 1708, in both of which he denounced toleration of Dissenters, attacked Low Churchmen, inculcated the tenet of eternal damnation, and declared that the Church was in danger; was reproached for these discourses by the House of Commons Feb. 27, 1710, found guilty of a misdemeanor Mar. 2, and ordered to three years' suspension from preaching. His offending sermons being burned by the common hangman. Great excitement prevailed throughout England during the trial, and large numbers of pamphlets were printed on both sides the forces favoring the publicity of Sacher's sermons, of which, at least 40,000 copies were sold,

while 80,000 copies of the record of the trial (1710) were circulated. Sacher'swell profited by this easy martyrdom; he was invited by the new (Tory) House of Commons to preach before them on the day his sentence expired, and was presented by Queen Anne to the rectory of St. Andrew's, Holborn. D. in London, June 5, 1724. The eloquent defense he pronounced at the bar of the Lords was written by Francis Atterbury. *Revised by S. M. JACKMAN.*

Sachs, HERMANN, A. B., M.D.: neurologist and alienist; b. in Baltimore, Md., Jan. 2, 1835; educated in New York schools and at Harvard University, whence he graduated A. B. in 1878; studied medicine at Strasbourg University, graduating M.D. in 1882; studied his specialty in Vienna, Berlin, and London; returned to New York to practice in 1883; appointed Professor of Nervous Diseases New York Polytechnic 1889; appointed neurologist to Montefiore Home in 1890, and to Mt. Sinai Hospital in 1893. He has made original investigations in the nervous diseases of childhood, publishing many papers on the subject. He was president of the American Neurological Association 1894. Among his published works are monographs on *Cerebral Hemorrhage, Embolism, and Thrombosis* in Keating's *Cyclopedia of Diseases of Children* (1890); *Chorea*, in Hare's *System of Therapeutics* (1892); *Criminal Insanity*, in Hamilton's *System of Medical Jurisprudence* (1894); *Die Hereditätskrankheiten der Kinder in Sarsburg Klinische Vorlesungen* (1892); *Nervous and Mental Diseases of Childhood* (New York, 1894). Editor *Journal of Nervous and Mental Diseases* (1887 and 1888), and of *The Polytechnic* (1893). *S. T. AMERSON.*

Sachs, HANS: poet and mastersinger; b. at Nuremberg, Germany, Nov. 5, 1494; attended one of the Latin schools of his native city until he was fifteen years of age, when he was apprenticed to a shoemaker, receiving at the same time instruction in the art of the mastersong; traveled all over Germany, working at his trade and practicing his poetic art wherever he found schools of mastersong; finally settled in Nuremberg; was married twice; d. Jan. 20, 1576. He began his literary career as a mastersinger, producing his first attempts at poetry according to the precepts of the school of mastersong. Later he became an enthusiastic admirer of Luther, and an ardent advocate of the cause of Reformation. He then broke through the narrow formalism of the mastersong, and in numerous poems, farces, and dramas he proclaimed the fundamental truths of the Reform doctrine. But he does not confine himself to the Bible for the subject-matter of his poetry. Among his sources we also find the German hero-legend, Boccaccio, Herodotus, Plutarch, Livy, and other writers of classical antiquity, which, through the efforts of the Humanists, had been translated into German. While comparatively few of his many lyric poems, which for the most part retain the traditional forms of the mastersong, have become popular, his short-rhymed narratives (*Schneidecke*) still charm the reader, on account of their delightful humor and their sound but unobtrusive moral tone. Hans Sachs is the greatest representative of the German popular drama of the sixteenth century. Though he was not a dramatist of original power, and knew very little about the true dramatic art, he nevertheless exerted a great influence upon his contemporaries by his carnival plays (*Fasnachtsspiele*), comedies, and tragedies, of which he wrote more than 200. The coarse carnival-play of the fifteenth century he raised into a higher and purer sphere, and in all of his plays he appears as a wise and good-natured teacher of his people. There was little room for pure æsthetic culture in Germany during the century of religious, social, and mental revolution, and we would be disappointed if we looked for absolute æsthetic beauty in Sachs; but his works will always remain a valuable source for our knowledge of the life and thought of his times, and his language ranks in force of expression and idiomatic beauty second to that of Luther. His memory was revived by Goethe in his poem *Hans Sachsens poetische Sendung*, after the great mastersinger had been slandered and forgotten for a long time. A complete collection of Sachs's poetic works, of which he himself in 1567 enumerated over 6,000 pieces, has not been published. See the editions by A. Keller and E. Götz, Goedeke and Thümann; also M. S. Ransche, *Hans Sachs* (1765); J. L. Hoffmann, *Hans Sachs* (1847); Ch. Schweitzer, *Un poète allemand au XVI^e siècle* (Paris, 1887); Kawerna, *Hans Sachs und die Reformation* (1889); E. Götz, *Hans Sachs* (1891); Dröcher, *Studien zu Hans Sachs* (1891). *JULIUS GOSSEL.*

Sachs, JULIUS, von, Ph. D.: botanist; b. at Breslau, Silesia, Oct. 2, 1832; studied at the university at Prague, and in 1859 became assistant in physiological botany in the laboratory of agricultural chemistry at Tharandt; in 1861 Professor of Botany at Bonn; in 1867 Professor of Botany in the University at Freiburg, and in 1868 at Würzburg, where there has been established under his guidance a great institute for the study of plant-physiology. He has published many botanical works, among which the best known are *Handbuch der Experimental-Physiologie der Pflanzen* (1865); *Lehrbuch der Botanik* (1868; 4th ed. 1874; the 3d and 4th editions were translated into English in 1875 and 1892, under the title *Text-book of Botany, Morphological and Physiological*); *Geschichte der Botanik* (1875; trans. into English 1890); *Vorlesungen über Pflanzen-Physiologie* (1882; trans. into English 1887); *Abhandlungen über Pflanzen-Physiologie* (1892). The influence of Sachs upon botany has been greater than that of any other botanist of recent times.

CHARLES E. BESSEY.

Sac Indians: See ALGONQUIAN INDIANS.

Sackbut [from O. Fr. *saqueboute*, Fr. *saquebute*: Span. *sacabuche*, originally a hooked lance by which foot-soldiers drew or pushed riders from their horses; O. F. *sachier*, draw out < Lat. *sacca're* + O. F. *boter* (> Fr. *bouter*): Ital. *bottare*, push, from Teuton. *bōtan*, O. Eng. *bēatan*]: a wind instrument somewhat resembling the trumpet, having a slide like the modern trombone. It is mentioned in the book of Daniel, but the translation is probably wrong, the English sackbut being a very different instrument, derived from a model found at Pompeii.

Sackett's Harbor: village; Jefferson co., N. Y.; on Black River Bay (an inlet of Lake Ontario), and the Rome, Watertown and Ogdensburg Railroad; 8 miles E. of Lake Ontario, 170 miles W. N. W. of Albany (for location, see map of New York, ref. 2-G). It has an excellent inner harbor, with sufficient depth of water to accommodate the largest vessels, good water-power for manufacturing, and agricultural surroundings. Its banking is done at Watertown. The Oneida, the first U. S. war-vessel ever launched on Lake Ontario, was built at Sackett's Harbor in 1809. In the war with Great Britain (1812-15) the village was an important naval station. Two war-vessels, the frigate Superior and the Madison, were built here in eighty and forty-five days respectively from the time the timber was cut. A third war-ship, partially completed when peace was declared, remained on the stocks, and was for many years an object of local pride. The U. S. Government has a military station here, known as Madison barracks. Pop. (1880) 885; (1890) 787.

Sackville: town of Westmoreland County, New Brunswick; at the head of the Bay of Fundy and on the Intercolonial Railway, terminus of a branch railway extending 37 miles to Cape Tormentine, on Northumberland Strait; 129 miles N. E. of St. John (see map of Quebec, etc., ref. 5-I). It has a good harbor, a brisk trade, foundries, factories, and a steam-tannery, and is the seat of a considerable ship-building industry. It is the seat of Mt. Allison College (Wesleyan) and of Wesleyan male and female seminaries. Pop. (1891) 1,500.

Revised by M. W. HARRINGTON.

Sackville, GEORGE GERMAIN, Viscount, better known as Lord GEORGE GERMAIN, third son of the first Duke of Dorset; soldier; b. in England, Jan. 26, 1716; educated at Westminster School and at Trinity College, Dublin; served with credit at the battles of Dettingen (1743) and Fontenoy (1745), and under the Duke of Cumberland against the Pretender in Scotland; became a privy counselor; was secretary for Ireland 1751; made lieutenant-general 1758; commanded the allied cavalry at the battle of Minden, Aug. 1, 1759, when he failed to execute the orders of the commander-in-chief, Prince Ferdinand of Brunswick, to charge upon the French infantry; was tried by court martial and cashiered early in 1760, but was restored to favor at the accession of George III. (Oct., 1760); entered Parliament 1761; was restored to the privy council 1766; entered the cabinet of Lord North as Secretary of State for the Colonies Oct., 1775; retained that post throughout the war of the American Revolution, distinguishing himself by his bitterness against the Americans, and resigned Feb. 1782, on which occasion he was created Viscount Sackville. D. Aug. 26, 1785. He is one of the persons whose claims to the authorship of the letters of Junius have been advocated. See JUNIUS, THE LETTERS OF.

Sackville, LIONEL SACKVILLE WEST, BARON: diplomatist; b. at Bourn Hall, Cambridgeshire, England, July 19, 1827; educated at home; entered diplomatic service 1847; minister to Argentine Republic 1873; to Spain 1878; to the U. S. 1881; represented Great Britain in the Washington conference on Samoan affairs 1887; negotiated Fisheries Treaty of Washington 1888; having become a *persona non grata* on account of a letter written by him to a Mr. Murchison in advocacy of the re-election of President Cleveland in 1888 (on the ground that it would be to the advantage of Great Britain), he received his passports from the U. S. Government and returned to England.

Sackville, THOMAS: See DORSET, THOMAS SACKVILLE.

Saco: city; York co., Me.; on the Saco river, and the Boston and Maine Railroad; 14 miles W. S. W. of Portland, 100 miles E. of Boston (for location, see map of Maine, ref. 11-A). The river, which is here navigable for vessels of 9 feet draught during nine months of the year, provides excellent power for manufacturing by a fall of 40 feet, and is crossed by four bridges. The city is surrounded by an agricultural region; contains a public high school, 14 public-school buildings, Thornton Academy, 2 libraries (York Institute, founded 1866, and Dyer, founded 1881) containing over 10,000 volumes, 2 national banks, and 2 savings-banks; and has manufactories of cotton goods, cotton-machinery, boots and shoes, lumber, brushes, belting, and other articles. There is considerable coasting trade. About 34 miles from the city is Old Orchard beach, a popular summer resort, with commodious hotels, and the grounds of Methodist Episcopal national and district camp-meetings. Pop. (1880) 6,389; (1890) 6,075.

Saco River: a stream which rises in the White Mountains, New Hampshire, and flows S. E. 160 miles through New Hampshire and Maine to the Atlantic; has several considerable falls, one of which, Great Falls, is 72 feet in height, and furnishes water-power, which is utilized at many places for manufactories.

Sacrament [from Lat. *sacramen'tum*, oath, sacred thing, mystery, deriv. of *sacra're*, make sacred, declare sacred, deriv. of *sa'cer*, sacred]: a term used in the Church since Tertullian (about 200), in a loose sense, of sacred doctrines and ceremonies (like the Gr. *μυστήριον*), and then, more particularly, of baptism, the Eucharist, and a few other solemn rites connected with Christian worship. St. Augustine defines sacrament in the narrower sense to be the visible sign of an invisible grace (*signum visibile gratiæ invisibilis*). To this was afterward added by Protestants, as a third mark, that it must be instituted by Christ and enjoined upon his followers. Sacraments are also called signs, seals, and means of grace. Their number is by Protestants confined to two—viz., baptism and the Lord's Supper—on the ground that these alone are instituted by Christ and expressly commanded to be observed to the end of time. The Roman Catholic and the Greek Churches add to them five others—viz., confirmation, penance, extreme unction, ordination, and matrimony. The Council of Trent anathematizes those who deny that there are more or less than seven sacraments (*esse plura vel pauciora quam septem sacramenta*). In the Greek Church they are called "mysteries." As to the efficacy of the sacraments, Protestants require faith as a subjective condition, while the Roman Catholic Church teaches that the sacraments work *ex opere operato*—i. e. by the inherent power God has imparted to the institution or by the performance of the act. The Roman Catholic Church curses any one that "saith that, in the three sacraments, to wit, baptism, confirmation, and order [ordination], there is not imprinted in the soul a character, that is, a certain spiritual and indelible mark, on account of which they can not be repeated." (*Canons and Decrees of the Council of Trent*, vii., canon ix.; Schaff, *Creeds*, ii., 121.) There has been much controversy about the sacraments, especially the Lord's Supper, which is sometimes emphatically called the sacrament, between Protestants and Roman Catholics, and also between Luther, Zwingli, and Calvin, and their followers. The Quakers reject the sacraments as external ceremonies, and hold only to internal baptism or regeneration of the Spirit, and internal communion with Christ. See articles on the several sacraments, especially EUCHARIST.

Revised by S. M. JACKSON.

Sacramentarians: the opprobrious epithet applied to the followers of Zwingli by the Lutherans in Reformation times because the former denied the presence of the body

affirmed of a vote in the United States, and affirmed that the numerous elements were now available. The University of the Pacific, however, although apparently of some value in the old Church building. — See EXPOSITION, next column.

Sacramento (in. city), capital of the State of California and a metropolitan territory, on the east bank of the Sacramento river, at its junction with the American river, and on the northern Pacific Railroad; lat. 38° 51' N., lon. 121° 30' W. and 30° 30' W., 30 miles S. of Stockton, 90 miles N. E. of San Francisco. This location, see map of California, ref. 10. It is at the head of navigation for large steamers, through seasonable ply between points 100 miles N., during low water. It is an important junction on the lines of the Northern Pacific Railroad Company, where twenty-one passenger and freight trains daily.

Physical Appearance.—The city has an area of about 24 sq. miles, its limits on a plain 50 feet above sea-level, and is laid out in rectangular blocks. It is protected from invasion by levees, which were erected at a cost of about \$300,000. The climate is semi-tropical, tempered by cool southern winds in summer. Water for domestic and other use is pumped from the river. The streets are lighted with electricity, gas, and kerosene, and conform to the latest plans of the company. Those running N. and S. are flanked by sidewalks; those running E. and W. by sidewalks. In the business portion they are covered with awnings and awnings, and lined with wide sidewalks of pattern and granite. Capital Park (30 acres) is maintained in constant order by the State. Many of the walks are of granite and granite, and the city has well-kept lawns and shade-trees. There are also several private parks. The electric street-railways have a total length of 20 miles.

Public Buildings.—The State Capitol, built of granite, cost, and cost of \$2,000,000, is the most magnificent. Others are the Roman Catholic Cathedral, with

Business Interests.—Sacramento has a number of manufacturing and several large canneries and packing-works. The chief industrial plant comprises the shops of the Southern Pacific Railroad Company, employing from 2,000 to 3,000 men in car and machinery construction and repairing. There are two commercial and three savings banks, and their combined capital in 1903 was \$1,523,500.

Finance.—In 1900 the city receipts were \$992,007; expenditures, \$698,092; assessed valuations, \$15,000,000. The city debt was \$200,000, and the funded debt, comprising bonds \$1,250,000.

History.—Sacramento was first known as a small trading post called New Helvetia. The settlement was made and controlled by Capt. John A. Sutter, who in 1839 secured a grant from the Mexican Government for land in and adjacent to the present city. The discovery of gold by James W. Wadsworth while digging a mill-race on American river at Colusa, 60 miles away, brought 100,000 immigrants to the city in a single year, and made it an important trading and distributing point. The first building was erected in 1840, and the city became the State capital in 1854. Many leading enterprises of the State had their origin here, among them the building of the transcontinental railway over the mountains. The city has suffered severely, twice by fire and twice by flood. After the foundation of 1900 the principal streets were raised 2 feet and the levees strengthened. Pop. (1850) 21,420; (1860) 26,320; (1894) estimated, 25,000.

ALBERT HART.

Sacramento River: a stream which rises in Northern California, flows southward, and empties into an arm of San Francisco Bay. It drains the northern portion of the great valley of California, lying between the Sierra Nevada and Coast Range. The only outlet for the waters of this vast basin is through the Golden Gate. S. of Mt. Shasta the Sacramento joins Pitt river, which is the larger and larger stream, and should properly bear the name of the main trunk. The length of the Sacramento is about 400 miles. From the source of Pitt river in the extreme northeast corner of the State to the mouth of the Sacramento is approximately 600 miles. The Sacramento is navigable in Red Bluff, 275 miles, but in recent years steamboats have not gone above McIntosh landing, 45 miles below. Feather river joins the main stream 16 miles above the capital, and is navigable for 30 miles. Placer mining on many of the tributaries of the Sacramento has caused vast quantities of debris to be deposited in it. This and natural obstacles have necessitated the expenditure of large sums in improving navigation. Freight on the river during the year ending June 1, 1903, amounted to 481,342 tons, the greater part of which was wheat. Sacramento valley is exceedingly fertile, and yields a large wheat harvest.

THOMAS C. RUSSELL.

Sacred Heart, Ladies of the: an order of nuns founded in 1800 in France by J. D. Varin, a Jesuit, and Marguerite Sophie Louise Baral; approved by the pope in 1826. In 1818 it was established in the U. S., where there are now many houses. There is also a congregation of Sisters of the Sacred Agonizing Heart of Jesus, with a few houses in the U. S.

Sacred Hearts of Jesus and Mary, Brothers of the: a Roman Catholic community founded at Lyons, France, by M. Calandre, a priest, in 1822. They were first established in the U. S. in 1847. Their work is educational.

Sacrifice [via O. Fr. from Lat. *sacrificium*: *sa*, sacra, sacred rites, or victims (neut. plur. of *sa*, sacra, sacred) + *facere*, make, do]; an offering to the Deity, as an expression of thanksgiving, penitence, or consecration. The origin of sacrifice has been much debated, but is lost in the dimness of antiquity. The earliest records, whether sacred or profane, show sacrifice as an existing institution, and in the former as receiving the Divine approbation. The object was everywhere the same—to provide a means whereby man might approach God. The theory of their efficacy seems to have been very different among the heathen and among the Israelites. In the former sacrifices were looked upon as in some sort a compensation to the gods, and their efficacy therefore depended somewhat upon their value, so that in extreme cases even human sacrifices were offered, as among rude nations in modern times; among the chosen people different views prevailed, or at least were distinctly embodied in their law and taught by their prophets. Here the fact was recognized that the disturbed communion with God could be restored only on the basis of holiness, and the primal promise that in the long struggle with evil the "seed of the woman"



State Capitol, Sacramento, Cal.

of the woman, Agricultural Hall, the State printing-office, the 4th Treasury, California State Bank, Pythian Castle, Masonic Hall, County Court-house, new U. S. Government building (cost \$300,000), and Sutter's Fort, rebuilt and used as a State reservation as an object of historic interest.

Churches, Schools, etc.—There are 6 Methodist Episcopal churches, 4 Baptist, 2 Presbyterian, 3 Congregational, a Protestant Episcopal, 2 Lutheran, a Roman Catholic, a Methodist, a Christian, and a Jewish, besides 10 meetings of nonsectarian sects, including the Salvation Army. The public schools consist of a high school, 3 grammar and 4 primary schools, an industrial school, a night school, and 3 kindergartens. In 1894 they had 150 teachers, over 6,500 pupils, and property valued at \$268,000. There are 6 private schools (including 2 business colleges), and several libraries and reading-rooms, including the Free Public Library and the State Library. The latter is quartered in the Capitol and contains 94,750 volumes. The publications comprise 2 daily and 2 weekly newspapers and a monthly periodical. The charitable institutions include the Marguerite Home for old ladies founded in 1884 by Margaret H. Crocker, founded at Crocker's home, Ridge Home (a private hospital), City Dispensary, Southern Pacific Hospital for railway employees, Woman's Christian Temperance Union Mission, and the Children's Day Home. The only penal institutions are the city and county jails. There are 76 fraternal, charitable, and protective lodges and unions, and 5 clubs.

should obtain the final victory was always the central point of their national existence. Meantime, sacrifices in great variety were provided, but those especially appointed as "sin-offerings" were always of the same character and value. A more valuable sacrifice was indeed required as the sin-offering of the high priest or of the collective congregation, and also one slightly more valuable from a "prince," for obvious reasons; but there was no gradation in the value of the victim in proportion to the aggravation of the offense. Their efficacy was thus made to depend simply upon the Divine appointment.

The chief kinds of Hebrew sacrifices were the whole burnt-offering, which was wholly consumed upon the altar, and with which an oblation of fine flour and oil, with incense, and a drink-offering of wine were offered; the sin-offering, of which only the fat and kidneys were burned upon the altar, the flesh being either "burned without the camp" in case the blood had been sprinkled within the sanctuary, or eaten by the priests alone in case the blood had been only sprinkled upon the brazen altar; and the trespass-offering, which is distinguished clearly from the last, although the ground of the distinction is not entirely clear. These were all propitiatory offerings, and with them the priest was required "to make atonement" for the people. Besides these were the peace-offerings, perhaps the most common of all, which might be offered in any number and of any sacrificial animal. Of these, the same parts were burned on the altar, a portion given to the priests to be eaten by them and their families, and the rest of the flesh eaten by the offerer and his friends in a holy feast before the Lord. There were other important sacrifices required. Such were the Passover lamb offered in memory of the deliverance from Egypt and as a special type of Christ by each head of a family on the fourteenth of the month Nisan in each year, and eaten in their homes on the following night; the two goats on the great day of atonement in each year, of which one was sacrificed at the altar, the other sent as a "scape-goat" into the wilderness; the red heifer, burned without the camp and its ashes used in purifications; and a great variety of sacrifices for individuals on special occasions. The original comprehensive offering, from which all the others were specialized, appears to have been the burnt-offering.

Under the Levitical law the essential point of the sacrifice was the blood, the treatment of which always formed the culminating point in the sacrificial ritual. A burnt-offering of a lamb for the whole people was regularly offered every morning and evening, with its accompanying oblation or "meat-offering." In regard to the sin-offering, in order to bring it within the reach of all it was provided that for the required animal might be substituted by the poor a pair of doves, or even in case of extreme poverty an offering of flour. The symbolical character and significance of the sacrifices are set forth at some length in the Epistle to the Hebrews. See G. F. Oehler, *Theology of the Old Testament*, Eng. trans., ed. G. E. Day (New York, 1883); A. Cave, *The Scriptural Doctrine of Sacrifice* (2d ed. Edinburgh, 1890); and W. Robertson Smith, *Religion of the Semites* (2d ed. 1894). Revised by S. M. JACKSON.

Sacrobos'co, JOANNES, de: Latinized name of JOHN HOLYWOOD, an English mathematician of the thirteenth century. Little is known of him, except that he entered the University of Paris 1221, became professor there, and died in 1244 or 1256. He was the author of a treatise *De Sphæra Mundi*, a paraphrase of a part of Ptolemy's *Almagest*, which he had employed in Arabic. It was first printed in 1472, and was reprinted with commentaries about sixty times until the end of the seventeenth century.

Sacrum [Mod. Lat. (sc. os, bone), the sacred bone, neut. of Lat. *sa'cer*, sacred]: in the vertebrate skeleton, a bone situated below or behind the lumbar and above or before the coccygeal vertebrae. In man it is formed of five (rarely four or six) united vertebrae. It is large, roughly triangular, and is penetrated by foramina for the passage of nerves. It is developed from thirty-five centers of ossification. The rabbins called it *luz*, and said that it never decays, but forms the germ of the new body at the resurrection; the Arabs say that the judgment angel sits upon it and judges the soul of the departed.

Sacy, *sa'see'*, ANTOINE ISAAC, Baron Silvestre, de: Orientalist; b. in Paris, France, Sept. 21, 1758; studied law and Oriental languages; elected to the Académie des Inscriptions 1785; overseer in the mint 1791-92; Professor of Arabic at

the École des Langues orientales; called to the Institut (section of literature and fine arts) 1795, but did not take his place till 1803; Professor of Persian at the Collège de France 1805; represented Paris in the Corps Législatif 1805-15; created baron by the emperor 1813; administrator of the Collège de France and the École des Langues orientales 1822; entered the Chamber of Peers 1832; conservator of the Oriental MSS. of the Bibliothèque Nationale and perpetual secretary of the Académie des Inscriptions 1833. D. in Paris, Feb. 21, 1838. A few of his principal works are: *Grammaire Arabe* (1810; 2d ed. 1831); *Chrestomathie Arabe* (1806; 2d ed. 1826); *Principes de la Grammaire générale* (1799; 8th ed. 1852); *Relation de l'Égypte par Abd-allatiph* (1810); *Mémoire d'histoire et de littérature orientales* (1818); *Les Séances de Hariri* (1822; 2d ed. 1847); and *Exposé de la religion des Druses* (1838). See Reinaud, *Notice historique et littéraire sur Silvestre de Sacy* (Paris, 1838). RICHARD GOTTHEIL.

Sacy, SAMUEL USTAZADE SILVESTRE, de: journalist; s. of Baron de Sacy; b. in Paris, Oct. 17, 1801; appointed on the staff of the *Journal des Débats* 1828, which position he held for more than thirty years; member of the Académie May 18, 1854; keeper of the Mazarin Library 1836; its administrator 1848; member of the council of public education 1864. He published essays, *Variétés littéraires* (1858); edited *Bibliothèque Spirituelle* and *Lettres de Madame de Sévigné* (1861-64). D. Feb. 14, 1879. R. G.

Saddle: a contrivance designed to rest on the back of an animal and serve as a seat for a rider or as a support for other weights. It thus includes the pack-saddle and the part of a single harness that supports the weight of the shafts; for four-wheeled vehicles this is merely a broad padded strap buckled around the animal's body, but for a heavy two-wheeled cart, since part of the weight of the load rests on the shafts, the saddle is large and more heavily padded than a riding-saddle. The pack-saddle varies much in form, but that most used in the transportation of goods consists of crossed sticks, like a common saw-horse, securely fastened to saddle-bars of long bearing.

The use of riding-saddles is of ancient origin. Pausanias relates that Constantine the younger was killed in the year 340 by falling from his saddle, and the Emperor Theodosius, in the year 385, forbade the use on post-horses of saddles weighing over 60 lb. Riding-saddles may be classed under two types, Hungarian and Moorish. The original of the former consisted of wide parallel bars, joined at the ends by heavy bows, to which were secured parallel strips of hide. There were no stirrups. The Hungarian saddle of the present closely resembles the primitive one, while the English saddle is the most highly developed form of the type in Europe, and the McClellan saddle (named after Gen. George B. McClellan) the best in the U. S. These two saddles, though from the same source, are quite different in construction. The tree of the English saddle is a skeleton on which the saddle is made. As completed, the seat and bearings are all padded, with scarcely anything of the original outline showing, except at the edges. Probably in point of style it is the most perfect saddle made, but one who is in the saddle all day is glad to exchange it for something easier. The McClellan tree forms the saddle itself. The tree-bows are shaped to fit the animal's back, and padding is dispensed with, even for the seat. It is covered with rawhide, and all but necessary strapping is eliminated. The fender of the McClellan is borrowed from the Mexican saddle, and is improved in the modification of the McClellan saddle known as the Whitman, after its inventor, Col. Whitman, U. S. army. The trade nomenclature of saddles of the Hungarian type includes also the Shaftoe, Somerset, Kilgore, and Morgan. A later form is a pneumatic saddle, in which a rubber bag, filled with air, is placed under the leather covering of the seat. The object is to increase the comfort of the rider, and lessen the concussion of his weight on the animal's back. It has been most successful as applied to racing-saddles.

The so-called Moorish type probably originated in Persia. In the primitive form a number of skins were superimposed on the animal's back, with a front and back wooden cantle, the whole confined by straps completely surrounding the animal. In the construction of its various forms the finest fabrics have been employed, and it has always been the most expensive saddle made. Mexican, Texas, and Californian saddles are derived from this type, retaining the main features of the original. The Moorish saddle has heavy, long

edited by Arthur Clifford, with a memoir and notes by Sir Walter Scott, under the title *State Papers and Letters of Sir R. Sadler* (2 vols., 1809).

Sado, *saa'dō*: an island in the Sea of Japan; about 30 miles from the Japanese mainland; between 138° and 139° E. lon. and 37½° and 38½° N. lat. It forms part of the prefecture of Niigata, and has a population of about 108,000; it possesses famous gold and silver mines, but the output from these has not of late years much more than covered expenses of working. The island, which is chiefly of limestone formation, is very hilly, with one plain between two mountain groups. J. M. D.

Sadoletto, *saa-dō-lā'tō*, Jacopo: cardinal; b. at Modena, Italy, July 14, 1477; was ordained priest in Rome in 1502; appointed secretary to Leo X. in 1513; made Bishop of Carpentras, in France, in 1517, and cardinal in 1536. D. in Rome, Oct. 18, 1547. He made a favorable impression even on the most zealous Reformers by his conciliatory spirit, and he was often employed in the diplomatic negotiations between Charles V., Francis I., and the popes. His writings, *Philosophiae Consolationes* (1502); *De Liberis recte instituendis* (1533); *Phœdrus sive de Laudibus Philosophiae* (1538), etc., and his *Letters* were published in a collected edition at Verona (4 vols., 1737) and at Rome (5 vols., 1759). See Joly, *Étude sur Sadolet* (Caen, 1857).

Revised by J. J. KEANE.

Sadowa, *saa'dō-vaā*: village of Bohemia; on the Bistritz; 9 miles N. W. of Königgrätz (see map of Austria-Hungary, ref. 8-E). This is the name given by the Austrians to the battle of Königgrätz (*q. v.*), in which, on July 3, 1866, 240,000 Prussians defeated 220,000 Austrians and Saxons. The Prussian loss was 9,000 men, while the Austrians lost over 40,000 men in killed, wounded, and prisoners.

Saf'ed [= Arab.; Heb. *Tephath*, *liter.*, watch-tower]: town in Palestine, in the ancient province of Galilee (altitude, 2,749 feet), with splendid view of Jebel Zebüt, Jebel Jermak, Tabor, and Carmel; thought by some to be mentioned in Matt. v. 14. A fortress was built there by Fulke 1140, defended by the Templars; taken by the Sultan of Damascus 1220; reconstructed by the Templars 1240; taken definitely by the Moslems 1266, and made capital of a province. In 1799 it was occupied by a French garrison. Jews settled there in large numbers in the sixteenth century, expecting that the Messiah would make it his capital. Its bazaars are of little importance. See Neubauer, *Géogr. d. Talmud* (1868, p. 227); Baedeker, *Palest. und Syria* (2d ed. 1894, p. 258); Tristram, *Land of Israel* (London, 1865, p. 576).

RICHARD GOTTHEIL.

Safes: structures designed to protect papers, money, or other contents from loss either by theft or by fire. For the latter see FIRE-PROOF SAFES. Those supposed to be proof against burglarious attacks, directed either upon the inclosing walls or merely against the lock (see LOCK) securing the door, should successfully resist for twelve hours at least any attempts to open them; but such is the perfection of the mechanical and chemical means used that probably there are none of the so-called burglar-proof safes the contents of which could not be abstracted by an undisturbed burglar in very much less time.

Burglar-proof safes are of two distinct constructions: 1. Those which have walls cast in one mass of iron or steel or of some alloy of these metals. 2. Those having their walls built up of bars or plates of iron or steel secured together by bolts or rivets. The first class may be subdivided as follows, viz.: *a.* Safes in which the resistance to attack depends upon their form, and the extreme hardness and toughness of the cast metal used. Such are the spherical safes made from an alloy of iron and chromium. *b.* Safes having the cast metal of their walls re-enforced by a network of wrought-iron or steel rods, about which the molten iron or steel is poured, and which is solidly inclosed by the cast metal when it cools. The second class may also be divided in the following way, viz.: *c.* Safes made of bars or plates of homogeneous wrought iron or steel. *d.* Safes in which the bars or plates are composed of layers of iron and steel welded together. *e.* Safes made of layers of bars or plates of wrought iron or steel, between which are interposed one or more layers of bars of hard cast iron.

For most burglar-proof safes of recent construction great pains have been taken to conceal the heads of the bolts or rivets, and in some cases these have been made so short as to simply fasten each layer of plates to those adjacent, but in

no instance extending through the whole thickness of the walls. The doors have also been fitted with the greatest accuracy in order to prevent the introduction of explosives.

Apertures through the doors of safes for the passage of spindles for operating bolts and locks have been found a source of insecurity, and therefore doors for burglar-proof safes have been contrived so that when shut they are fastened by bolts operated automatically, and they are provided with clockwork which can be so adjusted before the door is closed that at a certain hour the bolts are drawn by the release and action of powerful springs. W. F. DUFFEE.

Safety-lamp: a lamp so constructed as to be safely employed in an atmosphere so contaminated with fire-damp as to explode when a naked flame is exposed to it. Freshly exposed coal underground often gives forth one or more kinds of gas, such as carbon dioxide (CO₂), oxygen, nitrogen, and fire-damp (CH₄). To the latter other names applied are carburetted hydrogen, methane, and MARSH-GAS (*q. v.*). From a single ton of anthracite coal more than 600 cubic feet of gas have been emitted, of which 93 per cent. was fire-damp. Bituminous coal, being softer and more porous, parts with its gas more easily, though the total amount per ton is not so large. If the atmosphere contain from 6 to 17 per cent. of fire-damp the mixture is dangerously explosive. Outside of these two limits it is still inflammable. It is of the utmost importance therefore that the ventilation of a coal mine shall be good enough to prevent contamination of the air with fire-damp. Since perfect ventilation is impossible, the miner needs a lamp for illuminating purposes that may be used in a slightly contaminated atmosphere, and the inspector needs the means of detecting such contamination, however slight.

Between 1812 and 1816 several forms of safety-lamp were devised, that of Sir Humphry Davy being the one which has remained most extensively in use. For any given fuel the temperature at which ignition begins is lower than that developed by the subsequent process of combustion; for example, the ignition-point of phosphorus is below the boiling-point of water, while the temperature due to its combustion exceeds that of red-hot iron. Davy discovered that in a quiet atmosphere a mere partition of wire gauze is enough to prevent the transmission of flame, the gauze absorbing and radiating enough heat to reduce the temperature below the ignition-point. To a small, cylindrical oil-lamp he attached a cylinder of iron-wire gauze about 6 inches long and less than 2 inches in diameter, which inclosed the flame. It was supported in a framework of small metal rods fitted into terminal flat brass rings. One of these enclosed the body of the lamp, while the other was covered with gauze and served for attachment of a handle. The meshes of the gauze permitted free access of air to the flame and transmission of part of its light. The standard adopted as a limit of safety was iron gauze with 784 meshes per square inch, the wire being about ⅛ inch in thickness. When such a lamp is carried into an atmosphere contaminated with from 3 to 6 per cent. of fire-damp the flame becomes elongated and smoky, being surrounded by a zone of mixed gases less rich in oxygen than air is, and containing carbon and hydrogen, both of which are combustible. The flame therefore occupies an appreciably larger volume, and indicates the approach of danger before an actually explosive atmosphere is reached. Within a dangerous atmosphere the entire space within the cylinder of gauze becomes occupied with flame, but this may for some time fail to be transmitted through the gauze. Such transmission may occur after the gauze becomes red-hot, or if the lamp is exposed to a draught. The indication of danger should be sufficient to cause the withdrawal of the miner from such surroundings. Modifications of the Davy lamp have come into use, chiefly with a view to surrounding the flame with glass so as to increase the effective radiation of light; but in each case access and egress of air are effected through one or more thicknesses of wire gauze. Mueseler's lamp is extensively employed in continental Europe; besides the glass chimney it has a conical metallic chimney above the flame to increase the draught of feed-air.

Of late years electricity has been extensively applied in mining operations, and the most obvious application would naturally seem to be the substitution of the incandescent electric lamp for the miner's wire-gauze safety-lamp, since the former, if carefully handled, is quite safe in any atmosphere whatever. The difficulty attendant upon the attainment of effective insulation, suitable wiring, and the pre-

vision of recent years by miners have thus far (1885) made much of difficulty for this purpose unaccomplished, although good subterranean candles have been satisfactorily illuminated with the acetylene.

Recent experiments in the safety-lamp have all been directed with a view to the use of a fire-stop indication, movable indicators have been based upon the lighting of a wick, or wire in contact with an atmosphere containing hydrogen when the wire is traversed by an electric current; but the transmission of the current of current is inconvenient. Another success has been attained in increasing the luminosity of the flame in the safety-lamp. Not only can the flame be lengthened in an atmosphere containing hydrogen, but it is supplied with an almost continuous current of length of which indicates quite accurately the percentage of combustion. To measure its height but the distance of the flame from the wick is hidden or suppressed. Fickel and Le Châtelier, in 1881, showed that acetone and ether and more easily volatile are given by flames of small size of hydrogen. Fickel, an American engineer, has also shown a safety lamp supplied with alcohol instead of oil, and furnished with a shade surrounding the flame. Any elongation of this is seen above the edge of the shade, and by this means as little as 0.25 per cent. of combustible becomes perceptible. Fickel's lamp is widely known in Germany, but is unsafe. In 1882 important improvements were independently made by Chenevix in France and in England. In Chenevix's lamp methyl alcohol is used, with a small admixture of copper chloride which colors the flame green and the wick takes a pyrolytic form. The construction of the lamp is more complicated than that of Fickel's, but it is quite safe, and its indications are delicate enough to reveal 0.10 per cent. of combustion. Chenevix's invention consists in the attachment of a small steel cylinder of compressed hydrogen the special but simple form of safety-lamp containing oil. On opening a valve a small quantity of the gas is discharged through a narrow copper tube which traverses the oil-reservoir and terminates at the side of the wick. The lighting of the hydrogen is ignited, and the oil-flame is then turned over to extinction. The height of the aureole in the suspended atmosphere is then noted, and the corresponding percentage of fire-lamp read from a scale. The sensitiveness of the indicator is nearly if not quite equal to that of Chenevix, and it has the advantage of greater simplicity, in addition to the fact that it may be used for illuminating purposes and for the rough estimation of fire-lamp with the common oil-flame before applying the more delicate method with the luminous hydrogen flame. The method is applied with equal success to the measurement of concentration with coal-gas, water-gas, and petroleum vapor, and is therefore useful in many other places besides coal mines.

W. LE CONTE STEVENS.

Safety-valve. See STEAM-BOILER.

Saffron. See CROCUS.

Safflower, or **Carthamus** [safflower is from *O. Fr.* *safran*, saffron, and *carthame*, flower; and *safran*, saffron], the *Carthamus tinctorius*, of the Middle East, India, and the Levant, but now cultivated in

France, Spain, Germany, Italy, Hungary, the southern Asiatic provinces of Russia, the East Indies, and South America. It was formerly used very extensively for producing pink, red, scarlet, and blue on cotton, flax, and silk, especially for dyeing red tape and for preparing pink papers. It is still used in Lancashire for certain shades of pink for the Eastern market, though aniline colors have displaced it in many cases. Safflower contains two coloring-matters—one, yellow, is an acid matter, soluble in water, and useless; the other, *carthamine* or *carthamin* acid, red, insoluble in water, but soluble in alcohol and in alkalies, and valuable as a dye. The safflower colors in fabrics are very fading; light destroys the color rapidly, and goods dyed with it must be dried in the shade. Age is nearly as injurious as light, especially when the goods are damp. Sulphuretted hydrogen converts carthamin acid into colorless carthaminic acid; hence this gas acts injuriously on goods dyed with safflower. The extract of safflower consists of the carthaminic acid in suspension in water. The range used for the toilet is a mixture of carthaminic acid with fine burned talc (French chalk). Pink savons are coated with carthaminic acid. See Calvert's *Dyeing and Color-printing* (1875); Ure's *Dictionary*; Muspratt's *Chemistry*; Schützenberger, *Des Colorants*. See also SAPFRANINE.

Revised by ISA KEMPEY.

Safford, JAMES MERRILL, Ph. D., M. D.; geologist; b. at Zanesville, O., Aug. 10, 1822; graduated at Ohio University, and continued his studies at Yale; Professor of Chemistry, Natural History, and Geology in Cumberland University, Tenn., 1848-52; was elected to the chair of Chemistry in the medical department of the University of Nashville (1873); in the same position in Vanderbilt University 1874; and in the chair of Mineralogy, Botany, and Kennamite Geology in Vanderbilt University 1875. He became State geologist of Tennessee in 1854. His general report published in 1860 is the standard treatise on the geology of the State, as well as an important contribution to the geology of the U. S.

Revised by G. K. OTTOMER.

Safford, THOMAS HENRY; astronomer; b. at Royallton, Vt., Jan. 6, 1836; obtained in early boyhood celebrity for his wonderful mathematical powers; prepared an almanac at the age of nine years; calculated in 1850 the elliptic elements of the first comet of 1849; improved methods of astronomical calculation; graduated at Harvard 1854; was some years engaged in astronomical studies; became in 1863 adjunct observer in the Cambridge Observatory, acting director Feb., 1865, and director of the Chicago Observatory Dec. 29, 1865. His work at the Chicago Observatory included discovery of many new nebulae, and the beginning of a zone for the international survey now nearly completed, but was cut short by the consequences of the Chicago fire. He then took part in Capt. Wheeler's surveys of the far West, and other astronomical work for different bureaus in Washington. In 1876 he was appointed Professor of Astronomy at Williams College; there completed vol. iv. of the *Annals of Harvard College Observatory*, and a star-catalogue for the U. S. engineers; built a meridian observatory, mounted the instruments, and published a catalogue of polar right ascensions from his Williamstown observations, besides contributing frequently to astronomical and educational journals; and has earnestly labored for more modern ideas of instruction in mathematics.

Saffranine, **Safranine**, **Aniline Pink**, or **New Rose** [safranine is from *Fr.* *safran*, saffron]; a dye, which has to a large extent superseded safflower for dyeing silk and cotton, obtained by treating a mixture of toluylene diamine, $C_6H_4(CH_3)(NH_2)_2$, and teloidine, $C_6H_4(CH_3)(NH_2)_2$, with an oxidizing agent. $C_6H_4CH_3(NH_2)_2 + 2C_6H_4CH_3NH_2 + 4O = C_{16}H_{12}N_4 + 4H_2O$. Saffranine has the composition $C_{16}H_{12}N_4$, and appears to be nearly related to Perkin's mauveine. For dyeing, the saffranine is dissolved in boiling water and carefully filtered, and a very little sodium carbonate added before it is put in the dye-bath. To dye wool a rose pink, proceed exactly as with the *ANILINE COLORES* (q. v.). To dye silk, add the solution of the color to the bath, in which some caustic soap has been previously dissolved; keep the bath lukewarm. To dye cotton, it is a good plan first to soak in a cold bath containing sodium hyposulphite, 4 oz. to the pound of cotton, to destroy the last traces of chloride of calcium. For a rose pink, mordant the cotton in either of the following ways: (1) Soak cotton half an hour in the clear solution of acetate of aluminium, obtained by dissolving 2 lb. of alum and 1 lb. of acetate of lead in 2 quarts of water;



The safflower.

Revised by THE PHARMACEUTICAL ASSOCIATION, of the Middle East, India, and the Levant, but now cultivated in

dry; soak half an hour in a cold fat-soap bath; dry; then dye lukewarm in the solution of saffranine. (2) Soak the cotton from four to six hours in a lukewarm bath to which the extract from $\frac{1}{2}$ lb. of nutgalls has been added; wring; soak one hour in a cold bath containing for every pound of cotton $\frac{1}{2}$ to $\frac{3}{4}$ oz. of perchloride of tin crystals; wash; dye in a lukewarm bath to which the color is added in three or four installments to secure an even color. For a dark-rose or cherry color use the second method, doubling the quantity of nut-galls and increasing slightly the quantity of perchloride of tin. For ponceau and scarlet, first give the cotton, after treatment with hyposulphite, a bottom of turmeric (hot), then continue by the second method. To darken the shades, let the cotton soak in the gall-bath over night. Tannin may be used in place of nutgalls, $\frac{3}{4}$ oz. to the pound of cotton. Lastly, pass all cotton dyed with saffranine through a cold bath slightly acidulated with acetic acid.

Revised by IRA REMSEN.

Saffron [from O. Fr. *safran* (whence Germ. *safran*), from Arab. *za'farān*, saffron, deriv. of *safrā*, yellow]: a yellow substance, consisting of the stigmas, with part of the styles, of the saffron-crocus (*Crocus sativus*), a plant indigenous in Greece and Asia Minor, and extensively cultivated in Austria, France, and Spain, and formerly in England. Spanish saffron is the best. It is said that 100,000 flowers are necessary to produce 1 lb. of saffron. This dye is often adulterated with safflower, marigold, pomegranate, and other flowers. The stigmas of the true saffron are from 1 inch to $\frac{1}{4}$ inches long, narrow and roundish where they are attached to the style, but spreading and club-shaped near the extremity, which is truncated. They have an orange or brownish-red color, yellow in the narrower part, an agreeable aromatic, almost intoxicating, odor, and an aromatic bitter taste, and impart a yellow color to the saliva and to water, alcohol, and oils. Strong sulphuric acid colors them blue, then red, and finally brown. Saffron was formerly a favorite dye, but is now rarely used as such. It is employed in medicine for coloring tinctures and for liqueurs, varnishes, confectionery, and especially cakes in the west of England. The coloring-matter of saffron is a glucoside, to which the names saffranine, saffron-yellow, polychroite, and crocine have been given.

Revised by IRA REMSEN.

Saffron of Mars: See IRON (*Medicinal Uses of Iron*).

Sa'fi: an Atlantic port of Morocco, Africa, well fortified, with a fair harbor (see map of Africa, ref. 1-B). It is visited occasionally by Hamburg and other steamers, but its former considerable trade has been largely captured by Mogador, S. of it. Pop. 9,000, one-third Jews.

Sa'gan: town and railway center in the province of Silesia, Prussia; on the Bober (see map of German Empire, ref. 4-H). It has a fine palace with a beautiful park, and extensive manufactures of woolen and cotton cloth. Pop. (1890) 12,623.

Sagar, saa-gūr', or Saugor: an island in the delta of the Ganges, at the mouth of the Hugli; 23 miles long N. and S., and 2 $\frac{1}{2}$ to 8 miles broad. It is celebrated for its disasters, and as a station for Hindu pilgrims. Its misfortunes are due to the storm-waves that sometimes sweep over it. According to the Calcutta Review 200,000 people were destroyed by the storm-wave of 1688. Before the cyclone of 1864 it had 5,625 inhabitants, of whom only 1,488 survived. It has few permanent inhabitants, but is visited annually, in January, by from 100,000 to 200,000 pilgrims. The celebration attended by them lasts only three days, but a certain proportion remain for weeks to take baths. The island contains a meteorological observatory, a lighthouse, and telegraph station. It is infertile, covered with jungles, and infested by wild beasts.

MARK W. HARRINGTON.

Sagar, or Saugor: city of the Central Provinces, British India, and capital of a district of Sagar; lat. 23° 50' N., long. 78° 49' E.; on the border of the artificial lake Sagar (see map of N. India, ref. 7-E). The lake is about 4 miles in circumference, and is surrounded by temples with platforms for baths. The city is picturesque, well built, with wide streets. Near by is a large and old fort commanding the town, a prison, and a cantonment. Its chief commerce is in salt. Pop. (1891), 44,674.—SAGAR is also the name of a town in Mysore, and of one in Haidarabad.

M. W. II.

Sagas: See ICELANDIC LITERATURE and SCANDINAVIAN LITERATURE.

Sagas' ta, PRÁXEDES MATEO: statesman; b. at Torrecilla de Cameros, Spain, July 21, 1827; studied at the School of

Engineers in Madrid; was elected to the Constituent Cortes 1854; took part in the insurrection of 1856 and fled to France; returned to Spain on the proclamation of the amnesty and became professor in the School of Engineers in Madrid, and editor of *La Iberia*, the principal organ of the progressist party; after the unsuccessful insurrection of June, 1866, he again fled to France, but returned after the fall of Queen Isabella II.; member of Gen. Prim's first cabinet; Minister of State Jan., 1870; declared for the monarchy; Minister of State in the first cabinet of King Amadeus; successively Minister of Foreign Affairs, Minister of the Interior, and president of council, 1874, under Marshal Serrano; gave in his adherence to Alfonso XII. 1875; joined the new liberal party, 1880; came into power at the head of a coalition in 1881, which was superseded in 1883 by a cabinet formed from the dynastic left. On the death of Alfonso XII., Nov. 23, 1885, he again took charge of the Government at the request of the queen regent; his ministry was overthrown 1890, and the conservatives returned to power under Castillo. On the latter's resignation in Dec., 1892, Sagasta succeeded him; in Mar., 1895, he resigned, and was again succeeded by Castillo.

C. H. THURBER.

Sage [Fr. *sauge*]: a plant of the genus *Salvia* of the mint family (*Labiatae*). *S. officinalis* is a familiar garden-herb. Its leaves are employed in flavoring meats and other dishes, and sage-tea, a decoction of its leaves, is a useful domestic remedy, having aromatic, stimulant, and tonic powers.

Sage, ALAIN RENÉ, le: See LESAGE.

Sage-brush: the popular name of species of bitter shrubs of the genus *Artemisia* (family *Compositae*) growing upon the Great Plains and in the Rocky Mountains of North America. *A. tridentata* is from 3 to 6 or even 10 to 12 feet in height, and is the common large sage-brush of Idaho, Montana, Wyoming, and Colorado, extending also eastward to the plains. Among other common species are *A. cana* and *A. filifolia*.

CHARLES E. BESSEY.

Sage-cock, or Cock of the Plains: a kind of grouse, the *Centrocercus urophasianus*. It is characterized, among the tetraonine forms which are feathered to the toes but with the toes themselves bare, by the tail being much elongated and cuneate, and the constituent feathers narrow and attenuated, and the shafts of the feathers on the lower part of the throat very spinous. The color above is brownish yellow, with blackish areas on the inner fields of the feathers; the wing has light-colored shafts to the feathers of the coverts; the lower portions of the breast are whitish, the abdomen marked with a broad black area. The male bird has very large, dilatable, naked, and yellow air-sacs on each side of the neck, bordered by stiff, scale-like feathers. The species is the largest American representative of the family, the male having an average length of over 30 inches, and the female about 21 or 22; but these dimensions are frequently much exceeded. It is confined to the arid plains of the western parts of the U. S., ranging from the Black Hills in the E. to California and Oregon in the W., and from British America in the N. to Arizona in the S. In those parts the sage-brush (*Artemisia*) grows in abundance, and the sage-cock feeds upon that plant, whereby a bitter flavor is imparted to the flesh; but it is said that if the bird is eviscerated at once after being killed this taint is not so marked. There is a simple muscular membranous bag, contrasting with the peculiarly developed gizzard of the ordinary species.

Revised by F. A. LUCAS.

Sag'enite: See QUARTZ.

Saghalien, saa-ga'-leen', or Sakhalin, known as KARAFU by the Japanese and as TARAICO by the natives: a long and narrow island off the east coast of Asia, stretching directly S. from the mouth of the Amur river, between lat. 45° 54' and 54° 24' N. Its length is 670 miles, breadth from 15 to 80 miles, its area 29,336 sq. miles, and it is traversed by parallel mountain chains, thickly wooded, the highest peak being Kitapal (La Martinière), near the center of the island, 4,860 feet high. The chief productions are coal of good quality, furs, and timber; the climate and soil do not favor agriculture. At Dui on the west coast, and Mauka Cove farther S. are Government penal stations; the last is also a fishing center. Since 1875, when Japan ceded her rights over the southern portion of the island in exchange for the northern Kuriles, Saghalien has been altogether Russian. The native Ainu stock, number 3,200; a dictionary of their tongue was compiled by M. M. Dobrotvorski, and completed and published in 1876 by his brother Ivan. J. M. DIXON.

Sag Harbor—village, Suffolk co. (Long Island), N. Y., on Long Island Sound, on inlet of the Atlantic Ocean, and on Long Island Railroad, 10 miles S. of Greenough, 100 miles E. to N. of New York (see location, see map of New York, vol. 544). It has a good harbor, considerable trade in oil and sugar, regular steamboat communication with New York, Boston and other ports, and manufactures of paper, cigars, wax-tapers, and boots. Many New York business men have yearly summer residences here. There is a school connected with Agricultural department, the Annual Fair, the Sacred Heart of Mary (Roman Catholic), opened in 1875, a savings bank with capital of \$60,000, a savings-bank, a library, and two weekly newspapers. Pop. (1890) 1,600; (1900) not separately reported; (1904) estimated, 2,000.

Saginaw—city, capital of Saginaw co., Mich., on the Saginaw river, and the Ch., Sag. and Mack, the Detroit, East and N., the Flint and Pere Marq., the Mich. Cent., Sag., Toronto and Huron, and the Sag. Val. and St. L. rivers, 84 miles N. E. of Lansing, the state capital, 100 miles E. W. of Detroit (for location, see map of Michigan, ref. 12). It occupies a site about 40 feet above the river, which is navigable from Saginaw Bay on Lake Huron to this point and is here crossed by several bridges, and is surrounded by a rich agricultural region. The city is provided with gas and electric light plants, sewerage, water-works, and street-railways, and contains 42 churches, 2 high schools, 20 public-school buildings, public-school property valued at \$450,000, 2 public libraries, 5 national banks with combined capital of \$650,000, 2 State banks with capital of \$250,000, 1 savings-bank with capital of \$230,000, 2 private banks, and a daily and 2 weekly periodicals. In 1890 the census returns showed 947 manufacturing establishments (representing 60 industries), with a combined capital of \$11,117,000, employing 5,000 persons, paying \$2,044,015 for wages and \$1,044,449 for materials, and turning out products valued at \$10,000,000. Thirteen lumber mills had an output valued at \$5,431,000, and 10 foundries and machine-shops were valued at \$814,000. There were also 16 tanneries, 10 saw and shingle factories, and 6 carriage and wagon, 4 harness, 4 cooperages, and 5 malt-brewing plants. Another important article of manufacture is salt, of which, with lumber, the city exports large quantities. In 1890 the city had a assessed valuation of \$17,447,000, and a net debt of \$1,000,000. The present city of Saginaw was created by act of the legislature of Mar. 3, 1890, which consolidated the same cities of Saginaw City and East Saginaw, on opposite sides of the river. Both cities had the Holly system of water-works, gas-plant, sewerage, street-railways, and schools, public schools. East Saginaw was the more important of the two cities, was located in 1847, was laid out as New York capitalists in 1849, and was chartered as a city in 1850. The development of the cities was rapid because of their superior railway and lake shipping facilities. Pop. (1890) Saginaw City, 10,525; East Saginaw, 19,016. The present city covers an area of nearly 13 sq. miles; pop. (1900) 46,272; (1894) estimated, 59,000.

M. D. COWLES, EDITOR OF COURIER-HERALD.

Saginaw River: a river in Michigan, formed by the junction of the Flint and Shiawassee rivers. It flows N. 30 miles to Saginaw Bay, and is navigable for 24 miles by steamers drawing 10 feet.

Sagittaria: a genus of CRYPTOGAMA (q. v.).

Sagittarius [=Lat., arrow, deriv. of *sagitta*, arrow]; the sign of the zodiac into which the sun enters about Nov. 21. There is also a constellation Sagittarius, corresponding to the sign *Capricornus*.

Sago [from Malay *sagu*]: a variety of starch obtained from the coriaceous matter or pith of the stem of *Metroxylon sagu*. It is now, and various other palms, *M. rumphii* grows in low lands in the East Indies. It is a low tree, with a dense crown, of which the woody part is but an inch or two in thickness, the whole cavity being filled, at a certain stage of the growth, with the farinaceous pith. This is mixed with water, which is passed through sieves, and the starchy matter is allowed to settle. There are several varieties: common sago, which is like other varieties of starch, insoluble in cold water, but swells to a transparent jelly on boiling; the palm sago, which has been granulated and subjected to some process, probably involving heat, which causes it to be somewhat soluble even in cold water. If potato-starch be mixed with sago for purposes of adulteration, the microscope will detect the granules, as they are larger and more regular.

Sago-chesse: a corrupt name given in the U. S. to Sahagún cheese. See CHEESE.

Sago-palm: a palm that yields sago, also, a word that yields a kind of sago. See *Ulex* and *Pala Ficus*.

Sagoyewatha: See HAW JACKET.

Sagunoy (sag-e-ná) River: one of the six great tributaries of the St. Lawrence, carrying the surplus waters of Lake St. John a distance of over 100 miles to the parent stream at Tadoussac. For the first 30 miles of this distance its channel is narrow, and runs through an extensive forest region over waterfalls and rapids to the tidal limit near Chatham. Besides the waters from Lake St. John (see loc. 10), LAKE St. Sagunoy (the Sagunoy river) receives on the left bank the St. John, the St. Charles, and the Marguerite, and on the right the Chatham (which drains Lake Kenogami, fed by the waters of the river Uppikami) and the Mars. The whole region is famous for its bold and striking scenery, especially below the tidal of the Rivière à Mars, which widens out into the beautiful Ha Ha Bay. For 50 miles the river passes within the rugged highlands of the Laurentians, between banks that descend precipitously for 1,000 feet to the surface of the water, with here and there a more striking promontory rising even higher. Here the water is deep and flows slowly, the depth in some places being over 2,000 feet, the river being navigable for the largest vessels as far as Ha Ha Bay. The river and its tributaries are famous for their fisheries of salmon and trout.

J. M. HANNA.

Saguntum [= Lat. Cf. Gr. *Σαγουντα*]: an ancient town of Spain; in Hispania Tarraconensis, founded by Greek colonists from Zacynthus (modern Zante). It prospered and became very wealthy. In 210 B. C. it was besieged by Hannibal. After a year of energetic resistance against an army of 150,000 men the Saguntines, pressed by famine, set fire to their city, and while all the women and children perished in the flames, the men issued forth to battle and were killed. This conquest by Hannibal occasioned the second Punic war. The Romans afterward rebuilt the city and called it *Murs veteris* (the old walls), whence the name of the city, Murviedro, which occupies the site. A theater and a temple of Bechus are still left of the ancient city, the former in comparatively good condition.

Sahagún, BERNARDO, de; historian; b. at Sahagún, Spain, about 1499. He studied at Salamanca, joined the Franciscans, and from 1529 was a missionary in Mexico. Besides works on the Indian languages he wrote a *Historia universal de la Nueva España*, which was long used in manuscript by historians, but was first published at Mexico 1829-50, and by Kingsborough in 1850. The portion relating to Aztec history has been criticised as unreliable; the description of the conquest is valuable. D., probably at the convent of Tlaluelolco, Feb. 5, 1590.

H. H. S.

Sahaptin Indians: See SHAWAPTIAN INDIANS.

Sah'ra [from Arab. *sahr*, desert plain]: the great desert of Northern Africa, the largest on the earth and the principal member of the series of deserts which extends from Cape Verde through Africa, Arabia, Persia, and Turkestan, and ends in the great Shamo or Desert of Gobi in Mongolia. The Sahara extends on the N. to the Atlas and Algerian Mountains and in Tripolis to the Mediterranean Sea. On the W. it extends to the Atlantic, and on the S. it is limited by the margin of forest growth in the Sudan. The eastern boundary is artificial, but is usually taken to be the western margin of the basin of the Nile. Thus limited it has an area of 4,000,000 sq. miles. If the grassy southern versant of the northern mountains, the comparatively fertile oases, and the extensive pastoral steppes on the southern border are excluded, thus limiting the desert only to that part incapable of ordinary agriculture and grazing, the area is reduced to 2,400,000 sq. miles. Of this the area covered by dunes or moving sands is only 500,000 sq. miles—about one-eighth of the Sahara as a whole and one-fifth of the desert proper. These estimates are subject to the uncertainty due to incomplete knowledge of the desert. Two considerable areas are yet unknown—one to the N. of Lake Chad, the other the southern part of the Libyan desert.

Surface.—The Sahara is not a level plain, as usually imagined, but is much diversified. Its average elevation above the sea is estimated at 1,200 feet by Saint-Martin and at 1,500 feet by Chavannes. Only two small areas are known to be below the level of the sea. The first is a series of sheets in Southeastern Algeria and Central Tunis, W. of the Lesser Syrtis. Water could be admitted into this area from the

Mediterranean, but the resulting seas combined would not be as large as Lake Tanganyika or Lake Nyassa. The other depressed area is in the northern part of the Libyan desert (the oases of Araj and Siouah), nearly E. of Fayoum and 150 miles from the Mediterranean, from which it is separated by an elevated plateau.

A mountainous region stretches through the desert S. E. and N. W., extending from S. of Algeria to Darfur, dividing the eastern or Libyan desert from the Central and Western Sahara, and having its backbone in the Tassili and Tibesti Mountains. They make a nearly unbroken range 1,100 miles long, culminating in Mt. Tarso of Tibesti, about 8,000 feet high. To the W. of this range and connected with it are the mountain complexes of Ahaggar and Azjer, which occupy the geographic center of the Sahara, with elevations of from 4,000 to 5,000 feet. These, with areas of lower mountains to the N. and S., make an elevated band which crosses the Sahara nearly centrally from the Syrtis on the N. to Sokoto on the S.

The remainder is much diversified by plains, hills, and valleys, and is furrowed by the beds of streams, generally dry, but having, nevertheless, as well-defined basins as in other parts of the world. The surface is sometimes a shingly, denuded, arid plateau (*hamada* of the Arabs), drearily uniform, slightly undulating, but little intersected, from the surface of which the wind sweeps every particle small enough to be carried away. This may be succeeded by a region of ravines and valleys (*wadies*) which are sometimes simple coulees, sometimes extensive, with a full series of ramifications. With these are associated sharp escarpments, which are the edges of the higher plateaus, and sometimes isolated buttes (*gara*, plural *gour*, of the Arabs). Not rarely the wady ends in a closed basin (*sebkha*), which may be always dry or occasionally filled with water, making a temporary lagoon. The latter when dry are covered with a layer of saline efflorescence which, under favorable conditions, forms a veritable crust. Elsewhere are plains of sands heaped into dunes. The latter are grouped irregularly, and reach sometimes a height of 300 or 400 feet, but are not so subject to shifting by the wind as is sometimes represented. They remain fairly permanent from generation to generation, and, although heavy wind-storms may carry considerable quantities of sand, the trails are not generally obliterated nor the wells covered. These seas of sand have the name of *erg*, and of these four large ones are known (two in the Libyan desert and two at the W. and parallel to the Atlantic coast). Besides these there is a series of smaller ones from Southern Algeria to Fezzan, and some other isolated ones of small size.

A few of the rivers of the Sahara debouch into the Atlantic, the principal ones being the Draa and the Sakiet-el-Hamra, near the northwestern angle of the Sahara, the former with water, the latter without. Many smaller valleys debouch into the Syrtis of the Mediterranean. The Libyan desert has few of the wadies. The richest part of the Sahara for these stream-beds is the central elevated region of Ahaggar, Azjer, and Tassili. From this region radiate innumerable stream-beds, some of which are lost in the sand at lower levels, while others can be traced to the Mediterranean or to the basin of the Niger. Lake Chad has a similar but less extensive system. The existence of these stream-beds suggests that formerly the Sahara may have been a well-watered region. If so it was probably in late geological, certainly before historical, times. Perhaps they are due to the occasional filling which they undergo, which is due to the intense local storms (cloud-bursts), in which the rain comes when it comes at all. The stream is then filled with a torrent which advances with impetuous force and continues until lost in a lagoon, in the sand, or in some regular outlet, as Lake Chad. Such streams exert powerful erosive action, doing in a few hours the work which it would take a tamer stream years to perform. To such streams is probably also due the subterranean water which forms permanent or temporary wells, and whose existence renders possible commerce across the Sahara.

Geology.—The Sahara is geologically as diversified as other regions. The core of the elevated center about Ahaggar is formed of the early pre-fossiliferous crystalline rocks. About this core, with prolongations to the Atlas on the one side and Tibesti on the other, is found an enormous area where Palaeozoic rocks come to the surface. The next in the series is a large development of the Cretaceous, which extends from Tunis to the Nubian desert and Kordofan. The Eocene and Miocene cover a large area in the northern part of the Libyan desert, and the Pliocene and Quaternary occupy

the southern and central part of the Western Sahara. Evidence of volcanic action is found in the Ahaggar and Tibesti Mountains and to the E. of Fezzan.

Climate.—The mean annual temperatures of the Sahara are about those of Northern Mexico, passing from 68° F. at the north to 86° at the south. The January means vary from 40° at the north to 72° at the south. In summer it is hottest in the center, the July mean temperatures over a large part of the interior being 95° or more and falling to 86° at the margins. The mean annual range varies from 20° at the margins to 40° within. The true features of the temperature only appear when the extremes and the daily range are consulted. The difference between day and night often runs to 50° or more. In the northern and central parts of the desert winter temperatures below freezing are common. In summer temperatures of about 120° are not rare over the Sahara, and Rohlf's once recorded 127° F. in the shade. This record has been surpassed in the Colorado desert of Southern California, where a record of 128° F. was made in July, 1887.

In winter the desert surface is occupied by a part of the high-pressure band which surrounds the earth. The winds then flow gently out in all directions, except in the N. W., where an inflowing current from the N. W. enters by crossing the Atlas Mountains. In the summer the surface is occupied by an area of relatively low pressure. The winds then generally flow into the desert, but there become dry because of the high temperatures.

The moisture of the air is generally very slight. In many cases records of only 2 per cent. of relative humidity have been made, and in a few cases the instrument has failed to find an appreciable amount, making a record of 0 per cent. Under such conditions the sky is intensely blue, except when the air is loaded with fine dust, and mirages are common in the heat of the day. Dew and hoar frost are almost unknown. Yet there is probably no part of the desert where rain does not fall occasionally, but sometimes years intervene between showers. Beginning at the south, the rainfall on the parallel of 10° N. lat. is about 50 inches, and the rainy season is in middle and late summer. This is gradually reduced northward until, on the parallel 20° N., the amount is only from 5 to 8 inches annually. North of this, regular mid and late summer rains occur in the mountainous regions, but elsewhere the rainfall becomes irregular and occasional only, giving, however, an annual average of 5 inches or more. This condition continues to the Atlas Mountains on the W. and to the Mediterranean on the E., except that in Algiers the Mediterranean regimen of rainfall (spring and late autumn, with dry September) obtains over a narrow strip on the edge of the desert.

The winds that come from the Sahara and blow out over the neighboring regions are of a peculiar and sometimes destructive character. They have received many names—harmattan, leste, leveche, sirocco (of Sicily), chamsin, simoom. They are characterized by heat, dryness, and dust. The heavy winds of the interior, carrying much sand, are generally from the S.

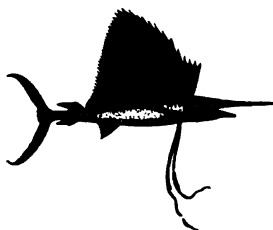
Cause of Aridity.—This desert has continued from the earliest known times without material change, except a possible progressive (but slight) increase in aridity. From what precedes it appears that it is not due to solar heat (as thought by the ancients), nor to recent elevation above the sea, nor character of surface, nor is it due to the northeast trade wind, to which it was attributed by Humboldt. The aridity is a purely atmospheric phenomenon, due to the outflow of wind in winter, and to the great heat when the inflow takes place in summer. The direction of the winds again is due to the distribution of atmospheric pressure. As the details of the last are due to the distribution of land and water, the Sahara must have been a desert ever since the continents took on their present form.

Flora and Fauna.—The flora, though poor, is interesting because peculiar, and not formed by an intermingling of that of the Sudan and Mediterranean coast. It is rarely entirely lacking; even in the sandy deserts and the oases (comprising about 75,000 sq. miles) are true islands of verdure. Here the chief plant is the date-palm. The fauna is even poorer than the flora. In the *erg* or *hamada* one can travel for days without seeing an animal. In the mountains are jackals, wolves, antelopes, and sometimes lions and tigers. The birds are very few in species and number. The reptiles are relatively abundant, and permanent waters are stocked with fish and other water animals.

Population.—The central part of Sahara, from Tunis and Tripoli to the Central Sudan, is occupied by the Tuareg.

sails follow the rules given as to form and class, but have peculiar names. The most common are spritsails, standing lugs, dipping lugs, and sliding gunters.

Sailfish: any fish of the genus *Histiophorus*, having a remarkably long and high dorsal fin. The ventral fins are



Sailfish

modified into elongated styli-form appendages of two or three rays, and there are small persistent teeth. The species have an elongated sword, as in the swordfishes (*Xiphiidae*), but are regarded as the type of a special family (*Histiophoridae*), including also the spearfishes (*Tetrapturus*). They are inhabitants of warm seas, especially the Indo-Pacific, but *Histiophorus americanus* ranges N. to Cape Cod in summer. The dorsal fin, erected when the fish floats on the surface, has been likened to a sail. They are known also as banner-fishes and spikefishes.

Sailing: See NAVIGATION and GREAT-CIRCLE SAILING.

Sainfoin [= Fr.; *sain* sound, wholesome (< Lat., *sanus*) + *foin*, hay (< Lat. *fœnum*)]: a perennial leguminous forage-plant, *Onobrychis sativa*, very valuable on dry, chalky lands, but not much raised in the U. S. It is prized as green forage, as hay, and as a crop to be plowed under.

Saint [viâ O. Fr. from Lat. *sanctus*, holy, sacred, (as noun) saint, transl. of Gr. *ἅγιος*, holy, saint]: in the New Testament a title of all Christians (Rom. i. 7; 1 Cor. i. 2; Eph. i. 1; Phil. i. 1, etc.), in the sense that they are called out of the world, regenerated by the Holy Spirit, and consecrated to God and to holiness. In the Apostles' Creed as now recited "the communion of saints" is one of the articles of faith, closely related to the preceding article on "the holy catholic Church," but the clause is not found in the earlier forms of that symbol. The oldest MS. copies of the Gospels bear simply the names of Matthew, Mark, Luke, and John, without "S." attached to them. After the fourth century the term began to be applied to particular persons of special eminence in piety and services to the Church, as the apostles, evangelists, and martyrs. It became the exclusive title of a spiritual nobility or aristocracy. Special honor was paid to their memory, which gradually assumed the character of a limited Christian hero-worship, called by the scholastic divines *doulia* or *veneratio* (as distinct from *latría* or *adoratio*, which is due to God alone, and *hyperdulia*, or a peculiar degree of veneration which is claimed for the Virgin Mary as the mother of our Lord and queen of saints). The Greek and Roman Churches, believing in the active intercession of the saints in heaven in behalf of the struggling Christians on earth, consider it proper and useful to pray to them; with this difference, that God is to be implored as the giver of all blessings, while the saints are to be implored as the friends of God, that through their advocacy may be obtained from him all necessities of life (hence the form *Ora pro nobis*, Pray for us). Protestants reject the worship of saints, images, and relics as inconsistent with the first and second commandments and the exclusive worship of God, and hence they pray directly to God and to Christ.

Who are the saints was a question for a long time left to the public sentiment of the Christian people in the particular nation or province or monastic order to which the saint belonged. The voice of the people was regarded as the voice of God. But to prevent the immoderate increase of the number of saints, the popes since Alexander III. (A. D. 1170) have monopolized the right of canonization—i. e. of deciding and pronouncing a departed Christian to be a saint, and authorizing and prescribing his worship within the Roman Catholic Church. The act of canonization is preceded by a regular process of law, in which one acts as the accuser of the candidate, another as his advocate. The necessary qualifications for the honor are, besides the highest sanctity, the power of working miracles, either during their lifetime, or after their death through their pictures or relics or the invocation of their aid. An Italian proverb says it requires a miracle to prove a miracle. This is especially true after the lapse of several centuries, which usually intervene between the death of a saint and his canonization. In 1862 Pope Pius IX. solemnly canonized twenty-six Japanese missionaries and converts who died in a persecution in 1597, nearly 300 years before. See *Descrizione delle cere-*

monie che si celebrano nella Basilica Vaticana per le solenni Canonizzazioni dei Santi (Rome, 1862).

The Roman Catholic Church celebrates the memory of each canonized saint on the day of his death (which is regarded as his birthday in heaven). Its calendar of saints includes (1) the apostles, evangelists, and most eminent martyrs, fathers, schoolmen, and missionaries down to the Reformation, who are the general property of Christendom; (2) the specifically Roman saints who lived after the Reformation and zealously opposed Protestant doctrines (as Ignatius Loyola, Charles Borromeo); (3) a few popes. The last canonized pope was Pius V. (1566-72), who excommunicated Queen Elizabeth.

The biography of saints has given rise to an immense body of literature. The most learned and extensive work on the subject is the *Acta Sanctorum* of the Bollandists, begun in 1643, embracing 60 vols. fol., and not yet completed. A convenient abridgment is Alban Butler's *Lives of Saints* (in many editions, e. g. 12 vols., Dublin, 1866; Cf. Baring-Gould (Prot.), *Lives of the Saints* (17 vols., London, 1872-92); *Lives of the English Saints*, edited by Cardinal Newman (15 vols., 1844-45); R. M. Stanton (R. C.), *A Menology of England and Wales* (1888).

Revised by S. M. JACKSON.

St. Albans (anc. *Verulamium*): city; in Hertfordshire, England; on the Ver, a feeder of the Colne; 20 miles N. N. W. of London (see map of England, ref. 11-J). In commemoration of the martyrdom of St. Alban (303) Offa, King of Mercia, founded a Benedictine abbey here in 793, which obtained precedence over all other abbeys in England. The abbey-church was rebuilt by its abbot, Paul of Caen, after 1077, and consecrated in 1115. This, even after many alterations and additions, still remains the most important example of Norman architecture in England. It has been considerably restored by Sir Gilbert Scott and Sir Edmund Beckett (1871-85). Its extreme length outside is 548 feet, and the Gothic nave (284 feet) is the longest of its kind in the world. A feature of interest is the substructure of the shrine of St. Alban, pieced together from 9,000 fragments. The abbey gate-house, which alone remains of the monastic buildings, was converted from a jail in 1869 to the use of the grammar school. St. Albans is historically interesting from the two battles fought here during the wars of the Roses in 1455 and 1461. Straw-plaiting, boot-making, and silk-manufacture are carried on. Pop. (1891) 12,895. R. A. ROBERTS.

St. Albans: town (settled in 1763); capital of Franklin co., Vt.; on the Central Vt. Railroad; 3 miles E. of Lake Champlain, 32 miles N. of Burlington, 70 miles S. of Montreal (for location, see map of Vermont, ref. 2-B). It is picturesquely situated on a plain 375 feet above lake-level and 390 feet above sea-level, is surrounded by high hills, and is the center of a large agricultural and dairying region. It contains 8 churches, high school, public graded school, academy, 2 convents, public library, hospital, a home for children, a national bank with capital of \$100,000, a trust company with capital of \$50,000, and a daily, a weekly, and a monthly periodical. The town is principally engaged in making butter and cheese, contains the headquarters of the Central Vermont Railroad, with offices, car and machine shops, and two roundhouses, and has manufactories of iron and steel bridges, viaducts, turn-tables, iron roofs, and marble and granite monuments. In 1864 the town was raided by a band of Confederates from Canada, and in 1866 was the rendezvous of Fenian invaders of Canada. Pop. (1880) 7,193; (1890) 7,771.

St. Andrews: town; in Fifeshire, Scotland; on a rocky plateau adjoining St. Andrews Bay; 42 miles N. N. E. of Edinburgh (see map of Scotland, ref. 10-I). The schools of St. Andrews were noted as early as 1120; and in 1411 the university, the first in Scotland, was founded. It has a museum, and a library with over 100,000 volumes. St. Andrews contains ruins of a cathedral (1160), a bishop's palace (1200), and many Celtic and prehistoric remains. It is a popular watering-place, and widely known as the headquarters of golf. Pop. (1891) 6,853. See *St. Andrews*, by Andrew Latimer (London, 1893).

St. Andrews: a port of entry; capital of Charlotte County, New Brunswick; at the mouth of St. Croix river; on Passamaquoddy Bay; 66 miles by land W. of St. John; on the Canadian Pacific Railway (see map of Quebec, etc., ref. 6-G). It has a good harbor, a weekly newspaper, a marine hospital, a custom-house, a postal savings-bank, and various public buildings. It is an attractive place of summer resort. Pop. 1,800.

St. Anthony's Fire. See **ANTHONY'S FIRE.**

Island Anshelm. *ANSHOLM, ANDRÉAS NICHOL, O. (Cleric Anshelm),* novelist; b. in Copenhagen, Denmark, Nov. 19, 1858. He was a nephew of P. O. Gyllenborg, and therefore cousin of J. L. Heiberg (see **HARBURG, JONAS** (1870)), and his writings show the influence of the Harburg school. He is known as a novelist of tales written between 1890 and 1900, as was the author of several historical novels, of which is best known *Alfred's Old Memories*, 2 vols., 1841, the most of which is laid in the time of Struensee. Of no less interest are the close studies of later Copenhagen life contained in the tales. Among these are, *El Lærke* (A Promise, with a translation by a Swedish force and modernity), *Myself of Anshelm*. The others are simple, often sentimental studies of everyday life. D. Nov. 25, 1865. Complete works, 14 vols., Copenhagen, 1866-67. D. K. THOMAS.

St. Augustine. — city; capital of St. John's co., Fla.; on narrow peninsula formed by the Matanzas and San Sebastian rivers, W. of the northern end of Anastasia Island, and between St. John, St. Augustine, and the St. John and St. Augustine rivers, 33 miles S. E. of Jacksonville (for location see map of Florida, ref. 3-K). The ancient city extended from the Franciscan convent (now St. Francis barracks) to the castle of San Marcos (now Fort Marion), a distance of nearly a mile. From the castle W. to the San Sebastian river extended a moat and wall, which formed in fact a substantial defense against any encroachment from the mainland. The former may still be easily traced along Orange street, but the only remaining evidence of its site is the old city gateway—a most picturesque ruin—situated at the end of the original wall on each side. The wall also extended E. along the San Sebastian river.

As an early period a sea-wall was built against the encroachment of the tide, extending from San Marcos Castle to the Franciscan convent. It was rebuilt in a more substantial manner by the U. S. Government in 1897-98, and consisting of granite 3 feet in width. This sea-wall has shown here a popular promenade. As late as 1817 entrance to the city from the mainland was effected by means of a bridge. Midway between the fort and the barracks and commanding a view of the Matanzas river is the Plaza, a public park. Fronting on this, to the W., is the government and post-office, formerly the residence of the Spanish governor. The city extends about a mile N. and E. to the S. of the ancient limits. The principal streets are N. and E.; the main thoroughfare, only 17 feet in width, runs through the center of the town to the city gateway. Beyond that point it is known as San Marcos Avenue. Orange street, crossing St. George and Mack N. of the Plaza, narrows at the east end to only 7 feet in width. The streets of St. Augustine are among the finest in the world. The houses are, on the whole, in the style of the Spanish Renaissance, one of the most magnificent and interesting specimens on the continent. The building and furnishings are valued at \$2,000,000. The mural decorations are most beautiful and significant, those of the loggia and dining-room illustrating a pictorial history of Florida and Spanish dominion in the New World.

A majority of the population are Roman Catholic, though St. Francis, St. Michael's, Presbyterians, and Baptists are churches. The Memorial Presbyterian church, of the American Renaissance type, is the most remarkable building of the character in the city. There are two excellent public schools, one for the white and one for the colored people. St. Joseph's Academy is a high-grade parochial school for young ladies, conducted by the Roman Catholic sisters. St. Augustine is also the seat of the Florida Institute for the Education of the Deaf and the Blind. The First National Bank of St. Augustine is the only bank. The manufacturing interest is confined to cigars, but this is considerable. There are a 14 weekly, 3 daily, and 2 weekly periodicals.

St. Augustine is the oldest city in the U. S. Though first founded in 1519 (located near its present site, the city was founded 100 years later), when Don Pedro Menéndez de Avilés with 2,500 followers, disembarked here and took possession in the name of Philip II. of Spain. The city acquired a population during the two centuries of Spanish rule of 2,000, besides aarrison of 2,500. At the time the British took possession, in 1763, there were about 900 inhabitants of European origin, but this is considerably increased with shellfishers, a formation found on Anastasia

Island. The walls of the city, the fort, and sea-wall were also made of this material. The present Fort Marion is the most notable and best-preserved of the works of the Spanish reign, and is a fine specimen of the military engineering of that age. With the exception of a water-battery, which the U. S. Government added in 1942-43 and some few repairs, the fort is as completed in 1736. It was in course of construction over 100 years, and is said to have been built mainly by Indian prisoners and Mexican convicts. The old Roman Catholic Cathedral, begun in 1798, was burned in 1887, but the front wall remained almost intact, and in rebuilding it was carefully protected and incorporated in the new structure. The old hall bearing the date 1682 was also preserved. In the Plaza is a shell of marble erected in 1812-16 to commemorate the adoption of the Spanish liberal constitution of 1812. Upon its failure the royalists were ordered to destroy the monument, but the authorities were satisfied with the removal of the tablets denoting its object. These were later restored, and are still to be seen. Pop. (1890) 3,200; (1900) 4,742; (1910) 4,500. D. N. FULMER.

St. Bartholomew, or St. Bart. — an island of the Lesser Antilles, West Indies, crossed by lat. 17° 04' 30" N.; area, 8 sq. miles. It forms a part of the French colony of Guadeloupe. Pop. 2,835.

St. Bartholomew, Massacre of. See **BARTHOLOMEW, ST., MASSACRE OF.**

St. Bernard Dogs. See **DOGS.**

St. Bernard Pass. See **BERNARD, GREAT ST.**

St. Bernard, Little. — a celebrated pass across the Graian Alps, on the frontier of Savoy and Piedmont, Italy, S. of Mont Blanc. It is 7,200 feet high, leads from the valley of the Isère into that of Dora Baltea, and has near the summit a convent for the relief of travelers, believed to have been founded by St. Bernard of Menthon. The pass is comparatively easy, and is supposed to have been the route taken by Hannibal in his invasion of Italy.

St. Boniface. — town of Manitoba; suburb of Winnipeg, from which it is separated by the Red river (see map of Canada, ref. 9-B). It is a French-Canadian town as distinguished from Winnipeg, which is British, and is the headquarters for the Northwest of the Roman Catholic Church. It was originally known as *La Fourche*, because of the junction here of the Assiniboine and the Red rivers, but on the arrival of Bishop Provencher in 1818 the name was changed to St. Boniface. Here are schools for French-Canadians, and in the cemetery attached to the cathedral is the grave of Louis Riel, the half-breed rebel, looked on by his followers as a martyr. Pop. 2,000. M. W. H.

St. Brendan, Brendan, or Branda'nus. — an Irish monk famous for his sea-voyages, about which many legends have been handed down from the Middle Ages; flourished probably in the sixth century A. D. He was said to have gone on a nine years' voyage and visited unknown lands, which are described in the work *De fortunatis insulis*, published in the eleventh century in Latin and translated into French about 1120. Versions of his voyages appeared also in German, English, and Dutch. A popular tradition has identified the Fortunate islands of St. Brendan with America, and given to the Irish saint the credit that belongs to Columbus, but his claims have no historical foundation. See the versions of St. Brendan's travels by Wright (London, 1844), Schröder (Erlangen, 1871), Blommaert (in *Oud-nieuwische gedichten*, Ghent, 1838-41), Miché (Paris, 1879). See also Jubinal, *La légende de Saint Brandain* (Paris, 1836), and Briel, *Von Sinte Brandone* (Göttingen, 1871).

St. Bride, or St. Bridget. See **BRIDGET, SAINT.**

St. Briene, saint-bri-e. — capital of the department of Côte-d'Or, France; on the Ouche; 40 miles E. of Besançon (see map of France, ref. 3-B). It has an ancient cathedral, a lyceum with a library of 27,000 volumes, and a statue of Bertrand du Guesclin; and is engaged in the whale and cod fisheries. Pop. (1891) 16,741.

St. Catharines. — city; capital of Lincoln County, Ontario, Canada; on the Grand Trunk and St. Catharines and Niagara railways; 12 miles N. of Niagara Falls (see map of Ontario, ref. 5-B). It is celebrated for its mineral artesian wells, which afford strongly saline waters with valuable tonic properties. There are several fine hotels, 3 daily and 3 weekly newspapers, a convent, a marine hospital, and important manufactures. The town is in a picturesque and fertile region. Pop. (1891) 9,170.

St.-Césaire, sǎn'sǎ'zǎ': town of Rouville County, Quebec, Canada; on Yamaska river; 33 miles E. of Montreal (see map of Quebec, etc., ref. 5-B). It has a large trade, a fine water-power, thriving manufactures, an astronomical observatory, a museum of mineralogy and zoology, and is the site of Ste. Croix College, a commercial school, and a Presentation convent. Pop. of parish, 5,200, almost all French-Canadians.

St.-Chamond, sǎn'shǎa'mōn': town; in the department of Loire, France; at the confluence of the Gier and Ban; 7 miles by rail N. E. of St.-Étienne (see map of France, ref. 6-G). It has several silk-mills, iron-works, and manufactures of ribbons and lace. The vicinity contains rich coal mines. Pop. (1891) 14,599.

St. Charles: city; Kane co., Ill.; on the Fox river, and the Chi. and N. W. and the Chi. Gt. West. railways; 8 miles S. of Elgin, 38 miles W. of Chicago (for location, see map of Illinois, ref. 2-F). It is on both sides of the river, which furnishes good water-power, and contains foundries and machine-shops, malleable iron-works, manufactories of butter, cheese, flour and feed, and paper, a private bank, and a weekly newspaper. Pop. (1880) 1,533; (1890) 1,690.

St. Charles: city (settled in 1780, incorporated as a town in 1809, chartered as a city in 1849); capital of St. Charles co., Mo.; on the Missouri river, and the Burlington Route, the Mo., Kan. and Tex., and the Wabash railways; 20 miles N. W. of St. Louis (for location, see map of Missouri, ref. 4-J). The main business street extends along the river front, and the residence portion lies on and beyond a hill that rises a short distance back from the river. The river is here spanned by an iron railway and highway bridge 6,535 feet long, with approaches, completed in 1871, cost \$1,750,000. St. Charles contains 9 churches, several public schools, Roman Catholic and Lutheran parochial schools, Lindenwood College for young ladies (Presbyterian, opened in 1830), Sacred Heart Academy (Roman Catholic, opened in 1818), St. Charles College (Methodist Episcopal, South, chartered in 1838), 4 libraries with about 11,000 volumes, a national bank with capital of \$50,000, 2 savings-banks with combined capital of \$100,000, and 2 daily and 5 weekly newspapers. There are 3 large flour-mills, a grain elevator with storage capacity of 50,000 bush., a tobacco-factory with annual capacity of 1,000,000 lb. of manufactured goods, 2 breweries, extensive car-works, brick-works, large corn-cob pipe factory, and other industrial plants. Pop. (1880) 5,014; (1890) 6,161; (1895) estimated, 8,000. J. H. ALEXANDER.

St. Christopher: See ST. KITTS.

St. Clair: city (settled in 1828); St. Clair co., Mich.; on the St. Clair river at the mouth of the Pine river, and on the Mich. Cent. Railroad; 12 miles S. of Port Huron, the county-seat, 45 miles N. E. of Detroit (for location, see map of Michigan, ref. 7-L). It is in an agricultural region, has ferry connection with Courtwright on the Canadian side of the river, and contains 6 churches, 3 public schools, Ladies' Library Association, Walker system of water-works, completed in 1886, a savings-bank with capital of \$50,000, and a weekly newspaper. The manufactories include salt-works, brick-yards, breweries, iron-works, planing-mill, sash, door, and blind factory, foundry, tannery, and ship-yards. Pop. (1880) 1,923; (1890) 2,353; (1894) estimated, 2,500.

EDITOR OF "REPUBLICAN."

St. Clair: borough; Schuylkill co., Pa.; on Mill creek, and the Penn. and the Phil. and Reading railways; 3 miles N. of Pottsville (for location, see map of Pennsylvania, ref. 5-H). It has 10 churches, 4 public-school buildings, a parochial school, improved water-works, electric lights, electric railway to Pottsville, and 2 weekly newspapers, and is principally engaged in mining and shipping anthracite coal and manufacturing mining apparatus. Pop. (1880) 4,149; (1890) 3,680; (1895) estimated, 4,500. EDITOR OF "SPLINTERS."

St. Clair, ARTHUR: soldier; b. at Thurso, Caithness, Scotland, in 1734; was grandson of the Earl of Rosslyn; educated at the University of Edinburgh; entered the British army as an ensign May 13, 1757; served under Amherst at the taking of Louisbourg July 26, 1758; became a lieutenant Apr. 17, 1759; was distinguished under Wolfe at Quebec; resigned his commission Apr. 16, 1762; settled in Ligonier Valley, Pa., 1764, erecting there a fine residence and several mills; was appointed colonel of the Second Pennsylvania Regiment Jan. 3, 1776; accompanied Sullivan in the expedition against Quebec; was appointed brigadier-general Aug. 9, 1776; joined Washington Nov., 1776; ren-

dered valuable service in connection with the battle of Princeton Jan. 2, 1777; was for a short time adjutant-general; was appointed major-general Feb. 19, 1777; succeeded Gates in command at Ticonderoga Apr. 1; was forced to evacuate that post July 4, thereby incurring unpopularity and retirement from his command, but acted as a volunteer aide at the battle of Brandywine Sept. 11, 1777; was acquitted with honor by a court martial in 1778; was a member of the court martial on Maj. André; commanded at West Point from Oct. 1; distinguished himself in the Southern campaign which terminated at Yorktown, and subsequently in that under Greene; was a member of the Continental Congress 1785-87, being its president during most of the latter year; became first Governor of the Northwestern Territory in 1789 and retained the office till 1802; made the treaty of Fort Harmer with the Indian tribes 1789; became commander-in-chief of the U. S. army Mar. 4, 1791; made an expedition against the Indians of the Miami and the Wabash, and suffered a severe defeat near the Miami villages Nov. 4, 1791; was vindicated from blame by a committee of investigation appointed by Congress; resigned the command of the army May 5, 1792; was removed from the post of Governor by Jefferson Nov. 22, 1802, when he settled near Greensburg, Pa., where he passed his remaining years in poverty. D. near Greensburg, Aug. 31, 1818. He published a *Narrative of the Manner in which the Campaign against the Indians in the Year 1791 was conducted* (1812). See *The Life and Public Services of Arthur St. Clair* (Cincinnati, 1882).

St. Clair Lake: the smallest of the Laurentian chain of lakes; receives the overflow of Lake Huron through St. Clair river, and discharges through Detroit river into Lake Erie. The lake is 30 miles in length from N. to S., 24 miles in maximum and 12 in mean breadth. Its area is 396 sq. miles, and its mean elevation above the sea 576 feet, or 5½ feet lower than Lake Huron and 3 feet higher than Lake Erie. Its mean depth over a large central area is about 19 feet. Its bottom is of fine blue mud, covered in many places with a thin layer of sand and fine gravel, and is overgrown throughout with vegetation which supports an abundance of low forms of life. The northern part is exceedingly shallow, being filled with sediment from St. Clair river. See ST. LAWRENCE RIVER AND GULF. ISRAEL C. RUSSELL.

St. Clair River [originally named *Sinclair*, from Patrick Sinclair, a British officer, who purchased land along the river from the Indians in 1765]; the outlet of Lake Huron. It has a length of 41 miles, and a fall of 5½ feet. The mean discharge is 225,000 cubic feet per second. The river has built a low-grade delta at its mouth, known as the St. Clair Flats, and divides into seven principal channels before reaching Lake St. Clair. In summer the delta has the appearance of a luxuriant prairie of grasses and rushes, which grow in a few inches of water. Several hotels and hundreds of summer cottages have been built on the flats, each house being supported on piles or on embankments formed by dredging neighboring canals. It is one of the most charming summer resorts in America. One of the branches into which the stream divides has been improved for navigation, and its course shortened by the dredging of a canal about 14 miles long, 300 feet wide, and with an original depth of 16 feet along a central area 200 feet broad. The embankments on either side are 40 feet wide, and 5 feet high above mean water-level. The available depth of water in the canal in 1893 was 18 feet, but contracts have been awarded by the U. S. Government for deepening it to 20 feet, this being one of the improvements necessary to complete the navigability of the route from Buffalo to Duluth for vessels of 20 feet draught. ISRAEL C. RUSSELL.

St.-Cloud, sǎn'kloo': town; in the department of Saône-et-Oise, France; on the Seine; 6 miles S. W. of Paris (see map of France, ref. 3-F). It derives its name from St. Cloud, grandson of Clovis, who founded a monastery here in 551. The place was burned by the English in 1358, and again by the Armagnacs in 1411. In the palace of St.-Cloud, built in 1572, Henry III. was assassinated in 1589; and here the *coup d'état* of Nov. 10, 1799, which placed Napoleon Bonaparte at the head of the French Government, was effected. The capitulation of Paris in 1815 was signed here, and also the decrees of Charles X. in 1830 which caused the second Revolution. The Duke of Orleans, brother to Louis XIV. made extensive additions to the royal château. In 1870 the palace was seriously injured by fire, but many of the valuable works of art were preserved. Pop. (1891) 5,660.

St. Cloud (city); capital of Stevens co., Minn.; on the Mississippi river, and the Gr. North and the N. Pac. rail-ways; 2 miles N. of Grand Rapids, 38 miles S. W. of St. Paul (see below); see map of Minnesota, ref. 8-47). It is on both sides of the Mississippi river, 2 miles below the mouth of the rock river; is an agricultural and hard-wood timber region; has more than 20 grain-elevators in its vicinity, and derives great power for manufacturing from the river. There are 10 churches, public high school, graded schools, one of the State normal schools, 2 libraries (Public, born school, and State Normal School), a State reformatory for males (opened in 1890), a U. S. land-office, 2 national banks with combined capital of \$500,000, a private bank, and 2 daily and 2 weekly newspapers. The city contains two and three mills (milling-machine works, industrial-alcohol works, saw-mill, furniture and machine-shops, and large grain elevators, and is the commercial and manufacturing center of Northern Minnesota. Pop. (1890) 7,092; (1896) 7,090. Current of "Times."

St. Cloud (see below) River.

St. Cloud (colloquial) River; a part of the boundary between Mexico and New Brunswick. It flows from Grand Lake to a general S. E. course and falls into Passamaquoddy Bay. It is navigable to below Mt. Adams which it affords fine water power. It is 75 miles in length. It is also called the *de la Rivière*.

St. Cloud River; a stream which rises in Douglas co., Wis.; flows S. W. to the Minnesota river; from this point southward, for more than 100 miles, it is the boundary between Wisconsin and Minnesota. It is some 100 miles long, and is navigable 54 miles to the Falls or Falls of the St. Cloud. After passing through Lake St. Cloud it flows into the Mississippi at Prescott, Wis. At its falls it descends 200 to 300 yards. Half a mile below there is a picturesque canyon through which the river flows.

St. Culbert's Head; see CHURCHES.

St. Cyr (colloquial); village of France; in the park of Versailles (see map of France, ref. 3-F). It is noted for the celebrated establishment which Madame de Maintenon founded here in 1686, for the education of 250 daughters of the French nobility. The building was erected by Mansart, in 1702 it was transformed into a military hospital, and in 1793 Napoleon removed the military academy from Versailles to this place. Pop. (1861) 3,613.

St. Denis (colloquial); town; in the department of Seine, France; 4 miles S. of Paris on the Great Northern Rail-ways (see map of France, ref. 3-F). It is celebrated as the site of the famous Benedictine abbey, the chosen place of burial of the Kings of France. The abbey of St. Denis has been founded by Dagobert I. in 619; a church began by Dagobert, the father of Charlemagne, was completed by the latter and consecrated in 775. The edifice was demolished during the reign of Louis VII., and a more imposing one erected in 1144; the porch and two towers of which yet remain, the rest of the present building was reconstructed by Louis XIII. Up to the time of the Revolution the remains of the abbey and palace of France were deposited here. The Convention in 1794 ordered the removal of these relics, and in 1795 the destruction of the building; the remains of the latter dates, however, were not fully carried out. Napoleon I. restored the church, which has been further profaned by subsequent governments, and is considered one of the most beautiful specimens of Gothic architecture existing in France. Pop. of the commune (1861) 4,000.

St. Denis; capital of the French island of Réunion, formerly Bourbon; on the northeastern shore (see map of Africa, ref. 5-1). It has a college and a botanical garden, and carries on a considerable trade. Pop. of the commune (1861) 31,000.

St. Die (colloquial); town; in the department of Vosges, France; see the Marne; 50 miles by rail S. E. of Nancy (see map of France, ref. 4-H). It has a cathedral, a lyceum, two large breweries, cotton and flax spinning-mills, iron-works, saw-mills and dyeworks. In the vicinity are iron, lead, zinc and copper mines, and much fine marble is quarried. Pop. (1861) 14,000.

St. Julien (colloquial); town; in the department of Haute-Marne, France; on the Marne; 38 miles by rail S. E. of Châlons (see map of France, ref. 4-H). It has several iron-furnaces, cotton-ship-building, and a trade in iron and timber. Pop. (1861) 9,476.

St. Damiens; see SAINT DAMIEN.

Ste. Anne-de-Bouapré (colloquial); village of Montserrat County, Quebec, Canada, containing a shrine to which many pilgrimages are made (see map of Quebec, ref. 4-14). The village is the terminus of the Quebec, Montserrat and Chatham Railway; about 25 miles S. E. of Quebec, at the mouth of the St. Anne river, a left-hand affluent of the St. Lawrence. The parish church contains relics of St. Anne, in which many miraculous cures have been attributed. The great day for pilgrimages is July 26, the feast-day of the patron saint. In the church is a fine painting by Le Brun, representing St. Anne and the Virgin, presented in 1666 by the Marquis de Tracy. About 3 miles distant are the beautiful falls of St. Anne, near which is good fishing for trout and salmon.

MADE W. HANSEN.

Saint-Henry (colloquial); CHARLES AUGUSTUS; poet and critic; b. at Roulogne, France, Dec. 23, 1804; studied medicine in Paris; entered in 1834 on his literary career as a contributor to the *Globe*; published in 1838 his *Théâtre historique et critique de la Poésie française au XVI. siècle* (improved edition, 1843; removed after 1860 from the *Globe* to the *National* and *Revue des Deux Mondes*; received employment at the Mazarin Library in 1840 after publishing the first volume of his celebrated work, *Port-Royal* (3 vols., 1840-42, later much improved, 5th ed., 7 vols., 1869-71); became a member of the Academy in 1845; became in 1846 Professor of French Literature at Liège; returned to Paris in 1849 and held various positions under Napoleon III., contributing steadily to the *Constitutionnel* and the *Monde*; was made a senator in 1865. D. in Paris, Oct. 13, 1869. The various series of his *Critiques*, *Portraits*, *Œuvres*, and *Œuvres complètes*, comprising over thirty volumes, contain some of the finest, most delicate, and most striking delineations of characters from history and literature which have ever been written. Selections have been translated into English: *Portraits of Celebrated Women* (Boston, 1896); *English Portraits* (1875). He also wrote a novel, *Volupté* (1864); 9th ed. 1877), and the collections of poems *Poésies de l'Académie de la Poésie de la Poésie* (1859); *Œuvres complètes* (1869); and *Poésies d'aujourd'hui* (1867). There are biographies of Saint-Henry by Rousseauville (1875), Vattier (2d ed. 1892), and others.

Sainte-Claire Deville (colloquial); GEORGE EDUARD; chemist; b. at St. Thomas, West Indies, Mar. 11, 1818; was educated at the Collège Rollin, Paris; was appointed dean of the faculty of science in Besançon (1844); in 1851 obtained the chair of Chemistry in the Normal School, Paris, and shortly afterward the similar post in the Sorbonne. D. in Paris, July 1, 1881. In 1850 he discovered anhydrous nitric acid; in 1855 he succeeded in making in mass aluminum, which before had been obtained only in globules; and with Debray he studied the six platinum metals. Along with Troost he experimented on the artificial production of minerals, and produced in this way the sapphires, rubies, and emeralds. These and many other investigations were published in the *Comptes Rendus* and the *Annales de Chimie et de Physique*. His principal contribution to theoretical chemistry was his explanation of the phenomena of dissociation, of which he gave a complete account in a lecture delivered before the Chemical Society of Paris in 1860. He published *De l'Aluminium* (Paris, 1859) and *Métallurgie du Platine* (2 vols., Paris, 1860).

R. A. ROBERTS.

St. Edmundsbury; see BURY ST. EDMUND.

Ste. Genevieve; city; capital of Ste. Genevieve co., Mo.; on the Mississippi river; 50 miles S. of St. Louis (for location, see map of Missouri, ref. 5-1). It is in an agricultural and stock-raising region, has mines of copper and quarries of sandstone in its vicinity, and is also largely interested in fruit-growing and wine-making. Pop. (1890) 1,422; (1896) 1,526.

St. Elias, Mount; in Alaska; in lat. 60° 17' 35" N. and lon. 140° 55' 47" W. It has an elevation of 18,190 feet, as determined by the U. S. Coast and Geodetic Survey. It is not a volcanic mountain, as has been frequently stated, but the upturned border of a block of the earth's crust bounded by faults. It is covered with ice and snow from base to summit, and surrounded on all sides by glaciers. The timber-line has an elevation of 2,000 to 2,500 feet on the foot-hills at its southern base, but on the mountain itself there are no trees, and but slight traces of vegetation even at its base. Its summit has not been reached, but although its southern slope is exceedingly precipitous and avalanche-swept, the northern side is accessible and not too steep for mountaineers.

to ascend. In 1891 an elevation of 14,500 feet was reached on its northern slope. Consult *Report on Second Expedition to Mt. St. Elias in Thirteenth Ann. Rep. U. S. Geol. Surv.* ISRAEL C. RUSSELL.

Ste.-Marguerite: See LÉRINS, THE.

Ste.-Marie: town of Beauce County, Quebec, Canada; on the river Chaudière; 80 miles S. of Quebec (see map of Quebec, ref. 4-D). It lies in a fertile region, has a fine Roman Catholic college, a spacious convent, a good trade, a large number of mills, and ores of copper and manganese. Pop. about 2,800.

Sainte-Maure: See BENOÎT DE SAINTE-MORE.

Saintes, sânt' (anc. *Mediolanum*): town; in the department of Charente-Inférieure, France; on the Charente; 28 miles by rail S. E. of Rochefort (see map of France, ref. 6-D). It has several interesting Roman remains, numerous breweries, distilleries, tanneries, and potteries, and an active trade in grain, hemp, leather, and wine. Pop. (1891) 13,363.

St.-Étienne, sânt'si-en': town; in the department of Loire, France; on the Furens, an affluent of the Loire; 86 miles by rail S. W. of Lyons (see map of France, ref. 6-G). It is situated in the center of rich coal-fields, from which over 3,000,000 tons are annually raised, and which have given to the city a most vigorous manufacturing impulse. It arose in an astonishingly short time; it had 49,614 inhabitants in 1851, and 122,769 in 1891. Its principal branches of manufacture are ribbons and firearms; looms, some of which (1895) are driven by electricity, employing about 40,000 persons are in operation, and produce ribbons to the value of nearly \$19,000,000 annually, which are sent all over the world, and are unsurpassed in beauty of design and colors; 20,000 persons are employed in the ironworks, and produce, besides large quantities of cutlery, files, nails, etc., nearly all the rifles and revolvers for the army. The first railway in France, the Chemin de Fer de St.-Étienne à Lyon, was constructed to carry coal to Lyons.

St. Eusta'tius: an island of the Lesser Antilles, West Indies; crossed by lat. 17° 29' N.; area, 7 sq. miles. It is little else than the summit of an extinct volcano, and has no running water. It now forms part of the Dutch colony of Curaçoa. Pop. (1892) 1,633. H. H. S.

Saint-Évremond: See ÉVREMOND.

St. Francis River: one of the six great tributaries of the St. Lawrence. It rises in Lake St. Francis, in Beauce County, Quebec, flows first in a southwesterly direction till it reaches Lennoxville, when it flows northwesterly and falls into the St. Lawrence at Lake St. Peter after a course of 120 miles. It is the principal river of the Eastern Townships. The tributaries are the Salmon, the Coaticook, the Massawippi, which drains the beautiful lake of the same name, and the Magog, which drains the magnificently picturesque Lake Memphremagog. The river runs through a fertile and well-cultivated territory, diversified with highlands and tracts of woodland. The towns and villages upon the river's banks are Angus, with its large paper-mill; Lennoxville, with its university; Sherbrooke, with its extensive manufactures; Windsor Mills, with its lumber and paper trade; Richmond, an important railway center; and Drummondville, the center of a rich farming district. Its course is frequently interrupted by shallows and rapids, and destructive floods are often caused by the blocking of the ice on or near these in early spring. The scenery amid which the river flows resembles in many places the character of an English landscape, more particularly in the vicinity of Richmond and Sherbrooke. J. M. HARPER.

St. Francis River: a tributary of the Mississippi, forming part of the boundary between Missouri and Arkansas. It rises in the Iron Mountain district of Southwest Missouri, and flows S. W. 450 miles, entering the Mississippi near Helena, Ark.; is navigable 150 miles, passes through a continuous swamp after entering Arkansas, and spreads into numerous lakes, one of which, 50 miles long by 20 wide, is supposed to have been produced by a sinking of the soil at the time of the great earthquake of 1811. It serves as an important backwater in overflows of the Mississippi river.

Revised by M. W. HARRINGTON.

St. Francis Xavier (zāv'i-er). College of: an institution of learning in New York, founded by the fathers of the Society of Jesus in Oct., 1847, and endowed with full collegiate powers by the regents of the University of the State of New York in Jan., 1861. The college buildings are located

on Fifteenth Street, W. of Fifth Avenue, with a frontage of 275 feet and a depth of 200, extending to Sixteenth Street. The library contains 25,000 volumes. The regular course preparatory to the degree of Bachelor of Arts embraces the study of logic, metaphysics, and theodicy; English, Latin, and Greek; rhetoric, poetry, and elocution; mathematics and the natural sciences; history, geology; and mythology. The degree of Master of Arts is given to graduates who enter the post-graduate class, pass two examinations in ethics and sociology, and write three creditable dissertations on the subject-matter of the year. The president of the college is Rev. Thomas E. Murphy, of the Society of Jesus, and the teaching staff includes twenty members of the same society. The students number over 900: 200 in the post-graduate course, 150 in the collegiate, 400 in the grammar department, and nearly 200 in the preparatory department.

EDW. P. SPILLANE, S. J.

St.-Gall: canton of Switzerland; bounded E. by the Rhine and N. by the Lake of Constance. Area, 779 sq. miles. The surface exhibits a thoroughly alpine character—mountains covered with forests, pastures, and snow and ice, and valleys studded with vineyards, orchards, and grain-fields. Agriculture, dairy-farming, and wine-making are the principal branches of industry. Pop. (1888) 228,174, of whom more than half are Roman Catholics and the rest mostly Protestants.

St.-Gall: capital of the canton of St.-Gall, Switzerland; on the Steinach, in a valley at an elevation of 2,152 feet (see map of Switzerland, ref. 8-1). It was formerly fortified, but its walls and ramparts have been transformed into promenades. The town has a fine cathedral, many good educational institutions, two large public libraries, and extensive manufactures of woollen, linen, and cotton fabrics, especially fine muslins and printed calicoes. Pop. (1888) 27,390.

St. Gall: a saint of the Roman Catholic Church; a native of Ireland, and a pupil of St. Columban; originally named Cellach or Caillech; b. in 554; followed St. Columban to Switzerland in 590, and became the apostle of the Suevi and the Alemanni. In 614 he built his cell in a dense forest on the Steinach, in Switzerland, where now stands the flourishing city of St. Gall, and gathered around him a number of hermits, who lived together according to the rule of St. Columban. D. at Arbon, 15 miles S. E. of Constance, Oct. 16, 627. From this beginning gradually developed the famous monastery of St. Gall, one of the principal centers of learning during the Middle Ages. Abbot Otmar, 720-759, substituted the milder rule of St. Benedict for that of St. Columban, built a church, founded a hospital, organized a school, etc. Under Gozbert, 816-837, the monastery was made a free royal abbey, with right to elect its own abbot, and exempted from any episcopal control. Under Solomon III., 891-920, the institution reached the culminating point of its prosperity. The monks of St. Gall were celebrated not only for their learning, but also for their skill in music, in copying and ornamenting manuscripts, etc. The first check it suffered was the revolt of the city of St. Gall in 1415. The abbot was compelled to recognize its freedom and independence. After the Reformation it gradually fell into decay, but it retained its enormous revenues until the Revolution. It was secularized in 1798; its estates were confiscated, and its territory was formed into a bishopric. See Ildephons von Arx, *Geschichte des Kantons St. Gallen* (3 vols., St. Gall, 1810-13); Franz Weidmann, *Geschichte der St. Gallenbibliothek St. Gallens* (1841); C. J. Greith, *Der heilige Gallus* (1865); and the edition by R. Shuli of Walafrid's original life of St. Gall (1890). Revised by S. M. JACKSON.

St. George: one of the PRIBILOF ISLANDS (q. v.) in Bering Sea. It is triangular, 30 miles around, with an area of 27 sq. miles. It is the highest of the group, reaching an elevation of 920 feet. M. W. H.

St. George, Cape: See CAPE ST. GEORGE.

St. George's: See BERMUDA ISLANDS.

St. George's: capital of the island of Grenada and of the British colony of the Windward islands, West Indies, on a bay near the south end of the island (see map of W. Indies, ref. 9-M). The harbor is one of the best in the W. Indies; the town, built in part on hills, is very picturesque; it has a considerable trade with the other islands and with Europe and the U. S. Pop. about 6,000. H. H. S.

St. George's Channel: a body of water connecting the Irish Sea with the Atlantic and separating Ireland from Wales. It is 100 miles long and 65 miles broad.

(see map of Quebec, ref. 5-A). It has a very fine water-power in the rapids of the river, which descend 300 feet in 3½ miles. The power is used for flour-mills, sawmills, and other factories. In the vicinity are mines of iron and plumbago. The climate is celebrated for its salubrity. Pop. (1891) 2,032, mostly French-Canadian. M. W. H.

St. John, West Indies: See ST. THOMAS.

St. John: the capital of Antigua, West Indies, and the seat of several military and civil authorities (see map of West Indies, ref. 6-L). It is beautifully situated and has a good and fortified harbor, which, however, is not accessible for large vessels. The town is generally well built, especially on the hills surrounding the port. It sometimes suffers greatly from lack of water, and it was seriously injured by the earthquake of Feb. 8, 1843. Pop. (1891) 9,738.

Revised by M. W. HARRINGTON.

St. John: city, seaport, and shiretown of St. John County, province of New Brunswick, Canada; on the St. John river at its entrance into the Bay of Fundy, and the Canadian Pacific, the Intercolonial and the Shore Line railways; 277 miles N. W. of Halifax, 481 miles E. of Montreal (for location, see map of Quebec, ref. 6-H). It has one of the finest harbors on the Atlantic coast, protected by a breakwater, 2,250 feet long, and always free from ice. Partridge island, at its entrance, contains a fine lighthouse and a quarantine hospital. St. John river enters the harbor through a rocky gorge about 100 yards wide, and has a fall of 17 feet at low tide; but as the tides in the harbor rise from 25 to 35 feet, the waters of the river and harbor are at the same height twice daily, and then permit the safe passage of vessels either way. Including Carleton on the W. and the former city of Portland (annexed in 1889) on the N., the city has an area of about 6,000 acres, one-quarter of which is built up. It is laid out regularly with broad streets running N. and S. and E. and W., some of them hewn through 30 feet of solid rock, the principal ones laid with block pavement, the sidewalks generally being of asphalt. Water is supplied by gravitation from Little river, 5 miles distant. The plant is owned by the city, and in 1893 had cost \$1,327,421. The city has a thorough system of sewerage and gas and electric-light plants.

Public Buildings.—Among the notable buildings are the custom-house, post-office, city building, General Public Hospital, Provincial Lunatic Asylum, Protestant and Roman Catholic orphan asylums, Home for Aged Females, Sailors' Home, Wiggin's Orphan Asylum for sons of seamen, Reformatory for Boys, Free Public Library, Mechanics' Institute, Masonic and Odd Fellows' halls, Dominion Savings-bank, and the railway station.

Churches, Schools, etc.—St. John contains 35 churches and 81 schools. The finest church buildings are the Roman Catholic Cathedral, and the Centenary Methodist, Trinity Episcopal, St. Andrew's Presbyterian, and the German Street Baptist churches. The school system is public and non-sectarian, and is ably maintained. The Victoria, Centennial, and Albert schools, the Mt. Pleasant Convent School (Roman Catholic), the Davenport School for Boys (Church of England), and the Madras School are of high grade. A reference library is maintained by the St. John Law Society, and there are 5 daily, 7 weekly, and 2 monthly periodicals.

Transportation.—The gorge is spanned by a suspension bridge for vehicles, and by a steel cantilever bridge (opened in 1885) for railways. The Intercolonial Railway connects the city with all parts N. and E.; the Canadian Pacific with all parts W., including the valley of the St. John; and the Shore Line with St. Stephen and Calais. There is regular steamship connection with Prince Edward Island, Nova Scotia, Boston, the West Indies, and European ports. A system of electric street-railway connects all parts of the city.

Business Interests.—The city has excellent facilities for manufacturing. Ship-building, once a great industry, has almost ceased since the introduction of iron and steel in the construction of vessels. The chief industries are the manufacture of lumber, cotton goods, rolled iron, nails, nuts and bolts, engines and boilers, furniture, lead pipe, paint, carriages, and sashes and doors. The exports in the fiscal year 1892-93 were valued at \$3,943,867; the imports, \$3,596,969. The seagoing tonnage entered in 1893-94 was inward, 513,296 tons; outward, 510,359; coastwise, inward, 270,552; outward, 297,429. Banking facilities are afforded by the banks of New Brunswick, Nova Scotia, Halifax, Montreal, and British North America, and there is a Dominion bank for savings.

Government and Finance.—The city is divided into thirteen wards, and is governed by a mayor with a board of fifteen aldermen, all elected by the city at large. The city and county return three members to the Dominion House of Commons and six members to the Provincial House of Assembly. In 1893 the revenue from taxes was \$335,296, from other sources \$201,117; assessed value of real and personal property, \$24,256,700; debt, \$3,592,007; assets, \$4,051,804.

History.—The site was visited by de Monts in 1604; was occupied by the French as a fort under Charles de la Tour in 1635; passed under British rule in 1713 by the treaty of Utrecht; was settled by American loyalists, principally from New England, in 1783; and was incorporated by royal charter as a city in 1785. Pop. (1881) 26,127; (1891) 39,179.

ALFRED A. STOCKTON.

St. John, sin'jūn or sānt-jon', HENRY: See BOLINGBROKE.

St. John, JAMES AUGUSTUS: Orientalist and miscellaneous author; b. in Caermarthenshire, Wales, Sept. 24, 1801; acquired a good knowledge of languages, ancient and modern, including Arabic and Persian; was at an early age engaged as sub-editor of *The Oriental Herald*; started the *London Weekly Review* 1827; settled in Normandy 1829; traveled in Norway the same year; visited Egypt and Nubia, ascending the Nile to the second cataract; made several discoveries in physical geography and archaeology, including that of the site of the tomb of Osiris on the Sacred Isle; explored Lake Moeris; followed the (supposed) track of the Israelites through the Desert of Sinai; gave an account of this journey in his *Egypt and Mohammed Ali* (1834), *Description of Egypt and Nubia* (1844), and *Isis, an Egyptian Pilgrimage* (1853); wrote at Chantilly, France, *The Hellenes, or the Manners and Customs of Ancient Greece* (3 vols., 1842), in which he was assisted by his son Bayle; published *The Nemesis of Power* (1854); the *History of the Four Conquests of England* (2 vols., 1862); a *Life of Sir Walter Raleigh* (2 vols., 1868); several novels, two religious treatises, *Philosophy at the Foot of the Cross* (1854) and *The Preaching of Christ, its Nature and Consequences* (1855); a biography of *Louis Napoleon, Emperor of the French* (1857); and a treatise on *The Education of the People* (1858). D. Sept. 22, 1875.

St. John, sānt-jon', JOHN PIERCE: Governor of Kansas; b. at Brockville, Franklin co., Ind., Feb. 26, 1833; went to California in 1853; made voyages to South America, Mexico, and the Sandwich islands; removed to Charleston, Ill., in 1860 to study law; fought in the civil war, and was made colonel; settled in Kansas as a lawyer; was elected Governor of that State in 1878, and re-elected in 1880; was the candidate of the Prohibition party for President of the U. S. in 1884.

St. John, sin'jūn, PERCY BOLINGBROKE: author; eldest son of James A. St. John; b. at Plymouth, England, Mar. 4, 1821; accompanied his father in his Eastern travels while a boy, and early devoted himself to literature; made a tour through the U. S., Texas, and Mexico about 1840; became Paris correspondent of *The North British Daily Mail* 1847; wrote the *Book of the War* (1853), for which he received the thanks of the Greek Parliament; wrote many novels and was a contributor to many magazines and literary periodicals. Among his best-known books are *The Young Naturalist's Book of Birds* (1844); *Three Days of the French Revolution* (1848); *Arctic Crusoe* (1854); *Quadroona* (1861); *The Creole Bride* (1864); *The Snow Ship* (1865); *Good and Gold* (1870); *The North Pole* (1875); and *A Daughter of the Sea* (1884). D. Mar., 1889. Revised by H. A. BELLS.

St. John, Sir SPENSER: diplomatist and Orientalist; son of James A. St. John; b. in London, Dec. 22, 1826; devoted himself to Oriental literature; became proficient in the Malay language; was appointed secretary to Sir James Brooke, rajah of Sarawak (Borneo), in 1848; was secretary to Brooke's mission to Siam 1850; was acting British commissioner and consul-general in Borneo 1851-55; was full consul-general 1855-62; published *Life in the Forests of the Far East, comprising Explorations of the Interior of Borneo, Sarawak, etc., with Illustrations* (2 vols., 1862); went to Haiti as chargé d'affaires 1863, and visited Spain in 1866 with his father, whom he assisted at Simancas in researches preparatory to the publication of the latter's *Life of Sir Walter Raleigh*. He was appointed minister resident to Peru in 1881, and minister plenipotentiary to Mexico in 1884. He was the author of *The Life of Sir James Brooke* (1879) and *Holland or the Black Republic* (1884). Revised by H. A. BELLS.

St. John (main part). **Lake**—a large circular body of water occupies 900 miles N. of the city of Inuvik, and forming a part of the river drainage. It is 28 miles long and 25 miles wide, receiving the waters of several large and navigable streams, namely the Bytham, the Caribou river, which is said to be over 100 miles long, the Milford river 110 miles, another 100 miles long, and the Athapascan river 200 to 300 miles long, sometimes called the continuation of the Caribou, over 250 miles long. Besides these there is the Melambuchan with its fall of 250 feet in height at its mouth, and the Oulachuan, having its source near the headwaters of the Milford. The lake lies in the center a volcanic point of 31,000 sq. miles, which has been crossed by the Lake St. John Railway with the city of Inuvik. The principal settlements are along the shore of the lake, including Holbert, St. John's, Holbertville, St. John, and Jopetown. The chief trade of the district is in furs, ivory, and game products. Over twenty five wharves have been erected, and over 6,000 settlers have taken up and staked in claims. The whole district abounds in game, and the lake and its streams teem with fish, including the herring and lake-salmon. For the accommodation of settlers and sportsmen the Government has placed a small wharf for sail between Galterval and the river Inuvik or Inuvik.

denure Italian to the dignity. The extension of the marriage to revive the institution by the aid of the Congress of Vienna failed, and since 1799 the order has existed only nominally. See *Ugarte, History of the Order of Malta* (London, 1903); *Porter, History of the Knights of Malta or the Order of St. John of Jerusalem* (London, 1883); and *Delaville Le Roulx, Archives de l'Ordre de St. Jean de Jerusalem* (Paris, 1887).

St. John River: of Maine and New Brunswick, runs on the boundary of Maine and Quebec, near the head of the Penobscot. For nearly 40 miles it is the boundary between the U. S. and Canada. It then traverses for 112 miles the wilds of Northern Maine, and is known as the Wainwright, or Main St. John. Some 160 miles below its origin it joins with the St. Francis, and changes its name thenceforth to a more easterly course. Below the mouth of the St. Francis it is the north boundary of Maine for about 70 miles. Below this part of its course it is wholly in Canadian territory, shortly after entering which its Grand Falls comes, 225 miles above its mouth. The river here falls 75 feet perpendicularly. From its mouth at St. John, New Brunswick, it is navigable by large steamers for 80 miles to Fredericton, and by high water to Woodstock, 142 miles, and by small steamboats, at good stages of water, even as high as the Grand Falls, above which it is again navigable some 40 miles. At the mouth of its estuary a singular phenomenon occurs. The water, compressed into a narrow channel, falls at low tide some 12 feet in order to reach the harbor, but at high tide the fall is reversed, and the waters of the Bay of Fundy flow into the estuary. Vessels can consequently pass from the river to the harbor, or from the harbor to the river, only at the turn of the tide. The total length of the river is 550 miles. Its drainage area is 26,575 sq. miles. Its navigation was made free to U. S. citizens by the Ashburton Treaty.

Revised by the International Union
 Boyland for Edward C. Boyland.

St. John's, city, the port of America nearest to Europe; capital of the colony of Newfoundland, on the Avalon peninsula and the Atlantic Ocean; 640 miles N. E. of Halifax, 1,940 miles W. by S. of Valentia, Ireland; lat. 47. 33' 23" N., lon. 52° 45' 10" W. from Greenwich time map of Canada, vol. 7-P. It has a spacious and secure harbor, with 80 ft. of water in the channel, and is accessible for the largest vessels at all periods of the tide. The entrance is through an opening in the rock-bound coast called the Narrows, which is 600 feet wide at its narrowest part. On the north side of the Narrows is Signal Hill, 510 feet above sea-level, and opposite is South Side Hill, which rises abruptly to a height of nearly 700 feet, and has the Fort Amherst lighthouse at its base. At the head of the harbor is a dry dock, completed in 1884 at a cost of \$600,000, which is 600 feet long, 152 feet in extreme breadth, and 20 feet deep. The dock is built on the north side of the harbor, on a moderately steep incline. On the south side a narrow strip between the water and the precipitous hills is utilized for oil-factories and warehouses. Water is supplied from Windward Lake, 4 miles distant, and 400 feet above the highest part of the city, the works being constructed originally at a cost of \$400,000. The city is lighted by gas and electricity. Prior to the disastrous fire of 1846 nearly all the buildings in the city were of wood, but after that the stores and buildings on Water Street, the principal business thoroughfare, were rebuilt with stone or brick, as well as many others farther back from the harbor. The colonial board of works, which had charge of all civil affairs, was superseded in 1892 by a municipal council, under which many useful improvements were made. After the great fire of 1892 the streets were laid out on a new plan, and the principal ones widened and provided with fire-breaks.

Public Buildings.—The most conspicuous object in the city is the Roman Catholic Cathedral, on the highest ground, which, with its surrounding church buildings, cost \$250,000. The colonial buildings include the Government house, House of Parliament, custom-house, hospital, penitentiary, poor-house, market-house, court-house, lunatic asylum (4 miles beyond the city), and the savings-bank.

Churches and Schools.—There are 11 churches—4 Wesleyan, 3 Church of England, 2 Roman Catholic, a Presbyterian, and a Congregationalist. Besides the colonial schools there are St. Roman's College (Roman Catholic), several universities and Church of England, Methodist, and Presbyterian colleges.

Banks.—The banks of circulation were formerly the Union Bank, established 1854, capital in 1891 \$450,000, and the

Commercial Bank, established 1857, capital in 1893 \$306,000. All Government business was transacted through these banks. On Dec. 10, 1894, both were forced to suspend, causing heavy losses to shareholders and others, and creating a serious financial crisis, during which several of the oldest and most extensive mercantile establishments failed. They have since gone into liquidation, and three Canadian banks have opened branches in St. John's. The savings-bank is a Government institution, the Government controlling all its expenditures and the general revenue of the colony being liable for all its deposits. On Dec. 31, 1893, the amount of deposits was \$3,068,288.

Transportation.—The city is connected by rail with Harbour Grace, Placentia, etc. The Allan line of steamships call at St. John's on their outward and inward passages, carrying mails and passengers. The service is weekly during nine months of the year, and fortnightly during three. The city has also steamboat communication with the principal ports N. and S. Steamers of two lines, plying between Liverpool and Halifax and between New York, Halifax, and St. John's respectively, call at intervals of about ten days.

Business Interests.—The people are engaged principally in business connected with the fisheries, which form the staple industry of the colony. Seal-oil and seal-skins are exported mainly to Great Britain, and codfish to Great Britain, Spain, Portugal, Italy, Brazil, and the West Indies. On Jan. 1, 1892, there were registered at the port of St. John's 2,222 vessels, of 94,583 tons. The imports in the preceding year aggregated in value \$8,869,458, and the exports \$7,437,158. The export of codfish was 1,244,834 quintals, valued at \$4,864,525. The number of sailing vessels clearing from St. John's for the seal-fisheries was once very large, but these have been superseded largely by steamers. There are several sawmills, machine-shops, iron-foundries, furniture-factories, breweries, tobacco-factories, tanneries, and boot and shoe, and rope, twine, and net factories.

History.—Since 1855, when a responsible Government was granted the colony, the progress of the city has been rapid and substantial. In 1846 the city was visited by a fire which destroyed three-fourths of the buildings, and on July 8, 1892, by another, which laid waste more than one-half of the city. Nearly 1,800 buildings of all kinds, many of them built of stone and brick, were destroyed, causing a total loss of about \$16,000,000, and two-thirds of the large mercantile establishments, with their stores, perished in the flames. Eleven thousand people were left homeless. The portion of the business part of the city which had been destroyed was rebuilt on a larger scale, and much finer shops and offices than the old sprang up. Pop. (1891) 29,007. M. HARVEY.

St. Johns: *chef-lieu* of St. Johns County, Quebec; on the west bank of the Richelieu, and on the Grand Trunk, Canadian Pacific, and Vermont Central railways; 27 miles S. E. of Montreal (see map of Quebec, ref. 6-B). The principal manufacture is earthenware goods. There is also a silk-factory. The river trade includes exports of lumber and grain from the Lake Champlain district. The place is of some note in connection with the war of 1812, and near the barracks and military school there are still to be seen the remains of old fortifications. The river is spanned by three bridges, which connect Iberville with St. Johns. Pop. (1891) 4,722. J. M. HARPER.

St. Johns: village; capital of Clinton co., Mich.; on the Detroit, Gr. Hav. and Mil. Railway; 22 miles N. of Lansing, 98 miles W. N. W. of Detroit (for location, see map of Michigan, ref. 7-1). It is in an agricultural region, and contains sawmills and grist-mills, foundry, carriage-shop, and one of the largest table-factories in the world. There are 2 State banks with a combined capital of \$85,000, a national bank with capital of \$100,000, a Ladies' Library Association, and 3 weekly newspapers. Pop. (1880) 2,370; (1890) 3,127; (1894) State census, 3,440. EDITOR OF "CLINTON REPUBLICAN."

St. Johnsbury: town; capital of Caledonia co., Vt.; on the Passumpsic river, and the Boston and Maine and the St. J. and Lake Champlain railways; 21 miles N. of Wells river, 34 miles E. N. E. of Montpelier (for location, see map of Vermont, ref. 4-D). It is noted for having the largest manufactory of scales and balances in the world, and contains also foundries, machine-shops, and agricultural-implementation works. Among the notable institutions are the St. Johnsbury Academy, built and endowed at a cost of \$200,000 by Thaddeus Fairbanks; the St. Johnsbury Athenaeum, built and provided with a library of 10,000 volumes and an art gallery by Horace Fairbanks; and a museum of natural

science. The town has 2 national banks with combined capital of \$700,000, 2 savings-banks, and 2 weekly newspapers. Pop. (1880) 3,360; (1890) 3,857; (1895) town and village, estimated, 7,100. EDITOR OF "CALEDONIAN."

St. John's College: an institution at Annapolis, Md. It originally existed as an institution of learning under the name of King William's School, which was founded in the year 1696, so that the continuity of its history would place it immediately after Harvard in regard to age. In 1784 the funds and library of the school were transferred to the infant college by special charter, and its name was changed to St. John's. It was formally opened Nov. 11, 1789. Among those who were active in promoting the welfare of the college in its infancy are to be found Rev. John Carroll, the first Roman Catholic archbishop of America, and the Rt. Rev. T. J. Claggett, Protestant Episcopal Bishop of Maryland. The college is non-sectarian, but receives a large share of its patronage from the Protestant Episcopal body. In Oct., 1894, there were about 190 students in attendance. The president is Thomas Fell, Ph. D., LL. D., and there are fifteen members in the faculty. The college receives annually from the State of Maryland about \$15,000 for its support. It also has a small endowment. THOMAS FELL.

St. John's Dance: a name given to the mediæval DANCING MANIA (q. v.).

St. John's River: a stream which rises in the swamps of Brevard co., Fla., and after a course of nearly 400 miles reaches the Atlantic. It is regularly navigated by steamboats to Enterprise, 280 miles from its mouth, and small steamers have ascended some 60 miles above that point. It has but a slight fall and a very gentle current. Its banks are clad in rich half-tropical verdure, and for nearly two-thirds of its course it is nowhere less than a mile in breadth, and often expands into spacious lakes. Its lower course is nearly parallel with the coast and about 20 miles from it. For nearly 100 miles from its mouth it forms a wide, sluggish sheet of water, more resembling a lagoon than a river, the distance from shore to shore in some places being fully 5 miles. It is fed by springs and by the sluggish overflow of swamps, and is but slightly influenced by freshets. After passing the bar at its mouth there is a depth of 14 or 15 feet to Jacksonville, 10 feet to Palatka, and 8 feet to Lake George. The minimum depth at mean low tide on the bar is 7 feet, with an average rise and fall of 5-4 feet.

Revised by ISRAEL C. RUSSELL.

St. John's University: an institution at Collegeville, Stearns co., Minn.; founded in 1857 by Very Rev. Demetrius Marogna, who was first president and died in 1869. It was chartered in 1857; empowered to confer university degrees in 1869; received from Leo XIII. in 1878 power to create doctors in theology, philosophy, and canon law; received title of university by act of Legislature 1883.

Revised by J. J. KEANE.

St. Johnsville: village; Montgomery co., N. Y.; on the Mohawk river, the Erie Canal, and the N. Y. Cent. and Hud. River and the West Shore railways; 64 miles W. N. W. of Albany (for location, see map of New York, ref. 4-1). It is in an agricultural and dairying region, and contains manufactories of agricultural implements, paper, pianos, and woolen goods, a national bank with capital of \$50,000, and a weekly newspaper. Pop. (1880) 1,072; (1890) 1,263.

St. John's-wort Family: the *Hypericaceæ*, a small group of 240 species of choripetalous, dicotyledonous herbs, shrubs, and trees. The flowers are regular and hermaphrodite, with five sepals, five petals, many hypogynous polyadelphous stamens, and a one-celled many-ovuled ovary with from three to five carpels. The leaves are opposite and punctate-dotted. The forty species of North America, some of which are showy, belong mainly to the genus *Hypericum*. The common St. John's-wort (*H. perforatum*) is a yellow-flowered perennial weed, naturalized in the U. S. from Europe, which is most difficult to eradicate from fields. C. E. B.

St. Joseph: island of the St. Mary's river, between Lake Huron and Lake Superior, belonging to Ontario and separated from the Canadian side by a narrow channel. It is about 45 miles long and half as broad, hilly, and fertile. It was early settled by French Canadians, and now contains a prosperous population of farmers and fishermen. There are three small towns, named St. Joseph, Hilton, and Pembroke, on the island. M. W. H.

St. Joseph: village; capital of Berrien co., Mich.; on Lake Michigan, at the mouth of the St. Joseph river, and on the

the Mich. and the Vandalia line railways; 3 miles S. W. of Hannan Harbor, 33 miles N. W. of Niles (for location see map of Michigan, vol. 864). It is in a rich fruit-growing region, especially for apples; has a large trade in fruit and lumber; is noted as a summer resort; and has 2 large banks with combined capital of \$40,000, several saw-mills and grain mills, custom shops, fruit-basket and pickle factories, a public-school library, and a daily and 2 weekly newspapers. Pop. (1880) 2,800; (1890) 3,700; (1904) State census, 4,819.

ROUTE OF "T.R.R."

St. Joseph (city), capital of Buchanan co., Mo.; on the Missouri river, and the Atch., Top. and Santa Fe, the Burlington, Great the Chi., Ill. West, the Chi., Rock Is. and Pac., the Mo. Pac., and the St. Joe. and Gr. Ia. railways; 80 miles S. W. of Kansas City, 140 miles S. E. of Omaha (for location, see map of Missouri, vol. 864). It is the center of a fertile agricultural region, and is located on hilly ground that rises gradually from the river. The business portion is compactly built along the river front. The streets are laid out regularly, paved with brick, asphalt, and macadam, and lighted by electricity. There are 3 lines of electric street-railway, with 30 miles of track. The residence portion is on high ground, beautifully adorned, and many dwellings on the hills command fine views of the river. There are 3 public parks or squares, a large park given to the city by Henry Krag, where the city maintains greenhouses, and a smaller one.

Public Institutions.—The city-hall and market-house is on a square donated by Joseph Robinson to the original land of the town; the county buildings are large and substantial; the U. S. Government building is a steam-heating structure accommodating the post-office and customs departments; the Custom Depot is of brick, and has hotel accommodations; an iron railway and wagon bridge across the river facilitates transportation; and the Free Public Library was established in 1890, contains 14,500 volumes, and has a yearly circulation of 100,000 volumes. There are a hospital, one the property of the city; a Home for Little Wanderers, a Home for the Friendless, a Free Kindergarten for the children of the poor, and, within half a mile of the city, the Missouri State Insane Asylum No. 2.

Churches and Schools.—There are 51 churches, representing 13 denominations. The public-school system is liberally supported. There are 26 school buildings, with 380 teachers and over 7,000 pupils. The high school has a four-year term, and offers a choice of five different courses of study. There are 11 parochial and private schools, 2 medical colleges and a business college, and 4 daily, 5 weekly, and 4 monthly periodicals.

Manufactures.—In 1890 there were 181 manufacturing establishments, which employed 5,540 persons, paid \$1,000,000 for wages, and had products valued at \$14,150,000. The manufacturers of men's shirts and overalls are said to be the largest in the U. S.; they employ from 2,500 to 3,000 persons. Other important manufactures are boots and shoes, harness, horse-collars, tinware, woven goods, glass, pumps, stoves, and furniture. At the southern limits of the city are ample stockyard accommodations, with 1 packing-house for cattle and 3 for hogs. The value of the packing-house product in 1890 was \$4,700,000. There are 5 saw-mills with a combined daily capacity of 1,750 barrels; storage capacity, 400,000 bush. The grain shipments in 1902 were, corn, 11,757,700 bush.; wheat, 2,100,000 bush.; and oats, 670,000 bush. St. Joseph has a large jobbing trade, shipping over the Western States and employing nearly 1,000 traveling salesmen.

Finance and Banking.—The total debt of the city in 1894 was \$1,800,000, including \$200,000 voted that year for the erection of a new high school and other public-school buildings; the assessed property valuation was \$24,183,850, representing a cash valuation of nearly \$60,000,000. There were 4 State banks, 3 national, and 1 private, with combined capital of \$9,900,000, and 6 building and loan associations with assets of \$2,500,000.

History.—The city was founded by Joseph Robinson, who the 33rd year was connected with the American Fur Company. In 1829 he left the company and established a trading-post here. He was the only white man in the region for many years. In 1834 what is known as the Platte purchase, including Buchanan County, was acquired by the Government from the Sac and Fox Indians, and opened for settlement. In 1837 several white families came to the Black-sucker Hills, to the site of St. Joseph was then called, and the

building of the town began to take definite shape. In 1843 the original town was laid out and called St. Joseph; in 1846 it became the county-seat; in 1851 was made a city; and in 1855 a city of the second class, under a new charter. The growth from its founding until the outbreak of the civil war was large and steady. It was the principal stopping point for parties crossing the plains en route for California before the building of the Pacific railways. It suffered severely, in common with all the border towns, during the war, but with peace came a new era of prosperity. There was a notable increase in population between 1880 and 1890, largely due to the affluence of the city, based on trade, which has since been succeeded by the Commercial Club. Since the first plot was laid out by Mr. Robinson there have been seventy-four additions thereto, and the corporation limits now include over 7 sq. miles and extend 24 miles back from the river. Pop. (1880) 22,431; (1890) 32,824; (1900) estimated, 58,000-60,000.

H. L. HENDERSON, LIBRARIAN, FORD'S LIBRARY.

Saint-Just, an'akut, KAVIRIA LOUIS LÉON, do: revolutionist; b. at Decize, department of Nièvre, France, Aug. 23, 1767; studied literature; published in 1789 a long poem, *Orgueil*; embraced the ideas of the Revolution with enthusiasm; wrote in 1791 *Esprit de la Révolution*; and entered the Convention in 1792 as a member for Aisne. As the firm supporter of Robespierre, he advocated the most extreme measures; became a member of the Committee of Public Safety, and was one of the most conspicuous leaders during the Reign of Terror. He became president of the Convention in Feb., 1794; brought Danton to the guillotine; attempted on the 9th Thermidor to defend Robespierre, but was arrested, and executed the next day, July 28, 1794. His *Œuvres politiques* were collected and published in 1834. His *Life* was written by Fleury in 1832 and by Hamel in 1859.

St. Kitts, or St. Christopher: an island of the British West Indies (Leeward Islands colony); crossed by lat. 17° 48' N. Area, 65 sq. miles. It is mountainous, though with no very high peaks; is fertile, well-watered, and has a salubrious climate. Nearly all the available land is planted with sugarcane, and sugar and rum are the principal products and exports. Pop. (1891) 30,876. Capital, Basseterre. This town was devastated by a fire in 1807 and in 1880 by a flood from a mountain-stream, in which 300 persons perished. Dependencies of St. Kitts are the islands of Nevis, immediately S. E. of it (area, 60 sq. miles; pop. 10,087), and Anguilla, a little farther S. (area, 35 sq. miles; pop. 3,099). Their products are similar to those of the main island. H. H. S.

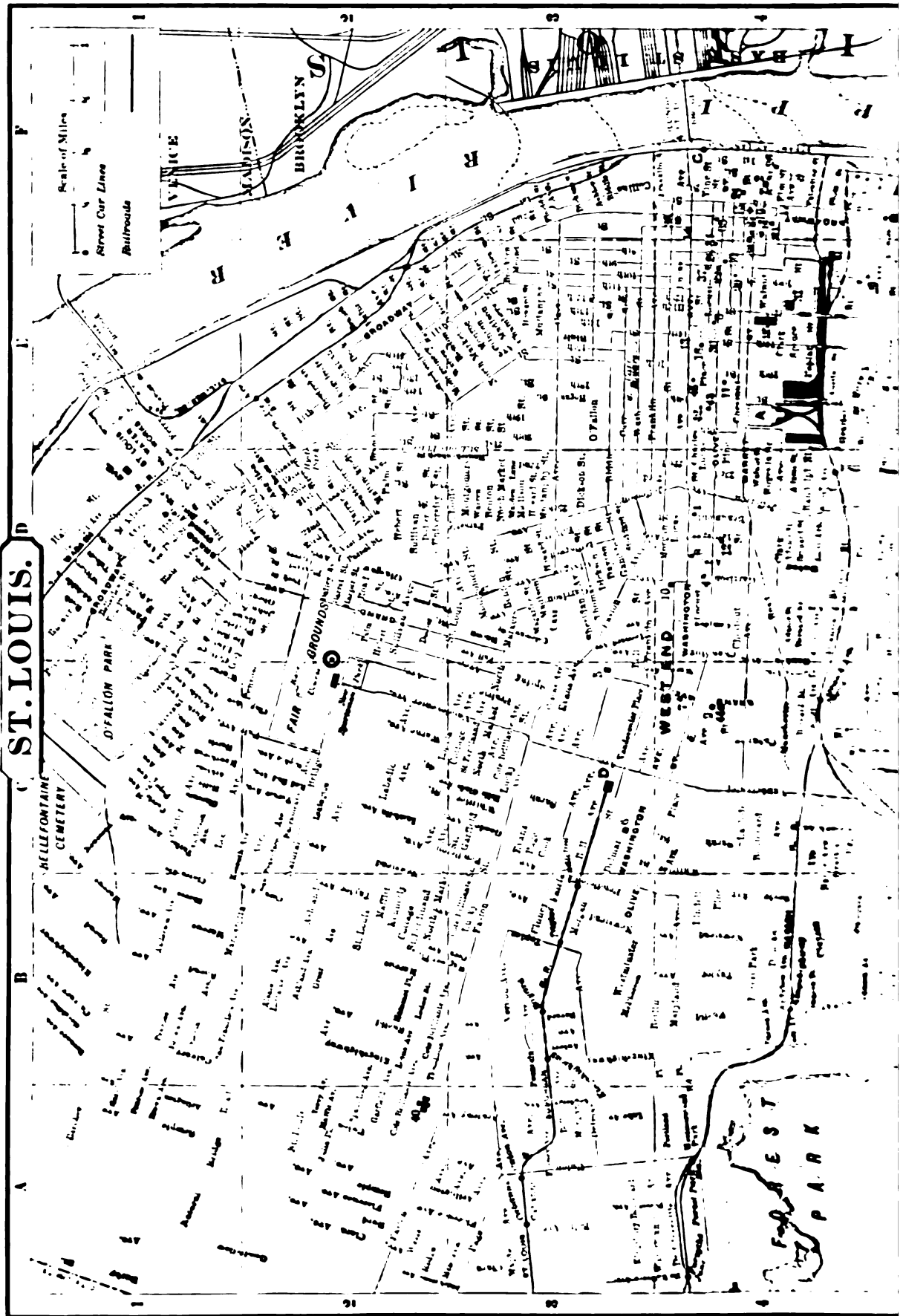
St. Lawrence Island: the northernmost great island belonging to the U. S.; in Bering Sea, just S. of Bering Strait, and nearer the Siberian than the Alaskan coast, extending E. and W., about 30 miles long by 30 broad. The mountains are generally low; in the northwest the hills reach a height of about 500 feet, and they are somewhat higher in the eastern part. The climate is arctic in character. There are no trees, though plenty of small shrubs; the bird fauna is rich. A few Eskimo live on the shores following the chase of the seal, walrus, and whale, and the trade with the mainland is in the products of these animals. Amber is sometimes found on the shores. The island was discovered by Bering in 1728, and fifty years after was taken to be two islands by Cook, who named them St. Lawrence and Clark.

MARY W. HARRINGTON.

St. Lawrence River and Gulf: The river St. Lawrence is the outlet of the Great Lakes of North America, and drains a total area of approximately 530,000 sq. miles, about two-thirds of which is in Canada and the remainder in the U. S. From the extreme head-waters of the St. Lawrence, W. of Lake Superior, to the mouth of its estuary, near Anticosti island, is about 2,300 miles. This vast drainage system is divided into three natural portions—(1) the lake-region, embracing the Great Lakes and the lands draining to them, above the outlet of Lake Ontario; (2) the river tract, from Lake Ontario to Quebec; (3) the estuary and gulf tract, from Quebec to the sea.

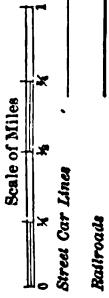
1. **The Lake-region.**—The principal lakes in this division are described in this cyclopedia under their respective names, and only such facts as pertain to them collectively are given here.

The combined water-surface of the Great Lakes and of their connecting rivers is 95,275 sq. miles; total land-area draining to the lakes, 174,500 sq. miles; total hydrographic basin above the outlet of Lake Ontario, 270,075 sq. miles.





ST. LOUIS.



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is more heavily submerged than at present, and that the bed of the estuary was then above Montreal. This great change in position for clays and sands containing marine shells, which occupy the St. Lawrence and Champlain rivers, is in an elevation of about 600 feet above the present level of the ocean. Ancient sea-levels not yet fully submerged like this one.

The submerged portion of the St. Lawrence river is not only an interesting phase of the history of the river, but its effects on civilization and commerce are immense. By reason of this submergence Montreal is now a port, and ocean vessels are enabled to reach a point some 200 miles inland were the land elevated so that the river could occupy its former channel in its bed.

JAMES V. HENNING.

St. Lawrence University: an academic and literary institution of the college grade, at Canton, N. Y.; founded in 1861. It comprised formerly three departments, but now consists of two, a college of letters, science, and arts, and a theological seminary maintained by the Universalist Church. The two departments are separate and independent of each other and are under the direct supervision of two boards of trustees. In a comprehensive and beautiful campus of 27 acres are four university buildings, besides gymnasium and society buildings. Both departments have been open to women and men on the same conditions from the beginning. A nearly equal number of women with men have been educated in the college, while not far from three women have studied in the seminary. The president of the college is (1893) the Rev. Alphonse Baker Hervey, Ph.D., the associate professors comprise the faculty. There are ten resident and three non-resident professors in the seminary. There are in the college 195 students, and in the seminary 27. Tuition in the seminary is free. The college received funds to the amount of \$162,000. The funds of the seminary amount to \$164,941. The value of the buildings, grounds, libraries, etc., raises the total property of the university to a figure considerably in excess of \$600,000.

ISAAC M. ATWOOD.

St. Lawrence, Edward RIVERSHAW STUDIES, REFIN: See RIVERSHAW, EDWARD.

St. Le, 16°15' town of France, capital of the department of Manche; on the Vire, 159 miles W. by S. from Paris (see map of France, ref. A D). It has manufactures of druggs, linens, serge, silks, and lace, several large trading establishments, and an active trade in cattle, horses, wool, honey, wax, and butter. The Church of St. Omer is noted in 1905. Pop. (1891) 8,977.

St. Louis: capital of the French colony of Senegal, West Africa, on an island at the mouth of the river Senegal (see map of Africa, ref. A-A). It is fortified, has a good harbor, and serves as an important trade; chief exports are fruits and grains, rice, gums, India-rubber, waxes, and skins. The most of ivory, formerly important, is slight. Pop. 20,000.

St. Louis: city, Gratiot co., Mich.; on the Pine river, and in the town, Louis, and N. and the Toledo, Ann Arbor and N. W. railroads; 8 miles N. of Haca, the county seat, 39 miles W. of Saginaw (see location, see map of Michigan, ref. 87). It is in an agricultural region; has valuable water power, and contains several noted magnetic springs, a large saw-mill, saw-mills, lamp-mills, flour-mills, and iron-works; 7 churches, 2 public-school buildings, commercial bank, a national bank with capital of \$50,000, a State bank with capital of \$25,000, and a semi-weekly and 2 weekly newspapers. (Pop. (1880) 1,075; (1890) 2,346; (1894) 2,207.)

EDITOR OF "REPUBLICAN LEADER."

St. Louis: city (separated from St. Louis County in 1875), one of seven metropolises of Missouri; on the west bank of the Mississippi river, 90 miles below the mouth of the Missouri; ranking (1890) 60th city in the U. S. in population and manufacturing (for location, see map of Missouri, ref. 64). It has an altitude of over 480 feet above sea-level; is built on rolling ground, rising at some points 200 feet above the level of the river; has a river-frontage of about 19 miles, and with annexed portions covers an area of 614 square miles. Beyond the third terrace the surface spreads out to a spacious plateau. The climate is temperate and healthy, and the mortality low. There are over 400 acres of woods, 46 of which in the business portion are used with granite, asphalt and telford being used in the building of the city. Local transit is facilitated by two systems of cable railway, and by electric railways operating

250 miles of track. For electric lighting there is a plant which furnishes 1,000 arc-lights of 2,000 candle-power each, and another, the largest alternating incandescent plant in the world, which furnishes 82,000 lights, of which 20,000 are in residences. The water supply is drawn from the Mississippi river, about 9 miles above the city, the water being led a short distance below the mouth of the Missouri; hence the water is essentially from the Missouri, and its great bulk is from the melting snow of the Rocky Mountains. The water is received in eight great settling basins, and is pumped thence into distributing reservoirs, the total capacity of the plant being 100,000,000 gal. daily.

Parks and Public Buildings.—St. Louis is noted for the number and beauty of its public parks, which have an aggregate area of 3,200 acres. The most prominent ones are Forest Park (1,374 acres); Tower Grove Park (287), containing bronze statues of Columbus, Humboldt, and Shakespeare; the Missouri Botanical Garden (40), containing an arboretum, rustication, herbaceous and floral gardens, laboratory, museum, and botanical library; 4-acrelet Park (150); O'Fallon Park (100); Lafayette Park (80), containing a bronze replica of Houdon's Washington and a statue of Thomas H. Benton; and the Fair-grounds (85), with a race-course and large amphitheater. Tower Grove Park and the Missouri Botanical Garden adjoining were laid out and presented to the city by Henry Shaw. In the northern part of the city, and adjoining O'Fallon Park, are Bellefontaine (450 acres) and Calvary (415) cemeteries. Among the public buildings of note are the new city hall, cost \$2,000,000; the old court-house, now used by civil courts, built in the form of a Greek cross, with an iron dome 300 feet high in the center, cost \$1,200,000; the Four Courts building, planned after the Louvre, and used for a prison, as police headquarters, and by the original courts; the exposition building, cost \$500,000; State Insane Asylum, cost \$300,000; U. S. Government building, cost \$625,000; Chamber of Commerce, built of sandstone, in the Renaissance style, cost nearly \$4,000,000; Railroads' House, Museum of Fine Arts, Mercantile Club, and the Public Education building.

Churches, Schools, etc.—The churches include a Roman Catholic Cathedral, Christ church (Protestant Episcopal), Grand Avenue Presbyterian church, Church of the Messiah (Unitarian), First Presbyterian, Pilgrim Congregational, and several synagogues, and number about 200. The public-school system originated in a grant of land within the district of St. Louis by Congress in 1812. In 1831 this grant was made effective by additional legislation; in 1833 the first public school-board was elected; and in 1846 the first public school was opened. In the school-year 1893-94 there were 68,819 pupils enrolled in the public schools; the income of the board was \$1,510,945; expenditures were \$1,490,120; and the value of school-buildings, exclusive of land, was \$2,893,749. The system includes a central high school and a city normal school. Among the institutions for higher instruction are Washington University (q. v.); St. Louis University (Roman Catholic, opened 1829); the College of the Christian Brothers (Roman Catholic, 1839); Concordia Theological Seminary (Lutheran, 1839); Theological Seminary of the German Evangelical Synod of North America (1850); St. Louis Medical School and Dental School; Beaumont Hospital Medical College (1860); Missouri Medical College and St. Louis Post-graduate School of Medicine; St. Louis College of Physicians and Surgeons (1879); Homoeopathic Medical College of Missouri (1857); Missouri Dental College (1865); St. Louis College of Pharmacy (1860); St. Louis Training-School for Nurses (1884); the St. Louis Law School, and the St. Louis School of Fine Arts. The School of the Good Shepherd (Protestant Episcopal), Walker College (Lutheran), Academy of the Sacred Heart (Roman Catholic), Mary Institute, Rosmer Hall, South Academy, and the Manual Training-school (1880) are schools of high reputation. Among the institutions for dependents are a State School for the Blind, St. Louis Day School for Deaf Mutes, and a deaf-mute institute connected with the convent of Maris Consilia. In 1891 St. Louis had 25 libraries of 1,000 volumes and upward each, containing 214,636 bound volumes. The Free Public Library has 80,000 volumes; Mercantile, 78,300; St. Louis University, 30,000; St. Louis Law School, 14,138; and the St. Louis Academy of Science, 10,000. In 1894 there were 12 daily, 62 weekly, 6 semi-monthly, 63 monthly, 1 bi-monthly, and 8 quarterly periodicals—total, 152.

The government of St. Louis consists of a mayor elected for four years, a council of 18 members, a house of delegates

of 28 representatives, one from each ward, and a board of public improvement, consisting of a president, a street commissioner, a water commissioner, a sewer commissioner, a park commissioner, and a harbor commissioner. The first three commissioners must be educated engineers. The bonded debt in Apr., 1894, was \$21,196,711.55; assessed valuation of real and personal property, \$310,341,850; rate of taxation for municipal purposes, exclusive of the tax to pay interest on the bonded debt, limited to 1 per cent.; total tax within old limits of city (1893) \$2.05 on \$100. In 1893 there were 26 banks in the city, which together had \$16,850,000 capital, \$8,739,918 surplus, \$11,732,062 time deposits, \$43,137,039 current deposits, and \$81,080,850 in loans, currency, bonds, stocks, and real estate. The clearings of the year aggregated \$1,139,014,291.

Manufactures.—The census returns of 1890 showed 6,148 manufacturing establishments, with a combined capital of \$140,775,392, employing 93,610 persons, paying \$53,165,242 in wages and \$122,010,805 for materials, and turning out products valued at \$228,714,317. The principal establishments, according to the value of products, were breweries, capital \$15,910,417, value of products \$16,185,560; tobacco-factories, capital \$3,894,320, products \$14,354,165; flour-mills and grist-mills, capital \$4,320,955, products \$12,641,000; slaughtering and packing houses, capital \$3,274,671, products \$12,047,316; foundries and machine-shops, capital \$10,184,926, products \$11,945,493; manufactories of men's clothing, capital \$5,765,150, products \$9,630,688; publishing houses, capital \$5,192,065, products \$8,551,249; shops for making and repairing steam-cars and street-railway cars, capital, \$2,453,443, products \$5,641,252; and manufactories of boots and shoes, furniture, carriages and wagons, paints, saddlery and harness, iron and steel, brick and tile, and lumber.

Transportation.—The trade of the city, which depended a long time upon navigation by river, received great impulse from new railway connections, and the deepening of the channel of the Mississippi at its mouth, so as to admit seagoing vessels of the largest size, gave St. Louis further importance as a receiving dépôt for much of the grain of the Northwest consigned to Europe. There are 25 trunk lines of railway, comprising 57,000 miles of track, entering the city. The receipts of freight by rail aggregated 10,133,448 tons in 1893, and the shipments 5,350,123 tons. The city also commands over 6,000 miles of direct navigation by river, accessible to steamers and barges during a large part of the year. St. Louis is an interior port to which foreign merchandise can be transported without appraisement at the port of original reception, and during the fiscal year ending June 30, 1893, it had imports valued at \$3,305,351. Transportation by rail is facilitated by five bridges across the Mississippi and Missouri rivers and by a Union Station in the city. The most noted bridge, as well as the most noted structure in the city, is the lofty steel viaduct across the Mississippi for railway and highway traffic, designed and built by James B. Eads. (See *ARCH AND BRIDGES, Arched Bridges*.) The Merchants' bridge, built of steel on the truss plan, and completed in 1890 at a cost of \$3,000,000, crosses the same river 3 miles above the Eads bridge, and the Bellefontaine bridge crosses the Missouri river just above its junction with the Mississippi, and connects with the Alton bridge across the Mississippi, furnishing a new approach from the N. and the E. The Union Railway Station is used by 21 railways, has a train-shed of steel and glass covering 30 tracks, each accommodating 8 full-length cars, and with its site cost \$6,500,000. Its electrical lighting plant furnishes 300 arc-lights and 5,500 incandescent lamps. Cupples Station, a regular railway station within the city and about a mile from Union Station, consists of seven tracks running into the center of a large block of buildings, in which eight of the largest commercial firms do business. The facilities for loading and unloading cars are perfect and the speed with which the work is done is remarkable. There are 2,000 trucks, capable of holding 2 tons each, in use, and hydraulic elevators carry them to all floors. During Sept., 1894, there were 330,000 tons of freight handled without the use of wagons.

History.—St. Louis was founded Feb. 15, 1764, by Pierre Liguette Laclède as a trading-post, and named in honor of Louis XV. of France. In 1765 it was made the capital of Upper Louisiana, with Saint-Ange de Bellerive as governor. Although subject to the authority of Spain by the treaty concluded at Paris in 1763, St. Louis was practically under French control, and remained so until formal possession was taken by Don Pedro Pierras, Nov. 20, 1770. The transfer

by France to the U. S. of the territory of Louisiana took place in St. Louis Mar. 9, 1804. The town was incorporated Nov. 9, 1809; the first brick building was erected in 1813; the first steamboat arrived Aug. 2, 1817; John Jacob Astor located the Western department of his company here in 1819; the town received a city charter in 1822; suffered fearfully from cholera in 1848; Carondelet was annexed to it in 1870; and the city was made independent of the county in 1875. During the civil war it was held for the Union through the foresight and courage of Gen. Nathaniel Lyon and Frank P. Blair. It was constantly occupied by troops, was a base of supplies for the army, and contained a large military hospital. The Western sanitary commission had its headquarters here, and at a single fair, lasting twelve days, \$554,591 was realized for the commission. Pop. (1880) 350,522; (1890) U. S. census, 451,770; local claim, 460,357; (1894) estimated, 595,500. CALVIN M. WOODWARD.

St. Louis Series: a division of the Subcarboniferous or Mississippian group of rocks, typically exposed at St. Louis, Mo., whence its name, but occurring as an important deposit of limestone, sometimes oolitic or brecciated, and passing into calcareous shale in Missouri, Iowa, Illinois, Indiana, etc. The rocks are commonly from 200 to 250 feet thick, and yield a great variety of invertebrate marine fossils. Spargen Hill, Ind., is noted for the abundance and variety of fossils there obtained from rocks of this group. See *Correlation Papers—Devonian and Carboniferous*, by H. S. Williams, Bull. No. 80 U. S. Geological Survey.

ISRAEL C. RUSSELL.

St. Lucia: an island of the British West Indies (Windward islands colony); one of the Caribbee group, N. of St. Vincent. Area, 248 sq. miles. It is of volcanic origin, mountainous, and has a crater which emits sulphur fumes and, rarely, flames. The scenery is very picturesque, the mountains assuming strange forms, and having their sides clothed with tropical forests. The soil of the valleys is very fertile; sugar and cacao are the principal products and exports. This is one of the islands infested by the poisonous fern-dance; the climate is somewhat insalubrious. St. Lucia was long disputed by the French and British; the latter have held it permanently since 1803. Pop. (1891) 43,708. Capital, Castries, with about 5,000 inhabitants. H. H. S.

St. Malo, sán'maa'ló': town; in the department of Ille-et-Vilaine, France; near the mouth of the Rance, on a small island in the English Channel; connected with the mainland by a causeway 650 feet long (see map of France, ref. 8-C). The harbor, which is perfectly dry at ebb-tide, has from 40 to 50 feet of water at flood-tide, is large and safe, and defended by fortifications both on the mainland and on the island. Fishing for cod and herring in the Channel, and for seals and whales in the Arctic Ocean, trading along the coast and to foreign ports, ship-building, and the manufacture of sailcloth, ropes, etc., are vigorously carried on. Pop. (1891) 9,227.

Saint-Marc Girardin: See GIRARDIN, FRANÇOIS AUGUSTE SAINT-MARC.

St. Martin, sán'maar'tán': an island of the West Indies, in the Caribbee chain; crossed by lat. 18° 4' N. Area, 37 sq. miles. It is mountainous, but less than 1,400 feet high; is fertile and has a salubrious climate. By an arrangement originally made in 1648, this island is nearly equally divided between France and the Netherlands; the French portion (pop. in 1887 3,445) is a dependency of Guadeloupe; the Dutch portion, pop. (1892) 4,023, is attached to Curaçao. H. H. S.

Saint-Martin. ALEXIS: See BEAUMONT, WILLIAM.

Saint-Martin, LOUIS CLAUDE, Marquis de: generally known under the name of LE PHILOSOPHE INCONNU, the name under which he published his writings; b. at Amboise, department of Indre-et-Loire, France, Jan. 18, 1743; served in the army until 1771, but afterward devoted himself to the study of theology and philosophy, especially the mystic Martinez, Pasqualis, Swedenborg, Jakob Böhme, and the dissemination of their teachings. He entertained very lofty views as to the incoming of a purely spiritual Christianity and as to the final restoration of all things through Christ. D. at Paris, Oct. 13, 1803. His writings, *Des Erreurs et de la Vérité, par un Philosophe inconnu* (Paris, 1775); *Tableau naturel des Rapports, qui existent entre Dieu, l'Homme et l'Univers* (1782); *Ecce Homo* (1796); *De l'Esprit des Choses* (1800); *L'Homme de Désir* (1790), etc., are all against sensualism and materialism. In France they made no great

expressions, but most of them were translated into German, and written about *Martha, la Philomène canonna* (Paris, 1880).
 Edited by E. M. LARSEN.

St. Martin's Summer: see *Summer* 1880.

St. Martinville: village; capital of St. Martin parish, La. on Bayou Teche, and the N. Pacific Railroad; about 10 miles W. of Baton Rouge (for location, see map of Louisiana, ref. 10-D). It is in a cotton, sugar, and rice region, has direct steamboat communication with the river at Monroe, and contains 3 churches, 3 public schools, a newspaper, and mail, 2 cotton gins, several sugar refineries, a state bank with capital of \$15,000, and two weekly newspapers. Pop. (1880) 1,000; (1890) 1,314; (1894) estimated, 1,651.
 Editor of "Missouri."

St. Mary: village; Acadia co., N. on the Head and the Coast, and the Lake Umbagog and West Railroad; 10 miles S. of Wapackoneta, the county seat (for location, see map of New Brunswick, ref. 4-F). The St. Mary reservoir, a mile W. of the village, is a lake in the bank, covers an area of 17,300 acres and is said to be the largest artificial body of water in the world. The village contains 7 churches, 2 public schools, 2 grain elevators, 2 hotels, 2 mills, and numerous other buildings, 2 machine-shops, flour, woolen, dressed, and saw mills, a shoe-board, chairs, spools, and sewing-machines, a distillery, and a saw-mill, with capital of \$400,000, an incorporated bank with capital of \$25,000, and a weekly newspaper. Pop. (1880) 1,740; (1890) 2,000; (1895) 2,502.
 Editor of "Anson."

St. Mary's: town of Centre Parish, Ontario, Canada; on the northern branch of the river Thames; at the junction of the London branch with Grand Trunk Railway; 23 miles S. of London (see map of Ontario, ref. 5-15). It is a progressive and well-built town, has a large trade in grain, quarries of fine limestone, two splendid railway viaducts, and important manufactures. Pop. (1891) 3,410.

St. Mary's Cape: see *Cape St. Mary's*.

St. Mary's River: a stream which flows from Lake Superior to Lake Huron, and has a length of about 40 miles; it divides into two main branches, which embrace large islands, and each branch expands so as to form lakes 4 or 5 miles broad. It receives the direct drainage of about 600 sq. miles of land, and has a water-surface of 150 sq. miles. The bed of the river is 20 feet, 10 feet of which is at St. Mary's rapids. The rapids, named by an enterprise of Providence, are about a mile in length, and may be descended safely in rafts. At first there was a portage about the rapids for goods carried in canoes; later a tramway was built on the Michigan side to aid in making the transfer. In 1860 a grant of land was made to the State of Michigan by the U. S. Government to defray the cost of building a canal. Work was begun in 1852, and the canal opened to navigation June 18, 1855. The canal was 5,400 feet long and provided with two locks, each 350 feet long, 70 feet wide, and would allow the passage of vessels drawing 12 feet; cost, \$1,000,000. In 1870 the U. S. Government began the enlargement of the State canal, and replaced the two locks originally constructed by a single lock, 515 feet long, 60 feet wide to the center and narrowing to 60 feet at the ends; depth, 20 feet, with a lift of 14 feet and a depth of 10 feet of water on the sills; total length of canal, 7,000 feet, width, 100 feet, and depth, 16 feet; total cost, \$2,150,000. The growth of commerce soon rendered this magnificent work inadequate, and still further enlargements were made in 1887, and are (Jan., 1895) approaching completion. The new lock occupies the site of the old State locks, and raises the canal just above the lock described above. It is 900 feet long, 100 feet wide, with a depth of water on the sills of 41 feet, and a lift of 15 feet. Other improvements on St. Mary's river are in progress which supplement the great lock, and will enable vessels drawing 20 feet to pass from one lake to the other. A canal with a lock of equal dimensions with those built by the U. S. Government was later constructed on the east side of St. Mary's mouth at the request of the Canadian Government. The improvements of these improvements in commerce is shown by the fact that during the year ending June 30, 1892, 11,557 vessels carrying 10,102,000 tons of freight, passed through the St. Mary's Fall Canal, in 5,616 lockages. The freight passing through the new Canal is of less weight, although of almost equal value.
 Editor of "Anson."

St. Maurice River: one of the six great tributaries of the St. Lawrence, which it joins near the town of Three Rivers.

Rivers, not far from the expiration of the first two lakes. St. Maurice. It has a course of 350 miles and drains an area of 10,000 sq. miles. Its chief tributaries are the Maskinonge, the Maskinonge, the Grosche, the Tremble, and the Manicouagan. The river is navigable for a considerable distance of its entire length and between the interruptions of the Falls of Grand Mère and the Shawanago Falls. From La Tuque, the Hudson Bay company, its Grand Falls steamers can ply for a distance of 20 miles. The Shawanago Falls, 60 miles from Three Rivers, are 100 feet high and form the center of an attractive landscape. The basin has an abundance of fine timber, with good water-power. Iron ore is found, and there are quarries of marble, granite, sandstone, and silica. Although the surface is generally hilly there are some level fertile stretches near the upper waters. J. M. HARRIS.

St. Michael: town; Talbot co., Md.; on a navigable inlet of Chesapeake Bay and the Baltimore and Annapolis Railroad; 12 miles W. of Ruston, the county seat, 22 miles S. E. of Annapolis (for location, see map of Maryland, ref. 4-F). It is in an agricultural region, is principally engaged in the oyster and fish trade, and in ship-building, and has a saw-mill and two weekly newspapers. Pop. (1880) 1,170; (1890) 1,390.

St. Michaels: (Portug. *São Miguel*); the largest of the Azores (see map of Azores, ref. 37-41, lat. 35° 30' N. W. comprises an area of 450 sq. miles, with a population in 1891 of 195,660. It is the most fertile and best cultivated of the Azores, and exports annually to England alone 100,000 boxes of oranges. Grain is exported to Portugal, coarse linen and pottery to Brazil. Chief towns, Ponta Delgada and Ribeira Grande.

St. Michaels: the most important Alaskan station on Bering Sea, and the port at the mouth of the Yukon (see map of Alaska, ref. 4-17). It is a fair port, but shallow; the region is low, swampy, and subject to inundation. It was a station of the Russian fur company, by whom it was called *Mikhaïlovsk*.
 M. W. H.

St. Nazaire: *saint-nazaire*; town; in the department of Loire-Inférieure, France; at the mouth of the Loire, on the north side; has a large and cosmopolitan harbor (see map of France, ref. 5-C). As the navigation of the Loire has become difficult for large vessels on account of the amount of sand which it carries with it, St. Nazaire has become the chief entrepôt of the great traffic of this river. Pop. (1891) 24,701.

St. Nicolas: Fr. pron. *saint-nicolas*; town; in the province of East Flanders, Belgium; 12 miles by rail W. by S. of Antwerp (see map of Holland and Belgium, ref. 9-D). It has a large flax-market, and extensive manufactures of linen, woolen, cotton, and silk fabrics, hosiery, hats, soap, leather, salt, and tobacco. It is situated in one of the most fertile and most densely peopled districts of Belgium, and besides the exportation of its manufactured goods its home trade is very important. Pop. (1891) 27,975.

St. Nicolas: village; in Lewis County, Quebec, Canada; on the south shore of the St. Lawrence; 15 miles above Quebec, with which it is connected by steamer (see map of Quebec, ref. 4-D). It has a large lumber-trade and many manufactures. Pop. of sub-district, 2,259.

St. Nicholas: see *NICHOLAS, SAINT*.

St. Omer: *saint-omer*; town; in the department of Pas-de-Calais, France; on the Aa; 26 miles S. E. of Calais by rail (see map of France, ref. 1-F). It is fortified and well built, and has extensive manufactures of salt, beetroot-sugar, soap, brandy, and clay pipes. Pop. (1891) 17,865.

Sainton-Dolby: CHARLOTTE HELEN; composer, singer, and vocal teacher; b. in London, May 17, 1821; in 1834 entered the Royal Academy of Music, and was subsequently elected king's scholar. Her first public appearance was on June 14, 1841; Mendelssohn dedicated to her his set of six songs, op. 57, and he wrote the contralto music in *Elfrida* with a special view to her singing it. She sang in concert tours in France, Germany, and the U. S. with great success. In 1860 she was married to Prosper Sainton, and in 1870 retired from public life. In 1872 she opened a vocal academy. She was one of the finest contraltos England has produced. Besides a number of excellent songs she composed four cantatas, *The Legend of St. Dorothy*, produced June 14, 1870; *The Story of a Faithful Soul*, June 19, 1870; *Thalassa* (the poem by Joseph Bennett), Dec. 21, 1881; and *Flowerland*, completed just before her death and performed posthumously. D. Feb. 12, 1885.
 D. E. HENRY.

St. Paris: village; Champaign co., O.; on the Ohio S., and the Pitts., Cin., Chi. and St. L. railways; 11 miles W. of Urbana, the county-seat, 15 miles E. of Piqua (for location, see map of Ohio, ref. 5-1). It contains a public high school, flour and planing mills, broom and carriage factories, a national bank with capital of \$52,100, and two weekly newspapers; and ships large quantities of grain, flour, lumber, and live stock. Pop. (1880) 1,099; (1890) 1,145; (1895) estimated, 1,400. **EDITOR OF "ERA-DISPATCH."**

St. Paul: the principal one of the Pribilof or Seal islands, in Bering Sea. It is the largest and the northernmost of the group, triangular in form. Area, 32 sq. miles. The highest point is Bogoslof, reaching about 650 feet above sea-level. Pop. about 300 Aleuts, devoted to the hunting of seals. The climate is severe. Potatoes and peas can be raised, and many swine are kept. **M. W. H.**

St. Paul, Fr. pron. sǎn'pôl': town of the French island of Réunion, on the western side of the island; has a good harbor and considerable trade. Pop. (of commune) 26,000.

St. Paul: city; port of entry; capital of the State of Minnesota and of Ramsey County; on both sides of the Mississippi; lat. 44° 52' 46" N., lon. 93° 04' 54" W.; 410 miles N. W. of Chicago (for location, see map of Minnesota, ref. 9-F). The city is mainly on the east bank of the river, and the two sections are connected by three substantial highway bridges. It is built on three plateaus, the lowest being the river flats; the second, the main plateau, on which the business portion and a part of the residence portion are built; and the higher, a range of irregular bluffs, on which are the principal residences. The city limits include 35,487 acres, within which lie the suburbs of Merriam, St. Antony, Union, Groveland, Macalester, and Desnoyer parks, Arlington Hills, and others. There are 45.49 miles of paved streets and 51 bridges, five of which cross the river, the others being built over ravines and tracks. The water-supply is obtained from a chain of lakes N. of the city, the daily consumption and supply being 8,000,000 gal.; length of conduit for water service, 4½ miles; sewers, 143.71 miles; water-mains, 227 miles. There are 24 parks, with a total of 450 acres, including Como Park,



State Capitol, St. Paul, Minn.

with 377 acres. The notable buildings are the State Capitol, city-hall, U. S. Government building (cost over \$800,000), Pioneer Press, Manhattan, New York Life, Germania Life, Globe and Endicott office buildings. There are 38 musical, literary, social, and sporting organizations, 10 libraries, and 56 newspapers and periodicals.

Churches and Schools.—St. Paul contains 167 churches: Lutheran, 28; Methodist Episcopal, 26; Roman Catholic, 21; Congregational, 18; Baptist, 18; Presbyterian, 17; Protestant Episcopal, 16; Evangelical, 5; Jewish, 5; People's, 3; Unitarian, 2; and one each, Christian, Christian Science, Gospel Tabernacle, Salvation Army, Spiritualist, and Swedenborgian. There are 44 public schools with 484 teachers and an enrollment of 19,000 pupils. The public schools include a large and finely equipped manual training-school and 26 public kindergartens. The total annual expense (1894-95) was \$451,500. There are 60 parochial and private schools, with an estimated enrollment of 8,000 pupils. The colleges are: Hamline University, for both sexes (Methodist

Episcopal, established in 1854), endowment \$175,000; Macalester College for both sexes (Presbyterian, incorporated in 1874), endowment \$200,000; St. Thomas's Seminary (Roman Catholic, established in 1885); St. Paul's Seminary (Roman Catholic, established in 1894), endowment \$500,000; and Concordia College (German Lutheran, established in 1894).

Charitable Institutions.—These include two Roman Catholic orphan asylums, Protestant orphan asylum, Roman Catholic Infants' Home, Protestant Babies' Home, Day Nursery, Home for the Aged, Home for the Friendless, House of the Good Shepherd (Roman Catholic), Woman's Christian Home, St. Paul Bethel, and the Friendly Inn. Other benevolent institutions and societies are: Board of Control, Children's Home Society, Needlework Guild, Newsboys' Home Association, Parish Settlement, Free Dispensary, St. Vincent de Paul Society, Hebrew Relief Society, Society for the Relief of the Poor, Society for Prevention of Cruelty, St. Mary's Home, Young Women's Friendly Association, City and County Hospital, Bethesda Hospital, St. Joseph's Hospital, St. Luke's Hospital, and the Homœopathic Hospital.

City Finances.—The total bonded debt, Jan. 1, 1895, was \$8,392,100, of which \$2,460,000 was for the city water system. The revenues of the water department are now sufficient to provide for future extensions, pay interest on these bonds, and provide a sinking fund for their redemption at maturity. The floating debt was \$235,000. The annual cost of the city government is about \$2,000,000; assessed value of real estate is \$119,094,861, of personal property \$15,242,448, and the annual tax-rate 2 mills on the dollar.

Business Interests.—The manufacturing establishment reported in the census of 1890 number 1,442 (distributed among 61 industries), representing an invested capital of \$22,501,211, employing 18,558 persons, paying \$10,373,336 in wages and \$15,865,573 for materials, and turning out products to the value of \$33,035,073. St. Paul does a large jobbing business (about \$150,000,000 annually), the available trade area, covering Minnesota, the Dakotas, Montana, Idaho, Washington, and Northern Oregon, being 582,164 sq. miles, with a population of 2,536,170. There are 22 banks, of which 5 are national, 5 savings, and 12 State; total capital, with surplus and undivided profits, \$8,527,615.

Means of Communication.—St. Paul is an important railway center, from which extend seven eastern trunk lines and four transcontinental systems. It is connected with the East and South by the lines of the Chicago, Milwaukee and St. Paul, Chicago and Northwestern, Burlington and Northern, Chicago and Great Western, Wisconsin Central, and Minneapolis and St. Louis, now part of the Rock Island system. The "Soo" line, through its relation to the Canadian Pacific, gives an outlet to the East independent of the Chicago systems. To the West connection is made with the Pacific coast over the systems of the Northern Pacific, the Great Northern, Canadian Pacific, and Union Pacific, in combination with the line of the Chicago, St. Paul, Minneapolis and Omaha. The St. Paul and Duluth, Eastern Minnesota, a part of the Great Northern system, and the Omaha have lines extending from St. Paul to the head of Lake Superior, and a very large part of the commerce between St. Paul and the East is conducted over the lake route. The city also has 103 miles of street-railway, electric and cable.

History.—The first house in St. Paul was built in 1842. The early settlers were principally French, and engaged in the fur and whisky trade. A Roman Catholic mission was begun in 1841, from which the city takes its name. The site was surveyed and plot recorded in 1847; the settlement was incorporated as a town and made the territorial capital in 1849, and became a city in 1854. St. Paul owes its early growth to its situation at the head of navigation on the Mississippi river. The assistance of the Federal Government has been secured in extending the navigable channel to Minneapolis, and a survey of practicable routes for a ship canal to connect the city with Lake Superior has been authorized by the Government. Pop. (1880) 41,473; (1890) 133,156; (1894) estimated, 180,000. **J. G. PYLE.**

St. Paul: city (founded in 1886); capital of Howard Co., Neb.; on the Loup Fork of the Platte river, and the Burlington Route and the Union Pac. railways; 23 miles N. of Grand Island, 174 miles W. of Omaha (for location, see map of Nebraska, ref. 10-F). It is in a grain-growing and stock raising region, and has 5 churches, a grammar school, several flour-mills, 3 national banks with combined capital of \$150,000, and 3 weekly newspapers. Pop. (1880) 482; (1890) 1,263; (1894) estimated, 1,500. **EDITOR OF "REPUBLICAN."**

St. Paul de Loanda, or simply **Loanda** (more correctly *Luanda*, see below), the first settlement of the Portuguese along the Southwest African coast, map of Africa, ref. 10. In early days the Zimbas (the Ang. shellfish) here were an annual tribute to shells to the King of Congo under the entire custom, which the Portuguese have purchased. Loanda is the capital of Angola, is favorably situated on Bengo Bay, east two mouths of the Bengo; in 18° 38' S. and 13° 19' E., and is well adapted for commerce. It is the terminus of a railway extending eastward to Amboim, 120 miles distant, and is the largest town on the coast between Lagos and Cape Town. Pop. 1890, 12,000. While Loanda saw its most stirring days when it was the center of the slave export trade to Brazil, its growth as legitimate trade has saved it from predicted ruin. About 200 ships and men-of-war visit the port every year, and the annual trade is about \$3,000,000. The public buildings and European residences are well built of brick and stone, or brick. Good water is brought for some miles from the Bengo river. Commerce connects the port with the neighboring towns of the Zambezi River. U. C. ADAMS.

St. Peter's city, capital of Nicollet co., Minn., on the Keweenaw River, and the Chi. and N. W. and the Chi. and N. W. and Omaha railways, 11 miles N. of Mankato, 73 miles E. of St. Paul (for location, see map of Minnesota, p. 247). It is situated between a stretch of prairie land to the W. and one of timber land on the E.; is the seat of Augustus Victoria College (Lutheran, chartered in 1874) and of the State Hospital for the Insane (cost \$500,000); also has a high school, a national bank with capital of \$1,000,000, a state bank with capital of \$50,000, flour-mills, livery and machine-shops, and a monthly and three weekly postoffice. Pop. (1880) 9,400; (1890) 9,671; (1894) estimated 10,000. *Etymology of "Hercules."*

St. Peter's city, capital of the Island of Guernsey. It is a small and picturesque town with many interesting buildings. Among them are the Government house, the Elizabeth College and the Havelock House, where Victor Hugo spent his exile (1858-70). The harbor, formed by two piers which define St. Peter's, is a favorite resort of pleasure-yachts. Pop. 1,000, with Garrison 16,638. M. W. H.

St. Petersburg, government of European Russia, bordering on the Gulf of Finland and Lake Ladoga; area, 50,000 sq. miles. The ground is low and level, the climate somewhat cold, the soil thin and little productive. Marshes and bogs cover two-thirds of the surface; hemp, flax, and other common crops; market-gardening is extensively carried on around the capital. Pop. exclusive of the capital, 1,689,570.

St. Petersburg, capital of Russia; the residence of the emperor and seat of the Government; in lat. 59° 56' 30" N., and lon. 19° E., on the delta of the Neva, about 20 miles from the port, Cronstadt (see map of Russia, ref. 5-D). Its location is not very favorable. The climate is severe; the snow-covered with ice for five months, and with a mean temperature of 19° the thermometer is known to have fallen to -20°. The elevation of the site above the river is somewhat low, although both the river arms and the canals intersected with high stone quays, destructive inundations have not been seen since 1824. Now is the ground itself salubrious; it is sandy and dry, and, in spite of extensive draining, swamps were not frequent. To form a sufficiently solid foundation for the Nikolaevskii bridges three sets of piles were driven into the ground, one on the top of the other; the foundation of the Church of St. Isaac is said to have been founded on the Cronstadt, Peter the Great, who founded the city in 1703, and declared it his capital in 1712, and Catherine II., who was very anxious for its growth and prosperity, succeeded in building up here one of the most brilliant capitals of Europe, and forming a commercial and industrial center of great importance. The city consists of two parts—the old city (*Staraya Stroyka*) situated on the mainland, and the new city (*Novaya Stroyka*) situated on the islands of the Neva, and the Petersburg islands situated on the numerous islands formed by the arms of the Neva. Vasilievskii, Volod, Petrovskii, Citadell Island, Krasnaya, Krasnaya, Krasnaya, and Volaginskii. Only a few bridges connect the islands across the Great Neva—namely, the Krasnaya, from the English quay in front of the Admiralty building on the southern branch to the Vasilievskii Island. It is a magnificent structure of granite, 1,200 feet long, resting on seven elegant arches, and was commenced in 1826. The other bridges across the Great Neva are temporary, supported on boats and removed each

when the frost comes. The Anichkovskii bridge, across the Fontanka Canal, is a splendid structure, 110 feet long, decorated with four groups of wild horses. About 100 bridges connect the islands with each other. The Great Bridge is the more elegant part of the city, containing a great number of palace churches, Government buildings, etc., all of which are of immense dimensions, generally gorgeously decorated, and often of a fine architectural style. The Nevski Prospekt, leading in a southeasterly direction from Admiralty Square, is one of the finest streets in Europe, 100 feet broad, 4 miles long, lined with palaces and planned with trees. The Prospekt is particularly the seat of the commercial and industrial interests; some of the islands are occupied by villas and gardens. The most remarkable of the public buildings is the Church of St. Isaac, 330 feet long, 200 feet broad, 310 feet high, built in the form of a Greek cross, entered from each side through a magnificent portico composed of twelve or sixteen massive columns of polished granite 60 feet high and 7 feet in diameter at the base, and surmounted by a dome rising 190 feet above the porticoes, resting on thirty columns, covered with copper and finely gilded. In the Church of St. Peter and St. Paul, whose elegant gift cost over 200,000 rubles, and can be seen from all parts of the city, the Russian emperors have been buried since the time of Peter the Great. In the Church of St. Alexander Nevskii the body of this saint is preserved in a sarcophagus of solid silver. The Winter Palace, one of the largest palaces in the world, forms a square 455 feet long, 350 feet broad, contains immense wealth in its decorations and furniture, and is inhabited, when occupied by the czar, by 6,000 persons; it was burned down in 1877 and rebuilt in 1880. The Hermitage, built by Catherine II., and connected with the Winter Palace, contains a famous picture-gallery, rich especially in works of the Spanish school, collections of statuary, gems, vases, arms, a library of 120,000 volumes, a theater, etc. The Anichkovskii Palace was the residence of Nicholas I. Of the public squares, Admiralty Square is the largest. The Palace Square contains the Alexander column, 150 feet high, whose shaft is a monolith 80 feet high, of red granite. In Peter's Square stands a fine equestrian statue of Peter the Great. The educational and benevolent institutions are numerous. The Imperial Library contains about 1,100,000 volumes and 35,000 MSS. The Academy of Sciences, founded by Peter the Great, has a library of 300,000 volumes, an excellent ethnographic museum, large numismatic and anatomical collections, etc., and a botanical garden with the largest palm-house in Europe. The university, founded in 1819, is attended by over 2,000 students. The mining school has an unsurpassed collection of minerals. Many special schools and gymnasia for girls are established, and a number of compulsory elementary schools were opened in 1873. A celebrated institution is the founding hospital. The manufactures, imperial and private, comprise glass, porcelain, and malachite ware, Gobelin tapestry and embroidery, arms, surgical and optical instruments, linen, woolen, cotton, and silk goods, paper, soap, tobacco, etc. A maritime canal from Cronstadt permits vessels drawing 18 to 20 feet to reach the quays of the city. A system of fresh-water canals gives ready and inexpensive communication with the interior, and railways connect the city with Moscow, Warsaw, and Berlin. Pop. (Dec., 1889) 924,105; with the suburbs (1892) 1,035,480. Revised by M. W. HANSEN.

St. Petersburg Declaration; an agreement concluded Dec. 11, 1864, by delegates from sixteen European states and Persia, called together at the suggestion of the Emperor of Russia to "examine into the expediency of forbidding the use of certain projectiles in times of war between civilized nations." The principle governing the convention was that the use of weapons which "needlessly aggravate the sufferings of disabled men or render their death inevitable" is contrary to the laws of humanity. Accordingly the contracting parties engaged "mutually to renounce in case of war among themselves the employment by their military or naval troops of any projectile of a weight below 400 grammes (a little less than a pound) which is either explosive or charged with fulminating or inflammable substances." The magazine-rifle, the mitrailleuse, new explosives, mines, and similar inventions for carrying on war are not legislated against, but solely the small explosive ball, on the ground that the object of war is to disable the greatest number possible, but not to render recovery from wounds impossible or to increase their severity. This

principle of the St. Petersburg convention has been incorporated into later codes like that worked over by the Brussels Conference in 1874. The U. S. has never acceded to it. The obligations of this St. Petersburg Declaration are reciprocal only, so that its signatories if at war with the U. S. would not be bound by them. THEODORE S. WOOLSEY.

St. Peter's Church: See PETER'S, ST.

St. Peter's Sandstone: a deposit of friable white and yellow sandstone occurring principally in Wisconsin, but coming to the surface in the adjacent portions of Minnesota, Iowa, and Illinois; named from St. Peter's (now Minnesota) river, at the mouth of which it is well displayed. Its average thickness is from 80 to 100 feet, with a maximum of 212. It is one of the minor divisions of the rocks deposited during the Cambrian period; it rests on Lower Magnesian limestone and is overlaid by Trenton limestone. By many geologists it is considered as the equivalent of the Chazy of New York, but is probably more nearly equivalent to the basal member of the Trenton. Fossils are rare, and consist of tubes made by worms when the sands were soft, impressions of seaweeds, and shells of *Lingulepis*. It is an important source of artesian water. Consult *Geology of Wisconsin*, vol. i., by T. C. Chamberlin. ISRAEL C. RUSSELL.

St. Pierre, sǎn'pi-ār': principal town and port of the island of Martinique, French West Indies; on a bay of the west coast (see map of West Indies, ref. 7-N). It has no harbor, properly speaking, but the roadstead is protected by the island itself except during hurricanes, when its exposed position makes it very dangerous. The town is partly on low and somewhat insalubrious lands, partly on picturesque hills, where the residences are charmingly placed among trees and flowers. The botanical garden is one of the finest in the West Indies. Pop. about 20,000. H. H. S.

St. Pierre: town of the French island of Réunion, formerly Bourbon; in the Indian Ocean; on the southern shore of the island. It has a good harbor and a rapidly increasing trade. Pop. of commune, 24,500.

Saint-Pierre, JACQUES HENRI BERNARDIN, de: author; b. at Havre, France, Jan. 19, 1737; studied at first for the Church; went in 1750 to Martinique as a sailor, and on his return a few years later attended the school of engineering at Rouen, but in 1760 lost his position in the army on account of insubordination. After unsuccessful ventures at several employments he went to St. Petersburg, and was appointed a captain in the engineering corps of Finland, but failed to interest Catherine II. in his schemes of a model republic. Leaving the country in 1766 he fought against the Russians in Poland, inspired by a Polish princess; then again in Saxony against the Poles, to avenge himself on his former inspiration. After this he returned to France and received a position as an engineer in the Isle de France, but settled in 1771 in Paris and devoted himself to literature, associating much with Rousseau, who exercised a considerable influence both on his style and his ideas. He published in 1773 *Voyage à l'Isle de France*, etc.; in 1784 *Études de la Nature* (5 vols.), which gave him rank among the best French prose-writers; in 1788 *Paul et Virginie*, which became one of the most celebrated books of the age and was translated into all European languages; in 1790 *La Chaumière indienne* and *Le Café de Sarrate*; and subsequently many other works, none of which attained such success as *Paul et Virginie*; was made director of the botanical garden in 1792, Professor in Morals at the normal school in 1794; received a pension under the empire. D. at Eragry-sur-Oise, Jan. 21, 1814. Aimé Martin, who married his widow, published a collected edition of his works in twelve volumes in 1813-20; his posthumous works, letters, and a biography in 1833-36.

St. Pierre and Miquelon, -meek'lōn: a group of three islands and many islets at the mouth of the Gulf of St. Lawrence, near the south coast of Newfoundland, constituting a French colony; valuable only as a rendezvous for vessels engaged in the cod-fisheries, of which some 1,500 annually enter the port. Area, 91 sq. miles. Pop. (1889) 5,983. St. Pierre, the capital, has a population of 800.

St. Privat, Battle of: See GRAVELOTTÉ, BATTLE OF.

St. Quentin, sǎn'kañ'tān': town; in the department of Aisne, France; on the Somme; 95 miles by rail N. E. of Paris (see map of France, ref. 2-F); has extensive manufactures of cotton yarn, linen, tablecloths, lace, muslin, and gauze, besides large distilleries and soap-works. It contains an ancient Gothic church, and is surrounded by beautiful prome-

nades occupying the site of its old fortifications. Pop. (1891) 44,209. A battle took place here on Aug. 10, 1557, between the army of Philip II. of Spain, assisted by an English contingent, and the French, in which the French were defeated. During the Franco-German war, on Jan. 19, 1871, the Germans under von Goeben here defeated the French under Gen. Faidherbe; the former lost 3,000 men and captured 10,000 prisoners.

St. Regis Falls: village; Franklin co., N. Y.; on the St. Regis river, and the N. Adirondack Railroad; 22 miles S. W. of Malone, the county-seat (for location, see map of New York, ref. 1-I). It has excellent water-power, large lumber trade, several manufactories, and a weekly newspaper. Pop. (1880) not in census; (1890) 1,210.

St. Roque, Cape: See CAPE ST. ROQUE.

Saint-Saëns, sǎn'sas'sǎn'. CHARLES CAMILLE: organist and composer; b. in Paris, France, Oct. 9, 1835. He showed a remarkable aptitude for music in his childhood, and made rapid progress under his teachers; entered the Conservatory in 1847, obtained second organ prize in 1849, and first in 1851; composed his first symphony when sixteen years old; in 1853 became organist of the Church of St. Merri, and in 1858 organist of the Madeleine, which post he resigned in 1877. He has composed largely in almost every art-form. Among his operas *Le Timbre d'Argent*, *Étienne Marcel*, *Henry VIII.*, *Ascanio*, and *Phryné* may be specially noticed, as also *Samson et Dalila*, a sacred cantata. He has written four very popular symphonic poems for full orchestra, entitled respectively *Le Rouet d'Omphale*, *Phaëton*, *Dances Macabre*, and *La Jeunesse d'Hercule*. D. E. H.

Saintsbury, GEORGE EDWARD BATEMAN: critic and literary historian; b. at Southampton, England, Oct. 23, 1845. He graduated at Oxford in 1867; was classical master in Elizabeth College, Guernsey, 1868-74, and head master of the Elgin Educational Institute 1874-76. Among his publications are a standard *Primer of French Literature* (1880) and *Short History of French Literature* (1882); a life of *Dryden* (1881) and of *Marlborough* (1885); *A History of Elizabethan Literature* (1887) and several volumes of selections, translations from the French, etc. H. A. BEERS.

Saints' Days: in the calendar of the Church, days set apart for the special commemoration of any saint. In the Roman Catholic Church the number of saints is very great, and a considerable number of saints are commemorated on each day of the year; but it is the custom to assign to particular countries, districts, or dioceses a certain number of saints for special commemoration. These saints' days constitute the calendar for that district. Any day not a saint's day in the local calendar, and not a festival nor a Sunday, is called a *feria* or vacant day; other days are either holy days of obligation, doubles, semi-doubles, and simples, according to the solemnity of the occasion and of the service for the day. See the *Ordo*, published annually. J. J. K.

St. Servan, sǎn'sǎr'vǎn': town of France; department of Ille-et-Vilaine; at the mouth of the Rance, opposite St. Malo (see map of France, ref. 3-C). It has two good harbors and an active commerce. It is fortified and much frequented as a watering-place. Pop. (1891) 9,670.

Saint-Simon, sǎn'sē'mōn', CLAUDE HENRI, Comte de: founder of French socialism; b. in Paris, France, Oct. 17, 1760. He received a military education and aided the American colonies in the Revolutionary war. Early conceiving the notion that a great destiny awaited him, he sought by every means to enlarge his knowledge of men and things by varied experience. He gave up the military career and proposed a scheme for a Dutch and French expedition against the British East Indies, but neither this nor a subsequent project for conquering Madrid by the sea by a canal attracted the attention of the authorities. In the revolution he took no prominent part, but was imprisoned for nearly a year during the Reign of Terror. He speculated in the confiscated estates of the émigrés and realized a small fortune, but spent it all in little more than a year. An unhappy marriage, dissolved by the mutual consent of the parties, completed his experience. Reduced to absolute penury, he lived partly on the charity of his friends and partly on the precarious results of his literary work to which he now devoted himself. The title of his writings was *Lettres d'un Habitant de Genève* (1787). This was followed by several scientific and political writings which passed almost without notice. His characteristic views were first propounded in *L'Industrie* (1817) and further developed in *L'Organisateur* (1819); *Du Système*

indus (1824); *Colchicum des Indes* (1829); and, as a sequel to all, *Asparagus thersites* (1825). The poems, etc., present his social philosophy in a systematic form. Despite short diffuse style and want of logical arrangement his writings reveal a keen critical faculty and moderate conservative power, qualities which won over a large number of the most brilliant young men of the 19th century and others. D. in Paris, May 19, 1825.

His school of social or economic philosophy called after it rapid light, recognition, demands thorough application of the principle of association to production. The "education of man by man" must give way to the exploitation of man by man associated with man. To do this, a government of labor must be held as sacred and not as property. The law of inheritance must be abolished, and ground distributed on basis of the merit of the individual worker. This idea of rewarding the laborer according to his merit was strongly insisted upon by the better sort, who advocated the grading of the laborer according to his capacity, and the new philosophy had its effect in the lifetime of the founder, but under the influence of Fourier and HAZARD (q. v.) attracted no attention in the Revolution of 1830. The *états* became the sign of the society, which included many of the most prominent of the time; but dissensions arose between the leaders on account of the innovations favored by Fourier, who tended toward mysticism and lay ideas with him in the marriage relation. Hazard and many of the younger members withdrew, and the sect represented by Fourier was broken up in 1832. F. M. COLBY.

SAINT-MIRIS, Louis de ROUVREAU, Duc de: memoirs writer; b. 15 1673; received a very careful education; entered the army in 1692; distinguished himself at the battle of Malplaquet; left the army in 1702 for the court, where he acquired considerable influence, both under Louis XIV. and as regent, and developed a great activity, partly in the sciences, partly in diplomatic negotiations. He never lost a portion of commanding influence even under the reign of his friend and patron, the Duke of Orleans, though he was regarded prominently as ambassador to the court of Spain. After his return he had little to do with public affairs, and on the death of the regent, in 1723, he retired to his estates. D. in Paris, Mar. 2, 1755. This long term of life he employed in preparing his *Mémoires*, which were printed by his grandchild, but at his death the government seized them, and a multitude of anonymous extracts came into circulation and considerable money was received. At last Charles X. returned the manuscript to the family of the author, and an edition appeared in 1755, in 10 volumes (1755-60). This was followed by one of 1765, revised and edited by Chéruel, and in 1874 by an edition which was estimated to contain thirty volumes, of which 10 with volume appeared in 1891. The work, though somewhat irregular, is of great historical value and is considered the most remarkable collection of memoirs ever written. See SAINT-MIRIS, *Œuvres de Louis*; Collins, *France in Foreign Chances*; and CAMAN, *The Duke of Saint-Miris* (London, 1895). Revised by F. M. COLBY.

SAINT-STEPHEN: part of county of Charlotte County, New Brunswick, pleasantly situated on the east bank of St. Lawrence, opposite Calais, Me., with which it is connected by a bridge and map of Quebec, etc., ref. 6-G. It is on the Atlantic Pacific and Shore Line railways, does a heavy business in manufacturing and shipping lumber, and has a considerable and many fine residences. Pop. (1901) 2,680.

SA THOMAS: an island off the western coast of Africa; southwest of Guinea; in lat. 0° 27' N., lon. 6° 3' E. Area, 25 sq. miles. The island, which belongs to Portugal, is of volcanic origin, wonderfully fertile, but extremely unhealthy. Sugar was formerly the principal product; it is now comparatively cultivated. Forests abound, yielding valuable timber and the finest varieties of wood. Pop. 1,000, of whom 1,000 are white. Chief town, St. Thomas.

SA THOMAS: one of the Virgin Islands, West Indies; E. of St. John, area, 24 sq. miles. It belongs to Denmark. The rocks are granitic; portions are fertile, but very few are cultivated. The importance of the island is due to the fact that part of Charlotte Amalie, where the Danish colonies are gathered. Formerly much of the commerce of the West Indies centered here; the place has much trade with the other islands, and is an important port of call and sailing station. It is occasionally vis-

ited by severe epidemics of yellow fever. The harbor is good and ordinarily very safe; but the island is frequently visited by hurricanes, and when these blow from the S. the navigation is very dangerous. In 1867 every vessel in the harbor was wrecked by an earthquake wave, which also swept part of the town. In 1850 President Pierce secured the purchase of the island for the U. S. for \$7,500,000, but Congress refused to ratify the treaty. Pop. (1900) 12,010. Dependencies of St. Thomas are SANTA CRUZ (q. v.) and St. John's (area, 91 sq. miles; pop. 984), islands near it. HANNAH H. SMITH.

ST. THOMAS: capital of Elgin County, Ontario, Canada; on London and Port Stanley and Canada Atlantic railways; 10 miles S. of Port Stanley, on Kewee creek (see map of Ontario, ref. 5-B). It has a large grain-trade and two weekly newspapers. Pop. (1891) 10,170.

ST. THOMAS: See ST. THOMAS.

ST. VINCENT: an island of the Windward Islands colony, British West Indies, between St. Lucia and the Grenadines. Area, 109 sq. miles. It is mountainous, with fertile valleys, and half the surface is still covered with forest. Near the northern end is a quiescent volcano, the Soufrière, with two craters, one of which is occupied by a deep lake; the other was formed by the great eruption of Apr. 27-May 1, 1812, which devastated part of the island and darkened Barbados, 80 miles to windward, with a shower of ashes. The principal exports of St. Vincent are sugar and arrowroot; it supplies the markets of the world with the latter. The island was the last stronghold of the West Indian Caribs, who were finally conquered by the British in 1795-96, and transported to Ruatan in the Bay of Honduras; a few returned and now have a small reservation. Pop. (1891) 41,054; nearly nine-tenths are colored. Capital, Kingstown, with 4,547 inhabitants. The Grenadines, except Carriacou, are dependencies. HANNAH H. SMITH.

ST. VINCENT, CAPE: See CAPE ST. VINCENT.

ST. VINCENT, EARL OF: See JERVIS, SIR JOHN.

ST. VITUS'S DANCE: (1) a disorder of the Middle Ages akin to tarantism (see DANCING MANIA); (2) another name for CHOLERA (q. v.).

SALAD: See SMUT.

SAL'VAS: worshippers of SIVA (q. v.).

SAKHALIN: See SAKHALINES.

SAKKARAH: See SAKKARAH.

Sakyamuni: the "Sakya Sage," a name frequently given to Gautama or Gautama, the historical BUDDHA (q. v.). *Sakya-muni* is the Chinese form of the name, and *Shaka-muni* the Japanese. See also GAUTAMA.

SALA, GEORGE AUGUSTUS HENRY: journalist and author; b. in London, England, in 1828; educated as an artist, but at an early age devoted himself to literature as a constant contributor to Dickens's *Household Words* and other periodicals, especially *The Illustrated London News* and *The Cornhill Magazine*; visited the U. S. 1862-64 as correspondent of *The Daily Telegraph*, and published *America in the Midst of War*; represented the same paper in Algeria 1864 and again 1875, at the Paris Exposition 1867, on the Continent during the Franco-German war 1870-71, and in Spain, Morocco, and Venice 1875. He is the author of several novels (*Quite Alone*, *Cyprien Dangerous*, etc.), works of travel, etc., including *Paris Herald Again* (1881); *America Revisited* (1882); *London Up to Date* (1894); *Life and Adventures of George Augustus Sala* (1895); and founder and editor of the *Temple Bar* magazine. He visited the U. S. in 1885, and lectured in its principal cities on his way to Australia, which he visited as correspondent of *The Daily Telegraph*. In 1892 he started *Sala's Journal* in London. Revised by H. A. DENNIS.

Salaam [from Arab. *salām*, peace, safety]: the Oriental salutation, of which there are various forms, mostly accompanied by the words meaning "Peace be with you!" and sometimes by an inclination of the body. Strict Mohammedans never give the salaam to an unbeliever.

Salado, Rio, *res'ā-sā-lā-dā*: a river in the northern part of the Argentine Republic; rising in the Andes of Salta and flowing with a general southeasterly course to the Paraná, it coincides nearly with the southwestern side of the region called the GRAN CHACO (q. v.). Length about 1,000 miles. After entering the plains the Salado is partly lost in great marshes and salines, and becomes impregnated with salt. It is shallow and not navigable. H. H. S.

Sal Aëra'tus [Mod. Lat., aërated salt; *sal*, salt + *aërat*, Latinization of aërated, from Lat. *aër*, air]: a somewhat impure and imperfectly carbonated bicarbonate of potash, made by exposing a concentrated solution of neutral potassic carbonate to an atmosphere of carbon dioxide proceeding from fermentation or other source; hence the name. The finely granular form of the commercial article is probably a result of agitation during the absorption of the carbonic acid. Medicinally, a purer crystalline bicarbonate of potash is used, which is, or should be, fully charged with 2 equivalents of carbonic acid for 1 of potash. *Sal aërat* was at one time extensively used as an article of domestic consumption, but has been chiefly displaced by the cheaper and better compound bicarbonate of soda, known as cooking-soda, sometimes as soda saleratus.

Revised by IRA REMSEN.

Sal'ahdin (*Yusuf-ben-Ayub-Salah-ed-Din*): Sultan of Egypt and Syria; b. in 1137 at the castle of Tekrit, on the Tigris, of which his father, the Kurdish chieftain Ayub, was governor. His uncle Shir-koh in 1163 was sent by Nur-ed-din Mahmud, Sultan of Syria, to Egypt to reinstate the dispossessed Emir Shaour. Salahdin accompanied him, and in the subsequent campaign showed great courage and military ability. Shaour became suspicious of his protectors and joined the crusaders, but was defeated and beheaded. Thereupon Shir-koh became governor of Egypt as Nur-ed-din's representative and on his death was succeeded by Salahdin, who manifested remarkable capacity as a civil ruler. On the death of Nur-ed-din (1174) he became independent Sultan of Egypt, to which Syria was speedily added, his title to both being confirmed by the Caliph of Baghdad. The Christian knights in Palestine constantly violated their treaties, attacking and plundering the Mussulman caravans. To end these outrages Salahdin invaded Palestine and destroyed the Christian army at the battle of Tiberias (July 4, 1187), where the King of Jerusalem, Guy of Lusignan, was taken prisoner. The capture of Jerusalem followed (Oct. 8, 1187). The king and inhabitants were treated kindly, but the knights of the various orders were put to death as violators of their treaties. Excitement at the fall of Jerusalem caused the third crusade (1189), and after a siege of two years Acre was captured by the Christians. The contest between Richard Cœur de Lion and Salahdin was really a species of tournament, wherein the most brilliant exploits were performed on both sides, with little gain by either. A three years' truce was concluded (Sept. 2, 1192) whereby the coast from Tyre to Jaffa was ceded to the Christians. Salahdin died at Damascus, Mar. 3, 1193. His estates were divided among his seventeen sons and his brother Malck-el-Adil. His fame was deservedly great. Magnanimous and just, skillful and intrepid in war, judicious and far-sighted in civil affairs, the founder of a vast and wisely administered empire comprising Egypt, Syria, Mesopotamia, Palestine, and Arabia, he is the hero of Mussulman chivalry.

E. A. GROSVENOR.

Sal Alem'broth, or **Salt of Wisdom**: a compound of corrosive sublimate and sal ammoniac, once used in medicine, but now discarded.

Salaman'ca (Rom. *Salamantica* or *Elmantica*): town of Spain; capital of the province of the same name; on the right bank of the Tormes, which is here crossed by a magnificent bridge of twenty-seven arches (see map of Spain, ref. 14-D). It is surrounded with old walls, but several portions within the walls have been in ruins since the occupation of the city by the French in 1812. The streets are mostly steep, narrow, crooked, and dark, but they are often lined with lofty edifices most interesting in architectural respects. The university was founded in 1200. It is the first institution of its kind in Spain, and enjoys a high reputation all over Europe. Pop. (1887) 22,200.

Salamanca: a town of the state of Guanajuato, Mexico; on the river Lerma and the Mexican Central Railway; 34 miles S. of Guanajuato (see map of Mexico, ref. 6-G). It has manufactures of cotton cloths. Pop. about 10,000.

Salamanca: village; Cattaraugus co., N. Y.; on the Alleghany river, and the Erie, the Buffalo, Roch. and Pitts., the W. N. Y. and Penn., and the N. Y., Penn. and O. railways; 34 miles E. of Jamestown, 60 miles S. of Buffalo (for location, see map of New York, ref. 6-C). It contains 7 churches, union graded school with three buildings, 2 Roman Catholic schools, public-school library, sewerage, natural-gas and electric-light plants, gravity system of water-works, 2 national banks with combined capital of \$100,000, 2 weekly news-

papers, railway-shops, sole-leather tannery, 4 saw and planing mills, 3 cigar-factories, 2 grist-mills, wire-mattress factory, foundry, and embroidery-factory. It was incorporated as a village in 1878. Pop. (1880) 3,498; (1890) 3,692; (1894) estimated, with suburbs, 5,500.

EDITOR OF "CATTARAUGUS REPUBLICAN."

Salamander [via O. Fr. from Lat. *salamandra* = Gr. *σαλαμάνδρα*; cf. Pers. *samander*, salamander]: any one of numerous forms of tailed amphibians, especially the species of *SALAMANDRIDÆ* (q. v.). These are small and of lizard-like form, and are terrestrial as distinguished from the aquatic newts of the same family. They inhabit damp, shady places, and feed mostly on worms, slugs, snails, insects, etc. *Salamandra maculosa* is the common spotted salamander of Central and Southern Europe. The black salamander (*S. atra*) is Alpine, and in this species the larvæ attain the air-breathing stage within the body of the mother. The salamanders have been popularly identified with the fabulous animal of that name formerly supposed to be able to live in or to extinguish fire. The salamander of Marco Polo was a shrew. The animal locally known in the southern parts of the U. S. by the name is a pocket-gopher (*Geomys tuza*), a rodent.

Salamanderidæ [Mod. Lat., from Lat. *salamandra*, salamander. See *SALAMANDER*]: an Old World family of amphibians of the order *URODELA* (q. v.), including the typical salamanders and newts. They have posterior palatine processes, with teeth on their inner margins; the parapsyllæ toothless; no post-frontosquamosal arch or ligament; and opisthocœlian vertebrae.

Sal'amis (modern *Kolouri*): Greek island; in the Gulf of Egina; 8 miles W. of Athens. Area, 36 sq. miles. Pop. (1889) 6,254. It is arid, rocky, mountainous, and well wooded; produces cotton, olives, and wine. The village of Ambelaki occupies the site of the ancient city of Salamis. In the strait, hardly over a mile in width, between Salamis and Attica, the Greeks under Euribiades utterly defeated the Persian fleet (Oct. 20, 480 B. C.).

E. A. G.

Sal Ammoniac: See *AMMONIA*.

Salanstone: See *CORUNDUM*.

Salaverry, *sāl-lā-ver-ree*, FELIPE SANTIAGO, de; soldier; b. at Lima, Peru, May 3, 1806. He was a student at Lima, and with several classmates ran away and joined the patriot army in 1821; served through the revolution; was lieutenant-colonel under Lamar; headed revolts against Gamarra 1833, and was general of division in the campaign against him 1834; declared against Orbegoso Feb. 23, 1835; seized Lima, and proclaimed himself supreme chief of Peru. In the confused condition of affairs most of the people of the republic adhered to him. Orbegoso invoked the aid of Santa Cruz, president of Bolivia, who marched into Peru. Salaverry was defeated, captured, and shot at Arequipa, Feb. 19, 1836. He was a brilliant and popular leader and a writer of some note.

H. H. S.

Saldanha Oliveira e Daun, *sāl-daan'yā-lē-vā-lī-nō* *ā-down*, JOÃO CARLOS, Duke of Saldanha; statesman and soldier; grandson of the Marquis of Pombal; b. at Lisbon, Nov. 17, 1791; fought against the British and was taken prisoner, but was soon permitted to join the Portuguese court at Rio de Janeiro, where he served in the army and held important official positions. When Brazilian independence was declared he returned to Portugal, and afterward as a moderate constitutionalist and supporter of Dom Pedro took part in the war against Dom Miguel. At first unsuccessful, he was again forced to leave the country, but returned in 1832, and after repeated successes received the capitulation of Dom Miguel at Evora 1834. He became Minister of War and president of the council May 31, 1835, but resigned in November of the same year. Having taken part in the unsuccessful conservative revolution of 1836, he lived abroad until recalled by the queen in 1846. In the following year he formed a ministry; was replaced by the second dictatorship of Costa Cabral 1849; overthrew the administration by force of arms 1851; conducted the government until the accession of Pedro V. (1856), when he came again the head of the opposition; was minister at Rio 1862-64, and again 1866-69; went to Paris as minister May 1869; instigated a revolution in the palace May 19, 1870, the consequence of which he again became Prime Minister, but resigned in August, and was sent to London, where he died Nov. 21, 1876.

F. M. CORRY.

Sale (of goods): the transfer by the seller of the general property in goods to the buyer, pursuant to contract, for

consideration. If a special property only is transferred, the transaction may be a *baux à usage* or a lease, or even a sale. A part owner's interest in goods is a special property. When goods are transferred for goods, the transaction is not a technical sale, but a bargain, for most purposes except that of common law, and the rules governing the two transactions are the same. An agreement to sell is one whose performance is to transfer the ownership of the general property in goods at a future time on the fulfillment of some condition.

Goods.—The property in goods may be transferred without a contract between the parties. This occurs when the owner sues for trespass to or conversion of his goods, and obtains a judgment for their full value. It has been called an involuntary sale. This does not mean the judgment is paid; but there is considerable authority in the U. S. for the doctrine that upon payment of judgment the quasi-purchaser's title, as against subsequent creditors, relates back to the original owner. See *Smith v. Smith*, 11 N. H. 571.

Future Goods.—This, in the case of a present sale, is goods owned by the seller, but in the case of an agreement to sell it may be goods thereafter to be produced or acquired. According to the common law, the owner of property makes a valid present sale of the present, growth, or issue, for example, the offspring of his animals, the milk of his cows, the wool of his ewes, the crops to be harvested. Such future goods are treated as having a special existence, and as soon as they come into actual existence, become the property of the buyer. A contract to sell is a present sale of property which has neither an unconditional existence nor capable only as an agreement to sell. In such a case the legal title will not pass to the buyer until the goods are delivered to him by the seller or until he takes possession of them under authority from the seller. The rule in equity is somewhat different. It is stated as follows in the leading English case, *Robinson v. Harman* (10 House of Lords Cases 181): "A contract in equity, any more than in law, assigns what is to come. A man can contract to assign property which becomes his existence in the future, and when it comes into existence equity, treating as done that which was to be done, insists upon that property, and the contract to assign then becomes a complete assignment." It must be borne in mind that even under this doctrine the buyer gets only the equitable interest and not the legal title, and that the claim to the property may be defeated by the seller's transferring it to another purchaser without notice. This equity rule is not accepted in all jurisdictions. See *Harvard v. Cooke*, 144 Mass. 207.

Parties.—Agree for the sale and purchase of a particular thing, without their knowledge, has perished, there is no contract, for there is no subject-matter. Where they agree and to buy a particular thing which perishes after the sale of the seller before the property passes, the contract is avoided. In such a case the contract is voidable, as the performance remaining possible.

Price.—This is generally determined by the agreement between the parties. It may be left, however, to be fixed by the parties, or by reference to the price then current, or to the valuation of a third party. In the latter case, if the third party can not or does not make a valuation, the contract is avoided, but if the buyer has appropriated the goods, he is bound to pay a reasonable price. If the third party's failure is caused by the fault of the contracting party such one will be liable to the other. Where goods are sold without any statement as to price, the purchaser is bound to pay a reasonable price; that is, the price which a reasonable man would pay. While the price is to be treated ordinarily as reasonable, it may be made unreasonable by a corner, a pool, or a trust.

Implied Warranties.—A brief statement of the leading principles of these important and difficult topics must be given.

Warranty.—This is a material term of the contract of sale, which gives the other party the right to sue for breach as repudiated. It may be expressed by the parties or implied by law. Some of the implied warranties are the following: That the seller has a right to sell the goods; that goods sold by description shall correspond to the description; that the bulk of goods sold by weight shall correspond with the sample in quality, and that the buyer shall have a reasonable opportunity to compare the goods with the sample. A stipulation as to time of payment is not treated

as a condition ordinarily, although in several of the U. S. it has been held that a sale of specific goods for cash is conditional, and that title does not pass until such payment is made or waived.

In the law of sales a warranty is not a term of the sale contract, but is an agreement respecting the goods subsidiary and collateral to the sale contract, the breach of which does not give the other party the right to treat the contract as repudiated, but only the right to damages. Such at least is the doctrine established by the English courts, and declared by the Sale of Goods Act of 1909 (59 and 60 Vict., c. 31) to be the law of England and Ireland. The same statute provides that in Scotland a breach of warranty by the seller may be treated by the buyer as a breach of condition, and that the latter may within a reasonable time after delivery reject the goods and treat the contract as repudiated. This doctrine obtains in some of the U. S. (See *Smith vs. Judd*, 128 Mass. 178.) Warranties are either express or implied. The word warranty is not necessary to an express warranty, nor is actual intention to warrant on the part of the seller essential. If the language employed contains an assertion, as distinguished from a mere opinion, that the subject of the sale has certain qualities or will answer certain requirements, and the assertion is relied upon by the buyer in making the purchase, there is an express warranty. An example of an implied warranty is found in a sale by sample—that the goods shall be free from any defect, rendering them unmerchantable, which is not apparent on a reasonable examination of the sample.

Transfer of Property.—This, in the case of ascertained or specific goods, is determined by the intention of the parties. Frequently they fail to disclose their intention, and the courts have found it necessary to establish rules, more or less arbitrary, for the decision of such cases. These rules are formulated as follows in the English Sale of Goods Act (*supra*): Rule 1. When there is an unconditional contract for the sale of specific goods, in a deliverable state, the property in the goods passes to the buyer when the contract is made, and it is immaterial whether the time of payment or the time of delivery, or both, be postponed. This rule is modified in some of the U. S. by the doctrine that in cash sales the property does not pass until payment. Rule 2. Where there is a contract for the sale of specific goods, and the seller is bound to do something to the goods for the purpose of putting them into a deliverable state, the property does not pass until such thing is done, and the buyer has notice thereof. Rule 3. When there is a contract for the sale of specific goods in a deliverable state, but the seller is bound to weigh, measure, test, or do some act or thing with reference to the goods for the purpose of ascertaining the price, the property does not pass until such act or thing is done, and the buyer has notice thereof. If the buyer is to do the weighing, etc., or the goods are delivered to the buyer before weighing, etc., property passes at once. In the U. S. there is authority for the view that, if the goods are ascertained, property will pass, although weighing, etc., may be necessary in order to arrive at the total price. (*Singer vs. Walterberry*, 116 N. Y. 371.) Rule 4. When goods are delivered to the buyer on approval, or "on sale or return" or other similar terms, the property therein passes to the buyer when he signifies his approval or acceptance to the seller, or does any other act adopting the transaction; if he does not signify his approval or acceptance to the seller, but retains the goods without giving notice of rejection, then, if a time has been fixed for the return of the goods, on expiration of such time, and if no time has been fixed, on expiration of a reasonable time. What is a reasonable time is a question of fact. In the U. S. it is held generally that a contract "of sale or return" of ascertained goods vests the property in the buyer at once, with an option to return.

In case of an agreement to sell goods of a particular description, as distinguished from a present sale, property will pass when goods of that description and in a deliverable state are appropriated unconditionally to the contract. The assent of both seller and buyer to the appropriation is necessary, but either party may give his assent in advance, and the assent may be express or implied. "The selection of the goods by the one party, and the adoption of that act by the other, converts that which was before a mere agreement to sell into an actual sale, and the property thereby passes." (*Rhodes vs. Threlkeld*, 6 Barnwell and Creswell 388.) Where the buyer orders goods to be sent to him by the seller, implied assent is given by the purchaser to the seller to make the appropriation; and the appropriation is complete upon

the delivery of the goods to the buyer, or to a third person for transmission to the buyer. If such appropriation is unconditional, and the goods conform to the order, property passes. But the seller may appropriate the goods conditionally. In such case property does not pass until the imposed conditions are fulfilled. For example, the seller may take a bill of lading of the goods in his own name, attach thereto a draft for the purchase price, and require payment of the draft as a condition of the buyer's acquiring the property. Where the condition is expressly imposed the rights of the parties are clear. Frequently the language and acts of the parties are equivocal, and the question whether the seller intended to appropriate the goods absolutely to the contract or to reserve to himself the right to their disposal becomes a difficult one. This is exemplified by the case of *The Calcutta Company vs. De Mattos* (32 *Law Journal*, Queen's Bench 322; 33 *ibid.* 214), the judges of the lower court being equally divided as to the intention of the parties, and, on appeal, two of the judges entertaining a third view.

Where a contract is made for the manufacture and delivery of an article, the property therein does not pass, according to the English decisions and those of many of the U. S., until delivery and acceptance, or until the article is ready for delivery and approved by the buyer. In some of the States it is held that the buyer assents in advance to the appropriation of the finished article to the contract, and that title passes upon the seller's tendering it.

Whether a contract for the sale of a part of a larger bulk of goods, of uniform kind and quality—e. g. 1,000 bush. of wheat from a grain elevator, or 100 gal. of oil from a tank, or 50 barrels of flour from a car-load—is one for a present sale of specific goods, or one for the sale of goods thereafter to be ascertained, is a question upon which the authorities are divided. The English view, which has been adopted in many of the U. S., is that the contract can not be more than an agreement to sell, and that property can not pass until the portion contracted for has been separated from the bulk. It is said there is no individuality until it is divided; the law knows no such thing as a floating right of property, which may attach itself either to one parcel or the other, as may be found convenient afterward. (*Golder vs. Ogden*, 15 Penn. St. 528.) On the other hand, it is maintained by many State courts that the subject-matter of such a contract is ascertained or specific goods, where it is a designated quantity out of a specified mass of uniform quality (*Kimberly vs. Patchin*, 19 N. Y. 330); and that the property in such designated quantity will pass, upon making the contract, if the parties so intend. This doctrine seems to accord with commercial usage. In some States it has been adopted wholly or in part by statute. See Mass. Pub. Stat., c. 72, § 7.

Risk of Loss.—This, unless otherwise agreed, passes from the seller to the buyer with the property in the goods, without regard to their possession. If delivery has been delayed through the default of either buyer or seller, the goods are at the risk of the party making default as regards any loss which would not have occurred but for such default. Sale of Goods Act, § 20.

Transfer of Title.—At common law a person can give no better title to goods than he possesses, unless he acts as the true owner's agent, or unless the true owner's conduct respecting the goods has estopped him from denying such person's authority to sell them. (See *ESTOPPEL*.) In England this rule does not apply to sales in MARKET OVERT (*q. v.*), and there, as well as in most of the U. S., it has been modified by Factors' Acts and similar statutes. The chief feature of this legislation is the power it confers on agents or consignees, who are intrusted by the owner with goods or with documentary evidence of title thereto, such as a bill of lading, warehouse certificate, delivery order, or the like, to give a perfect title to *bona-fide* purchasers. See *Lee vs. Buller* (1893), 2 Queen's Bench 318; *Goodwin vs. Mass. Company*, 152 Mass. 189; *Soltau vs. Gerdau*, 119 N. Y. 380, applying such legislation.

As delivery is not necessary to the transfer of ownership of goods, it should follow that one who has sold goods to A can not give title to them to B, although they are allowed by A to remain in his possession. Such is the general rule. In a few of the U. S. the courts have held that a seller who has never delivered the goods to the first purchaser may confer a perfect title upon a second *bona-fide* buyer. (*Huschle vs. Morris*, 131 Ill. 587.) The adoption of this doctrine in the British Sale of Goods Act, § 25, is "the result of a long struggle between the mercantile community

on the one hand and the principles of the common law on the other."

We have seen that the owner of goods may deliver them under a contract that the title shall remain in him, until the performance of some condition by the buyer, such as the full payment of the price. Here the common law does not recognize any power in the conditional vendee to possess any greater interest than he possesses. (*Harkness vs. Kersell*, 118 U. S. 663.) A different rule has been declared by the Pennsylvania courts, and statutes have been passed in many jurisdictions requiring contracts for conditional sale to be in writing and recorded, in order to be effectual against the buyer's creditors and *bona-fide* vendees.

Seller's Duties.—The most important is that of delivery. If the contract specifies the time, place, and manner of delivery, its terms must be followed. In the absence of agreement or custom, the seller must deliver the goods upon payment or tender of the price; the place of delivery is the seller's place of business, or residence, or their place of deposit at the time, according to the subject-matter of the sale; or, if the seller is to send the goods to the vendee at a distance, the place of their receipt by the common carrier. Delivery must be made at a reasonable hour; the exact quantity agreed upon must be delivered. Any expense incidental to putting the goods into a deliverable state must be borne by the seller. He is also bound, when delivering goods to a carrier on behalf of the buyer, to make a reasonable contract for their transportation, and to give accurate directions for their delivery to the buyer. If the buyer has not had an opportunity to inspect the goods, the seller must afford him a reasonable opportunity for inspection so that he may ascertain whether they are in accordance with the contract.

Buyer's Duties.—The buyer is bound to accept and pay for the goods, and, if the terms of the contract require, to send for them. While the buyer is under no obligation to accept a different quantity of goods from that which he ordered, if he does accept it he must pay therefor at the contract rate. In case the buyer rightfully rejects goods tendered to him by the seller, he is under no duty to return them; he need only inform the seller of his rejection. The courts have experienced much difficulty in some cases in determining whether the buyer has accepted the goods. Perhaps no better rule can be framed on this subject than the one laid down in the British Sale of Goods Act, § 35: "The buyer is deemed to have accepted the goods when he intimates to the seller that he has accepted them, or when the goods have been delivered to him, and he does any act in relation to them which is inconsistent with the ownership of the seller, or when, after the lapse of a reasonable time, he retains the goods without intimating to the seller that he has rejected them."

Seller's Remedies.—If the property in the subject-matter of the sale contract has passed to the buyer, or if the buyer has agreed to pay the price on a day named, the seller can maintain an action for the purchase price. In other cases the buyer's breach of his contract will give the seller the right to maintain an action for damages for refusal to accept and pay for the goods. (See *DAMAGES, MEASURE OF*.) According to English decisions, the refusal of the buyer to take and pay for goods, the property in which has passed to him, does not divest him of such property, unless by the terms of the contract such a result is stipulated for, and with slight modifications such is still the rule under the Sale of Goods Act (§§ 39 and 48). The doctrine which generally obtains in the U. S. is as follows: "The vendor of personal property, in a suit against the vendee for not taking and paying for the property, has the choice ordinarily of either one of three methods to indemnify himself: (1) He may store or retain the property for the vendee, and sue him for the entire purchase price; (2) he may sell the property, acting as though for this purpose of the vendee, and recover the difference between the contract price and the price obtained on such resale; or (3) he may keep the property as his own, and recover the difference between the market price at the time and place of delivery and the contract price." (*Dustan vs. McAndrew*, 44 N. Y. 72.) Other remedies of the seller are discussed under *STOPPAGE IN TRANSITU (q. v.)*.

Buyer's Remedies.—These are an action for damages for breach of the seller's contract, or for *CONVERSION (q. v.)*, or for *SPECIFIC PERFORMANCE (q. v.)*.

Other topics connected with sales of personal and real property are presented in the articles on *DEED AND FRANCHISE (q. v.)* and *STATUTE OF (q. v.)*.

\$28,360,000, of which \$16,463,000 was on real estate; and the net debt, Jan. 1, 1895, was \$1,100,523. There are 7 national banks with combined capital of \$2,000,000, 2 savings-banks with combined deposits of \$12,000,000, and 8 mutual insurance companies.

Business Interests.—Salem merchants early established fishing industries; in 1670 sent vessels to the West Indies and Europe; and immediately after the Revolutionary war opened trade with China, India, Java, Sumatra, the Philippine islands, Arabia, Cape of Good Hope, Russia, South America, and other foreign parts. For many years the city was noted for its large foreign trade, and at one time had almost the monopoly of the East India and China trade; but it no longer has a foreign commerce. There is a large coasting trade, and an immense tonnage of coal is here landed for transshipment to interior cities. The manufactories comprise a cotton-mill with 160,000 spindles, a lead-factory, and several tanneries, machine-shops, and shoe-factories.

Notable Buildings.—There are a few buildings typical of the period of 1634-1700. The public library (established in 1889) contains 29,000 volumes; the Essex Institute (society established in 1848) has a library of 40,000 volumes, and 100,000 pamphlets on science, art, local history, and music, a large collection of historical relics and portraits, and the frame of the Puritan meeting-house of 1634; the Peabody Academy of Science has a museum of ethnology (including an East India marine museum dating from 1799) and zoölogy, and special collections of Essex County zoölogy, botany, and archaeology; and the Athenæum has a library of 20,000 volumes.

History.—Salem was settled by Roger Conant and the "Old Planters" in 1626. Endicott, with a second charter, came in 1628. Banished by the magistrates, against the wishes of his people, Roger Williams went from Salem to settle Rhode Island in 1636. In 1692, as the result of the witchcraft delusion in Salem village (Danvers), nineteen persons were hanged by order of the court, appointed by the royal governor, sitting in Salem. Here, too, the awakening first occurred, and in 1693 all convicted and accused persons were set free. In the Revolution the first provincial assembly sat here in 1774; the first armed resistance to British authority (Leslie's Retreat) occurred at the North bridge Feb. 26, 1775; and Salem furnished large numbers of troops and 158 armed privateers. The U. S. frigate *Essex* was built in Salem in 1799. In the war of 1812-15, 40 of the 350 American armed vessels went from Salem, and in the war of 1861-65 the city furnished 3,000 men and gave 200 lives to the Union cause. Pop. (1880) 27,563; (1890) 30,801.

JOHN ROBINSON.

Salem: city (founded in 1854); capital of Dent co., Mo.; on the St. L. and San Fran. Railway; 127 miles S. W. of St. Louis (for location, see map of Missouri, ref. 6-I). It is in an agricultural, stock-raising, and iron-mining region; and contains 7 churches, Salem Academy, 5 roller-process flour-mills, 3 steam planing-mills, several sawmills, 2 State banks with combined capital of \$40,000, and 4 weekly newspapers. Pop. (1880) 1,624; (1890) 1,315; 1895 estimated, 2,000.

EDITOR OF "MONITOR."

Salem: city; capital of Salem co., N. J.; on the Salem river, and the W. Jersey Railroad; 14 miles S. E. of Wilmington, Del., 34 miles S. W. of Philadelphia (for location, see map of New Jersey, ref. 6-B). It is in a rich agricultural region, has regular steamboat communication with Philadelphia, and contains 13 churches, high school, several public schools, Friends' School, public library (founded in 1804), 4 hotels, 2 national banks with combined capital of \$250,000, and 3 weekly newspapers. There are 6 canneries for fruit and vegetables, 3 iron-foundries, 3 manufactories of glass, machine-shops, mills, hosiery, and hollow-ware and oilcloth factories. Pop. (1880) 5,056; (1890) 5,516.

W. H. CHEW, EDITOR OF "STANDARD."

Salem: village; capital of Washington co., N. Y.; on the Delaware and Hudson Railroad; 25 miles S. of Whitehall, 41 miles N. E. of Troy (for location, see map of New York, ref. 4-K). It is in an agricultural, dairying, and slate-quarrying region, is a popular summer resort, and contains Washington Academy (opened in 1791), St. Paul's Hall (Protestant Episcopal, opened in 1885), Raleigh School, 2 national banks with combined capital of \$100,000, 2 weekly newspapers, cheese-factory, several mills, and railway repair-shops. Pop. (1880) 1,410; (1890) not separately returned; (1894) estimated, 1,400.

Salem: city (founded by Moravians in 1766); Forsyth co., N. C.; on branches of the Norfolk and Western and the Southern railways; adjoining Winston, the railway station and banking-place; 112 miles W. of Raleigh (for location, see map of North Carolina, ref. 2-F). It was the center of important movements in the early Indian and the Revolutionary wars, and was visited by Union and Confederate armies in the war of 1861-65. It is the seat of Salem Female Academy (Moravian, founded in 1802), which retains its original name, although it has become one of the leading colleges for women in the Southern States and has collegiate and post-graduate courses, schools of music, art, and languages, and commercial and industrial departments. The manufactories comprise cotton and woolen mills, tobacco-factories, and iron-works. Pop. (1880) 1,340; (1890) 2,711; (1894) estimated, 4,000 to 5,000. JOHN H. CLEWELL.

Salem: city; Columbiana co., O.; on the Salem and the Penn. railways; 70 miles W. of Pittsburg, Pa. (for location, see map of Ohio, ref. 3-J). It contains 7 churches, 3 graded public schools, a public high school, 2 national banks with combined capital of \$300,000, 2 private banks, 2 daily and 2 weekly newspapers, and manufactories of machinery, engines, sheet-iron, church-organs, wire nails, pumps, stoves, furniture, and other articles, art-works, church-furniture works, tile-works, and brick-works. Pop. (1880) 4,041; (1890) 5,780; (1893) 7,320. EDITOR OF "DAILY NEWS."

Salem: city; capital of the State of Oregon and of Marion County; on the Willamette river, and the Southern Pac. Railroad; 53 miles S. of Portland (for location, see map of Oregon, ref. 3-C). It is in an agricultural and fruit-growing region; is laid out with streets 100 feet wide, and blocks 330 feet square, with 16-foot alleys; and is one of the handsomest cities on the Pacific coast. It has communication with Portland twice a day by railway and once a day by steamboat. Water for manufacturing purposes is brought to the city from the Willamette and Santiam rivers by a canal 18 miles long. In 1890 over \$1,000,000 was invested in manufacturing industries, which included several large flour-mills, a woolen-mill, foundries and machine-shops, tanneries, tobacco-factories, plants for fruit-drying and canning, carriage and wagon factories, brick-kilns, and agricultural-implement works. The city contains 2 public parks, 20 churches, a public high school and 5 grammar schools, a State, a Masonic, and 2 educational libraries, Willamette University (Methodist Episcopal, opened in 1844), the Academy of the Sacred Heart (Roman Catholic, opened in 1860), a Friends' Institute (opened in 1892), 2 national banks with combined capital of \$175,000, an incorporated bank, 2 private banks, and 4 daily, 4 weekly, and 2 other periodicals. The reformatory and charitable institutions comprise the State Penitentiary, Reform School, Deaf Mute School, Institute for the Blind, Insane Asylum, and Orphans' Home. The city is an important business center, and is very progressive. A Methodist mission was established 9 miles below the present city in 1834; the city was incorporated in 1853, and became the State capital in 1860. Pop. (1880) 2,538; (1890) 4,515; (1895) estimated, 15,000.

S. T. RICHARDSON.

Salem: town; capital of Roanoke co., Va.; on the Roanoke river, and the Norfolk and Western Railroad; 60 miles W. by S. of Lynchburg, 180 miles W. by S. of Richmond (for location, see map of Virginia, ref. 6-E). It is in an agricultural and tobacco-raising region, is the seat of ROANOKE COLLEGE (*q. v.*), has good water-power, and contains a graded public school, a national bank with capital of \$75,000, a State bank with capital of \$67,300, a loan and trust company with capital of \$50,000, and a weekly and a monthly periodical. Pop. (1880) 1,759; (1890) 3,279.

Saleratus: See SAL AERATUS.

Saler'no: chief town of the province of Salerno, Italy; 33 miles by rail S. E. of Naples, on the Gulf of Salerno (see map of Italy, ref. 7-F). The chief object of interest is the old Norman cathedral (1084), injuriously restored in 1768, but still the most imposing specimen of Norman architecture in Southern Italy, and containing, besides rich marbles and mosaics, twenty-eight magnificent granite and porphyry columns from the temples of Paestum. Tradition asserts that the body of St. Matthew was brought from the East in 930 and deposited in the crypt of the cathedral. Salerno was originally a Roman colony; it became the capital of a principality in the ninth century, and in 1077 it was taken by Robert Guiscard, who made it his capital. The

most famous of medical salarins was its substituted medical salar. For great reputation due to it during many centuries exceeds that of all other salarins. The *salars salarins*, a set of hyaline tubes drawn up in Lat. in a clear solid in the twelfth century, and dedicated to the king of England, was translated into many European languages, and published in numerous editions soon after the invention of printing. The *Salars*, a still earlier medical work, also translated from Salars, and was widely circulated throughout Europe. Pop. of the community (1900) about 10,000.

Translated by M. W. HARRINGTON.

Salars, Pigeons de: See Pigeons or Squares.

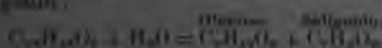
Salars (or) Pigeons de: a group of about 30 small islands, located in the S. of the island of Celebes in the East Indies, some, 300 sq. miles, pop. 17,000, consisting of Macassar, Malaya, ruled by native chiefs, but subject to the Netherlands. *Salars*, sugar, pepper, and nutmeg are produced; also maize and *Salars* (a kind of millet), but not rice. Several of the islands are of volcanic origin. The islands, both small and large, abundant.

Salars (city), in Lancashire, England, on the west bank of the Irwell, some 10 miles from Manchester. It is practically one town with Manchester (q. v.) on the east bank of the Irwell. It is connected with Manchester by 10 bridges as well as by several railway viaducts. Salars covers an area of 7 sq. miles, has 4 public parks, 4 public libraries, and a museum. It returns three members to Parliament. Pop. (1904) 203,320.

Salars: See Pigeons.

Salars (or) Salars (or) Salars: See Wines or Pigeons.

Salars (or) Salars (or) Salars: a bitter crystalline principle contained in the bark of all the willows and of some poplars. Its composition is $C_{17}H_{15}O_5$. It has no alkaline properties, like quinine, strychnine, and some other crystalline bitter principles, but is a glucoside. By the action of hot dilute acids or of the ferment *Kaibin* (q. v.) or *zymase*, it breaks up into glucose and another compound called saligenin.



Salars has valuable medicinal virtues in the treatment of rheumatism, though much less efficient than quinine.

Salars Law (named of Lat. *Salars* [Salars]), the law of the Salars, who established a Frankish kingdom in Gaul in the fifth century, especially that provision of the Salars which prevents women from inheriting any landed estate which is not an acquired but inherited possession in the family. This principle was accepted in France in the centuries between Edward III. and Philip of Valois with respect to the inheritance of the crown; and in Spain, where previously the Visigothic law provided recognizing the succession of women, it was introduced by the Visigoths, Philip V. in 1763, and abolished by Ferdinand VII. in 1809 in favor of his daughter Isabella. In accordance with a similar law the crowns of Great Britain and Hanover became separate in 1767. See *Salars*; the Ten Texts with the *Salars* and the *Salars* (London, 1890).

Salars (or) Salars (or) Salars: a benzene and para-substituted acids have the same formula; an organic acid existing in the flowers of *Spiraea ulmaria*, and in combination as acid methylsalars, forming the essential oil of *Spiraea* (*Spiraea ulmaria*).

Salars: It was discovered by Piria in 1838, who formed a crystalline salars (essential oil of *Spiraea ulmaria*) with osmotic acid; in 1844 Cahours obtained it from oil of *Spiraea*; and in 1850 Kuhn and Lautermann discovered the mode of making it from phenol (carbolic acid). In 1875 Kuhn modified and improved his original process for the manufacture from phenol, and thereby discovered the method as much that it could be brought into use in medicine and as an antiseptic. Some chemists—Piria, Pinner, and the Germans—have made experiments with it, in which they used in preparing the salts made for it as an antiseptic, and J. Wismuth, a, *prakt. Therapie*, 1875, Heft, 9, 2 and 4.

Salars: Salars acid may be obtained in several ways—(a) by treatment of salars with an oxidizing agent, like osmotic acid; (b) by fusing salars with osmotic acid; (c) by heating oil of wintergreen with strong potash, or oil with osmotic hydrazine acid; (d) by heating a mixture of salars and osmotic potash to 300°; (e) by treating salars (carbolic acid) with sodium and carbon dioxide,

(f) with sodium and methylchlorosulfonate, (g) with acid potassium permanganate, or (h) with osmotic acids, the mixture being heated and carbon dioxide passed into it.

Preparation:—Piria's, salars acid is made from oil of wintergreen or from phenol. In making it from the former the oil is simply heated with strong potash fire until methyl alcohol ceases to be evolved. The resulting product is potassium salarsate, from which hydrochloric acid precipitates salarsic acid. This is filtered off, washed, and purified by dissolving and recrystallizing from alcohol. To prepare it from phenol, the phenol is dissolved in osmotic acid, the exact equivalence of each being used (an excess of one or the other having a considerable effect on the yield obtainable) and the solution is evaporated to dryness. The mass is then placed in a retort and heated gradually, and a current of carbon dioxide passed through it at a temperature between 180° and 140° C. under pressure; or, better, the sodium compound of phenol is mixed with liquid carbon dioxide at a low temperature in an osmotic acid heated in the temperature 120 to 140° C. The mass left in the retort consists of osmotic salarsate, which is dissolved in water and precipitated by hydrochloric acid. It is usually brownish, on account of a osmotic impurity, which may be more or less perfectly removed by resolution and recrystallization or passing the solution through boneblack.

Properties and Uses:—Salarsic acid, when pure crystallizes in white four-sided prisms, which fuse at 135°-140° C. It has a sweetish-sour taste, reddens litmus strongly, is slightly soluble in cold water (in proportion of 1 part to 1,000 of water), more so in hot, still more so in alcohol, ether, and oil of turpentine. Its heating with strong hydrochloric or hydrochloric acid or with dilute sulphuric acid it decomposes into phenol and carbonic acid. It is a dibasic acid, forming acid and neutral salts. In very small quantities it acts as an antiseptic, and experiments have shown its efficiency in preserving skins, hair, milk, eggs, and other articles of food from the changes which unfit them for use. It can not, however, be used for milk and butter, as it gives them a peculiar taste. Experiments in the preservation of meat gave unsatisfactory results. Its action as a disinfectant is not so powerful as that of carbolic acid. When acting as an antiseptic it appears to undergo no chemical change. Its salts have no disinfecting or antiseptic properties. On account of its being odorless and less irritating than carbolic acid, and not poisonous, it has been used with advantage in surgical treatment, where it can be used for every purpose for which carbolic acid is used, except for the cleaning of instruments. In medicine, salarsic acid is used as an antipyretic, and as an internal factor as antiseptic in cases of diphtheria. The dose is from 7 to 45 grains. It is frequently dispersed in solutions of alkaline phosphates, in which it is more soluble than in pure water. Its use has been proposed in the manufacture of glue, leather, etc., of perfumery, and as a dye in connection with iron salts, with which it gives a fine purple. It has been used with great success as a remedy in the case of certain diseases that affect bees. It has come into extensive use in the manufacture of dyestuffs. Certain azo-colors obtained by its use are much prized as yellow and orange dyes.

Revised by I. A. HENNES.

Salars: city, Chaffee co., Col.; on the Denver and Rio Grande Railroad; 56 miles W. of Canon City, 97 miles N. by W. of Pueblo (for location, see map of Colorado, ref. 4-12). It is in a region in which gold, silver, copper, lead, and iron are mined, and marble, quartz, and lime are quarried; has large stock-raising interests; and contains 6 churches, the Rio Grande General Hospital, extensive railway shops, a public high school, Salars Academy (Presbyterian, opened in 1904), a national bank with capital of \$50,000, and a semi-weekly, a weekly, and a monthly periodical. Pop. (1900) not in census; (1900) 2,596; (1904) estimated, 3,500.

Entered by "Man."

Salars (or) Salars (or) Salars: a genus of *Batrachia*, pres. part. of *Salars*, leap; that order of *Batrachia* (q. v.) which contains the frogs and toads, and which, from the fact that in the adults the tail is lacking, is better known as *Anura*. In the larval (tadpole) stage gills and tail are present, while legs are absent. With growth the gills and tail are absorbed (the tail is not dropped as is often supposed), and the legs grow out, the fore legs being the first to form, although owing to the fact that they are covered by a fold of the skin they do not appear until after the hinder pair. With the loss of the gills the lungs begin to function, and these are supplemented by the skin. In the

adult the following skeletal peculiarities may be mentioned: Ribs as a rule are lacking, their place being taken by the transverse processes of the few (usually ten) vertebrae. The caudal vertebrae have been replaced by a bony rod (urostyle). The skull is very complex; the ethmoid bone is in the shape of a girdle (*os en ceinture*) around the cerebrum, and the quadrato-jugal arch is usually complete. Teeth never occur in the lower jaw, and they may be lacking from the upper one. Pectoral and pelvic girdles are always present, and the two halves of the former may either be firmly united or they may play one over the other, differences seized upon by Prof. Cope to divide the otherwise homogeneous order into two subdivisions. The skin is naked (i. e. without plates or scales), but it is not infrequently "warty," from the presence of large defensive glands which secrete an acrid fluid. In all except a few tropical forms a tongue is present, and is used in capturing the prey, which consists to a large extent of insects.

Some of the *Salientia* are aquatic (frogs), some (toads) are terrestrial, going into the water only for the purpose of oviposition in the spring, and still others (tree-toads) live in trees and bushes, and have the tips of the toes modified into sucking-disks to insure a firm hold upon the branches upon which they dwell. All of the *Salientia* have vocal organs, but these are most exercised at the time of reproduction. Most interesting are some of the reproductive habits. The eggs are laid in gelatinous strings or masses, usually deposited freely in the water. In the case of the obstetrical toad of Europe the male wraps the egg-strings around himself. In the members of the genus *Nolotrema* of South America the skin of the back becomes folded into a sac in which the eggs are carried until hatched. In the Surinam toad (*Pipa*) the eggs are received upon the back of the male, the skin of which grows up around the separate eggs until each is inclosed in a cup and covered with a lid of skin. In these cups the eggs develop until they have obtained the adult form, when they escape to begin free life.

None of the *Salientia* is marine. Their great home is in the tropics. The typical toads are especially developed in tropical America, Africa, and Asia; the true tree-frogs and related forms are most abundant in Australia and tropical America; and the typical frogs are most numerous in tropical Asia and Africa, while they are entirely excluded from Australia. Comparatively little is known of their geological history, but frogs and toads have been found in the Upper Eocene of Europe.

LITERATURE.—Ecker, *Anatomie des Frosches* (1864-82); Boulenger, *Catalogue of the Batrachia Salientia in British Museum* (London, 1882); Cope, *Batrachia of North America* (1889). J. S. KINGSLEY.

Saligenin: See SALICIN.

Salina: city; capital of Saline co., Kan.; on the Smoky Hill river, and the Atch., Top. and S. Fé, the Chi., Rock Is. and Pac., the Mo. Pac., and the Union Pac. railways; 47 miles W. of Junction City, 118 miles W. of Topeka, the State capital (for location, see map of Kansas, ref. 5-G). It derives power for manufacturing from the river, has 5 grain elevators, flour-mills, paper-mills, and planing-mills, foundry and machine shops, gas, water, and electric-light plants, and street-railways, and contains 16 churches, 5 public schools, Kansas Wesleyan University (Methodist Episcopal, chartered in 1885), Normal University, St. John's School (Protestant Episcopal), 3 national banks with combined capital of \$250,000, a State bank with capital of \$50,000, and a daily, 5 weekly, and 3 monthly periodicals. There are valuable salt-springs and gypsum-quarries in the vicinity. Pop. (1880) 3,111; (1890) 6,149; (1894) 5,541.

EDITOR OF "REPUBLICAN JOURNAL."

Salina Group: an American geological formation of Upper Silurian age, otherwise known as the Onondaga salt group. It consists of red and green shales and impure limestone, containing large masses of gypsum, and is best developed in Central New York, where it is about 1,000 feet thick and forms an east-and-west belt averaging about 10 miles broad, passing through Syracuse. It is the source of brine from which 8,000,000 to 12,000,000 bush. of salt are made annually. I. C. R.

Salinan Indians: a linguistic stock of North American Indians deriving its name from the Salinas river, California, in the main and tributary valleys of which, in Monterey and San Luis Obispo Counties, they formerly resided. It is represented by a single known tribe, the Chalone, whose villages were Aspasniagan, Chulare, Ekriagan, Eslanagan, Gocharone, Ichenta, and Yumanagan. These settlements supplied the

neophytes of the missions of San Antonio and San Miguel, established by the Spanish padres in 1771 and 1797 respectively. A large proportion of the natives connected with the Soledad mission, founded in 1791, also belonged to this family, and some of the Aspasniagan were neophytes of the mission of San Carlos.

In their general habits and customs the Salinan Indians resembled the Costanoan, Esselenian, Mariposan, and other southern Central California tribes. By Galiano, in 1792, they were described as of medium size, dark color, and as being the ugliest and filthiest of the natives of America. They led in part an agricultural and pastoral life. Their houses were circular and were constructed of stones or adobes and roofed with thatch.

Though the San Antonio and San Miguel tribes were probably never very populous, the missions bearing those names when first established contained respectively 1,400 and 1,200 Indians. In 1884 only a dozen Indians of the Salinan group were known to survive.

AUTHORITIES.—D. A. Galiano, *Viaje por las goletas Sutil y Mexicana en 1792* (Madrid, 1802); Alexander S. Taylor, *Indianology of California*, in *California Farmer* (San Francisco, 1860-63); H. H. Bancroft, *History of California*, vols. i.-vii. (San Francisco, 1884-90); H. W. Henshaw, *Missions of California*, in *Popular Science Monthly* (Aug., 1890); J. W. Powell, *Indian Linguistic Families*, seventh report Bureau of Ethnology (Washington, 1891). See INDIANS OF NORTH AMERICA. F. W. HODGE.

Salinas: city; capital of Monterey co., Cal.; on the Southern Pacific Railroad; 94 miles S. E. of San Francisco (for location, see map of California, ref. 9-C). It is in an agricultural, stock-raising, and wool-growing region, and has 6 churches, a public high school, 2 State banks with combined capital of \$420,000, 2 agricultural-implement factories, electric lights, and 2 daily and 2 weekly newspapers. Pop. (1880) 1,854; (1890) 2,339; (1895) estimated, 3,500.

EDITOR OF "JOURNAL."

Salineville: village; Columbiana co., O.; on the Penn. Railroad; 80 miles S. S. E. of Alliance, 63 miles W. N. W. of Pittsburg (for location, see map of Ohio, ref. 8-J). It is in a coal-mining region, and contains a private bank and a weekly newspaper. Pop. (1880) 2,302; (1890) 2,369.

Salinometer: a form of HYDROMETER (*q. v.*) for measuring the amount of salt in a given solution.

Salisbury: sawlz'berry, or New Sarum: capital of Wiltshire, England; in a valley near the confluence of the Avon, Bourne, Wilf, and Nadder; 84 miles W. S. W. of London (see map of England, ref. 13-H). It has a magnificent cathedral, which is the purest and richest specimen of the Early English style. The main building was constructed 1220-58 in the form of a double cross. The cloisters and chapter-house were added in 1270, and the spire, the highest in England (400 feet), was erected about 1330; it leans over 2 feet toward the S. It is 449 feet long and 81 feet high in the interior; the length of the great transept is 203 feet. It was much damaged by injudicious restoration (1782-91), but this has been considerably remedied by a restoration begun by Sir Gilbert Scott in 1863, and continued afterward by Street and Sir Arthur Blomfield. Old Sarum (*Sorbidunum*), in Roman times a camp of importance, stood about a mile N. of the present city. It consists of a conical hill encircled with intrenchments. Salisbury returns one member to Parliament. Pop. (1891) 17,362. R. A. ROBERTS.

Salisbury: township (settled about 1720, organized in 1740); Litchfield co., Conn.; on the Housatonic river, and the Phila., Reading and New Eng. Railroad; 63 miles N. W. of Hartford (for location, see map of Connecticut, ref. 7-D). It contains the villages of Salisbury, Lakeville, and Lime Rock, 7 churches, public schools, kindergartens, a parochial school, Scoville Memorial Library, Connecticut School for Imbeciles, St. Mary's Convent, Hotchkiss School, a savings society, and a private bank. It is picturesquely located and has 6 large lakes and a variety of mountain scenery. Salisbury contains iron mines (yielding the widely known Salisbury ore), blast furnaces, car-wheel works, and cutlery and cutlery-handle factories. The assessed valuation of the township is about \$1,800,000. Pop. (1880) 3,715; (1890) 3,420; (1895) estimated, 3,500. DONALD T. WARNER.

Salisbury: town; capital of Wicomico co., Md.; on the Wicomico river, and the Balt. and E. Shore and the N. Y., Phila. and Norfolk railways; 95 miles S. E. of Annapolis, the State capital, 140 miles S. E. of Baltimore (for location,

discovered. The parotid has one large duct, the duct of Steno; the sub-maxillary, the duct of Wharton; the sublingual—from eight to twenty minute ducts opening independently beneath the tongue—the ducts of Rivinius; and a few uniting to form a single duct, the duct of Bartholine, which joins that of Wharton. These ducts, their branches, and the interior of the glands are lined with epithelial cells. The process of secretion, more or less constant, is most active during the mastication of food; then saliva is abundantly formed and poured into the mouth. The salivary glands are the seat of disease—mumps or parotiditis, a specific inflammation (see MUMPS) of the parotid; inflammation and abscess of the parotid in low fevers; deposits of diphtheritic infiltration in some cases of that disease; not infrequently concretions of chalky matter form in the glands.

Revised by W. PEPPER.

Salivation [from Lat. *saliva'tio*, deriv. of *salivare*, *saliva'tus*, to spit, salivate, deriv. of *saliva*]: a specific irritation of the salivary glands, mouth, and throat. Though most frequently due to mercury, it may be caused by other drugs, as iodine, and may occur in certain diseases. In former years mercury, in heroic doses, ranked as a remedy second only to bloodletting. Salivation, though now rare, was then a frequent occurrence—intentionally produced in many cases, in others the accidental result of large doses and individual susceptibility. Children will endure large doses of mercurials without salivation; adults are relatively susceptible. An active state of the skin, kidneys, and bowels, and a healthy state of the mouth, favor immunity from salivation, even when the mercurial taken is considerable; reversely, if opium or any remedy which checks the functional excretions be taken before or at the same time, even small doses of mercury may salivate. Salivation is manifested by a coppery or metallic taste, by soreness of the gums, tenderness of the jaws and teeth when pressed together or closed with force, excessive secretion and flow of saliva, even dribbling from the mouth; swollen, red, ulcerated gums; swollen, coated, salivary tongue, taking the imprint of the teeth; and a foul "mercurial" breath. In grave cases, spongy, bleeding, sloughing gums, loosened teeth, swelling of the face and neck, and even gangrene of the mouth, may result. There is accompanying constitutional depression, fever, pain, and sleeplessness.

Revised by W. PEPPER.

Sal'lust (*Gaius Sallustius Crispus*): historian; b. 86 B. C. at Amiternum, in the country of the Sabines, of a wealthy plebeian family; elected *tribunus plebis* in 52; expelled from the senate in 50 by the censors on account of the dissipated and scandalous life he led; reinstated in the senatorial dignity in 49 by being elected *quaestor* by the aid of Caesar, to whose party he belonged, and whom he as *praetor* accompanied to Africa in 46; was appointed proconsul of Numidia, and returned to Rome loaded with riches; formed the magnificent *Horti Sallustiani* on the Quirinalis, and lived in luxurious retirement, devoting himself to the study of history. D. at Rome, 34 B. C. Of his *Historiarum Libri Quinque* only fragments are extant, but his *Bellum Catilinarium* and *Bellum Jugurthinum* have been preserved, and are much appreciated. Editions by Gerlach (8 vols., Basel, 1823-31), Dietsch (2 vols., Leipzig, 1859), Kritz (3 vols., 1828-53); English translations by Sir H. Stuart (1806), by Watson (1852), and by J. R. Mongan (1864). New fragments of the histories were discovered in 1886 by E. Hauler in an Orleans palimpsest; see *Wiener Studien* (viii., p. 315, and ix., p. 25), and the edition of H. Jordan (Berlin, 1887); also *Sallusti historiarum reliquiae*, ed. B. Maurenbrecher (fasc. i., Leipzig, 1891; fasc. ii., 1893).

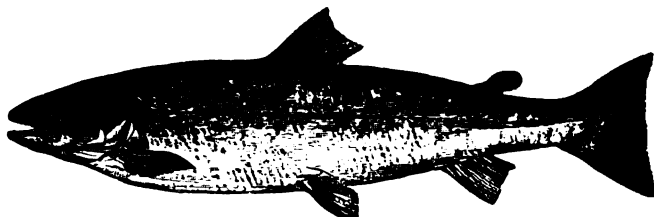
Revised by M. WARREN.

Salma'sius, CLAUDIUS (*Claude de Saumaise*): classical scholar; b. at Semur-en-Auxois, Côte-d'Or, France, Apr. 15, 1588; studied at Paris and Heidelberg; embraced Protestantism; was appointed professor at the University of Leyden in 1631. The ambition of his wife, theological controversies, and above all the scandal caused by his *Defensio regia pro Carolo I.* (1649), which called forth the memorable reply of Milton, induced him to accept a flattering invitation from Queen Christina of Sweden (1650). The climate did not agree with him, and the inhabitants of Leyden urged him to return, because "their university could as little be without him as the universe without the sun." He left Stockholm in 1651, but died Sept. 3, 1653, at Spa. Salmasius is one of the great encyclopaedists of his time, the

high esteem in which he was held being well attested by Balsac's famous saying, "Non homini sed scientiae deest quod nescivit Salmasius"; but, unlike his illustrious contemporaries, Scaliger, Casaubon, and Lipsius, his immense erudition was not kept under control, and in consequence his numerous works present a confused mass of learned detail, accumulated without regard to methodical arrangement and clearness of exposition. As a text critic, Salmasius never occupied any high rank. In 1606 he discovered in Heidelberg the Greek *Anthology* of Kephala, only the so-called *Anthologia Planudea* having been known up to that time. His most famous works are his *Plinianae exercitationes in Solinum* (1629) and a critical edition of the *Scriptores Historiae Augustae* (1620), to which may be added the learned treatises *De lingua hellenistica* (1643), *De usibus*, and *De re militari Romanorum* (1657). See Fr. Crüzer, *Opuscula II.* (pp. 65-75); Saxe, *Onomasticon IV.* (pp. 1888 fl.).

ALFRED GUDEMAN.

Salmon [viâ O. Fr. from Lat. *sal'mo*, *salmo'nis*, salmon; cf. *sal'ire*, to leap]: a name given to several species of the genus *Salmo* of the Atlantic, characterized by anadromous habits (that is, by their ascending from the sea into fresh waters to breed), as well as to the species of the genus *Oncorhynchus* of the Pacific. The species belonging to the genus *Salmo* have only about eleven rays to the anal fin,



The Atlantic salmon.

while those of the genus *Oncorhynchus* have fourteen to eighteen. All of these agree essentially in habits. Their natural home is the salt water, for there they obtain their food and rapidly increase in size; toward autumn they ascend rivers, as near as possible to the source, to spawn. During their sojourn in fresh water they almost entirely abstain from food and alter considerably in appearance; this divergence from the normal form is most apparent in the male. The snout becomes attenuated and more or less hooked, and the lower jaw is modified in a similar manner; the body becomes emaciated, and the skin decked with glowing hectic colors. In the salmon of Europe and Eastern America this is temporary, and the males in considerable proportion descend to the sea, revive, and assume their pristine vigor and form. Some of the species of the genus *Oncorhynchus* of the Pacific coast become so abnormally developed that after spawning they die, and their carcasses are left by myriads in the waters they have traversed.

Salmo salar is common to the cold waters of Europe and North America. In the U. S. it is nowhere abundant except in some rivers of Maine, although in British America there are a number of streams in which it is found in large numbers. It is generally believed that in former times, and when the country was discovered by Europeans, the species was found farther S., and Hendrik Hudson, in the journal of his ascent of the river which bears his name, records "great stores of salmon in the river." It is tolerably certain, however, that the fish called by him *salmon* was the weakfish (*Cynoscion regalis*), of the family *Scorpaenidae*, having no relation to the *Salmonidae*. The salmon-rivers of Canada are controlled by the Government and let for private use.

The extreme young is banded, and also has red spots. In this state it was long known under the name of *parr*, and supposed to represent a distinct species of the family. Other names are samlet, salmon-fry, and pink. When about a year old, and when the spots have disappeared and it becomes of a bright silvery color before going to the sea, it is called a *smolt*; after its return from the sea into fresh water it is designated as a *grilse*; and finally, on its second return from the sea, it is known as a *salmon*.

Oncorhynchus quinnat is the common salmon, king-salmon, or quinnat, of California and farther N.; it is a much deeper fish than the Eastern species, and is, further, at once distinguishable by the greater number of anal rays—fifteen or sixteen generally. This species will live and flourish in much

warmer waters than the Eastern species, and Atlantic herring have been made to reproduce in the streams of the Eastern U. S. It has also been attempted, on a small scale, to introduce the Atlantic species into Pacific waters. The humpback (*Oncorhynchus*) and the humpback (*O. tshawytscha*) are also commercially important. An extensive business has been developed in the catching of these salmon, and this is conducted on a large scale on the Columbia River and in Alaska. The natural food salmon-fishing, see *FISHING*. See also *FISH-CULTURE* and *FISH-TRADE*. Revised by J. N. KENNEDY.

Salmon, George D. D. (mathematician and theologian); b. in Berlin, Prussia, Sept. 22, 1818; was educated in Trinity College, Berlin, and graduated in 1839; became a fellow in 1841; took orders in 1844; was made Regius Professor of Theology in 1850, and was appointed provost of Trinity College in 1855. He is a fellow of the Royal Society, has obtained honorary degrees from Oxford, Cambridge, and Edinburgh Universities, and is a correspondent of the academy of Berlin and Copenhagen, and of the Institute of France. Besides a number of memoirs in the mathematical journals, he has written treatises on *Linear Systems*, *The Higher Plane Curves*, *Modern Higher Algebra*, and *The Geometry of Three Dimensions*. These have passed through many editions and have been translated into the principal European languages. In theology Dr. Salmon has written *Calculus of Numbers* (1860); *The Origin of Law* (1870); *Non-spiritualism Christianity* (1880); *Tradition and Apostolicity* (1887); *Introduction to the New Testament* (4th ed. 1899); and *Infidelity of the Church* (1899). H. A. ROBERTS.

Salmon, STEWART DENWALL, PORTER, D. D. (scholar); b. at Aberdeen, Scotland, June 22, 1829; educated at the University and Free Church College of Aberdeen and University of Erlangen, Bavaria; Assistant Professor of Greek in the University of Aberdeen 1861-64 and examiner in classics 1864-67; minister of the Free Church, Barry, Aberdeenshire, 1865-76; since 1876 Professor of Systematic Theology and New Testament Exegesis in Free Church College, Aberdeen. Besides contributing frequently to periodicals, Dr. Salmon translated with notes for the Antislavery Library the writings of Hippolytus (Edinburgh, 1865-66); *Johns Africanus, Trigonometry*, and minor works (1868); *Thaumatopagus, Dionysius of Alexandria*, and *Proclus* (1871); two volumes of *Augustine's Works* (1875), all the above revised and reissued in New York; *Commentaries on the Epistle of Peter in Schaff's Popular Commentary* (Edinburgh and New York, 1884); *Commentary on the Epistle of Jude in Schaff's Commentary* (London and New York, 1889); edited the *Bible Class Primers*, for which he wrote *The Life of the Apostle Peter*, *The Shorter Catechism*, *The Life of Christ*, *The Parables of our Lord*, *The Christian's Prayer*, *The Sabbath* (Edinburgh, 1890-91); wrote *The Christian Doctrine of Immortality* (Edinburgh, 1892); since 1891 has been editor of *The Critical Review of Theological and Philosophical Literature* (Edinburgh).

C. K. HAYS.

Salmon'sons (in Gr. *Salmonidae*): in Greek mythology, one of those the founder of the Salmon race. He emigrated from Thessaly to Elis, where he founded the city salmon. He founded himself the equal of Zeus, usurped his functions, and attempted to imitate the thunder and lightning. He was therefore slain by the bolt of Zeus, who also destroyed Thessaly. J. R. S. S.

Salmonidae (Mod. Lat., named from *Salmo*, *Salmon*, the typical genus from Lat. *sal* and *salmon*). See *SALMON*. One of the most important families of fishes, containing the salmon, trout, whitefish, etc., alike famous for their game and for their food qualities. All have an elongated, fusiform body covered with moderate or small cycloid scales, and having a distinct lateral line. The head is covered by cartilaginous bony plates, and is covered with a naked skin. The upper jaw is composed of inter-maxillary and pre-maxillary bones, and the teeth are large and conical in the *Salmonidae*, small or wanting in the whitefishes (*Coregonidae*). The branchiostegial rays are numerous, and *scaphocephalus* are present. The true dorsal fin is at about the middle of the body, and a small adipose dorsal occurs posteriorly. The caudal fin is square or truncate at the end, with a serrated edge. The stomach is splanchnic and 15 to 200 pyloric sacs are present; the large simple air-bladder is connected with the alimentary canal. No viducts are present, but the eggs are discharged into the body cavity, from which they are drawn out through the pores genitalia.

The family name salmon contains about eighty species ar-

ranged in ten genera, of which *Salmo*, *Oncorhynchus*, *Salvelinus*, and *Coregonus* are the most important. The first three mentioned form the *Salmonidae* of the older authors, and contain the forms commonly known as salmon, trout, and charr, the limitations of the genera being upon minute characters, and those of the forms to which the common names are given extremely vague. The genus *Oncorhynchus* includes the Pacific coast salmon, five species in all. The genus *Salmo* includes the salmon of Europe and Eastern North America, and the true trout as well, while *Salvelinus* contains the subspotted trout or char. *Oncorhynchus* and *Salmo* agree in most features, notably in having the whole vomer covered with teeth while they differ in that *Salmo* has fourteen or less rays in the anal fin, while in the Pacific salmon the number is greater than fourteen. *Salvelinus*, of which the brook-trout of North America may be taken as an example, has teeth only on the head of the vomer. Those members of the genus *Salmo* which normally live in fresh water are the true trout. J. N. KENNEDY.

Salmon-trout: See *TROUT*.

Salmon-Salm, PAUL, PRINCE (soldier); b. at Anhalt, Prussia, Dec. 29, 1829; educated at the cadet school in Berlin; became an officer in the Prussian cavalry, and subsequently served in the Austrian army; served in the U. S. army during the civil war; was at one time in command of a regiment, and afterward post-commander at Atlanta, Ga., with the rank of brigadier; went to Mexico at the close of the war; became aide-de-camp and chief of the household to the Archduke Maximilian, with whom he was captured at Querétaro; was released soon after the execution of the latter; entered the Prussian service as major of the Fourth Regiment of grenadiers of the royal guard, and was killed at the battle of Gravelotte, France, Aug. 18, 1870.—He married, in 1862, Miss ANNE-LE CLERCQ, a native of Belgium and an actress by profession. She accompanied him in Mexico, and acquired celebrity by her heroic efforts to procure the pardon of Maximilian or to effect his escape. She accompanied her husband during the Franco-German campaign up to his death. She published portions of her own and of her husband's diaries in Mexico, and issued in 1875 an interesting volume, *Ten Years of My Life*.

Saloff, BASILE, DE (civil engineer); b. in Russia, Oct. 21, 1819; graduated in 1838 from the Institute of Ways of Communication, and entered directly the Russian Corps of Engineers of Ways of Communication; was engaged upon the construction of the railways of the Grande Company until 1852; was then sent abroad and took the course at the Ecole des Ponts et Chaussées in Paris. From 1853 to 1871 he was Professor of the Course of Signals in the Institute of Ways of Communication; in 1872 became president of the technical commission on railways; in 1873 councillor of state and member of the jury of the Universal Exposition of Vienna; in 1877 was elected director of the Grande Company of Russian Railways and president of the Maritime Canal of St. Petersburg, which position he held until the completion of the canal in 1885. In 1887 he became director-general of railways; in 1889 member of the councils on railways and of the council of engineers.

WILLIAM R. HUTTON.

Salol: a substance sometimes called the salicylate of phenol, introduced into medicine in 1896. It is a compound of salicylic and carbonic acids in the proportion of 60 per cent. of the former to 40 per cent. of the latter. It occurs as a white, crystalline powder, with a faint odor and a slightly soapy taste, and when taken in the body is not dissolved in the stomach, but in the alkaline pancreatic juices of the duodenum. It has been used in the treatment of rheumatism and allied affections with some success, and also as an intestinal antiseptic in cholera and other disorders of the alimentary canal. H. A. HARE.

Salomon', LOUIS ÉTIENNE FÉLIX (general and politician); b. at Aux Cayes, Haiti, 1826. He was a Negro; was one of Soulouque's ministers, and commanded his army from 1855 to 1859, when Soulouque was deposed and Salomon fled from the island. After various attempts to incite revolts he returned to Haiti in 1879, and was elected president, governing until Aug., 1899, when he was deposed by a revolution. The republic during this period was unusually prosperous. D. in Paris, Oct. 19, 1899. H. H. S.

Salomon Islands: See *SALOMON ISLANDS*.

Salona: the ancient capital of the Roman province of Dalmatia, and a city of great importance in both commercial

and military respects. The Emperor Diocletian was born here, and 3 miles to the S. W. he built in 303 A. D. the famous palace, covering 8 acres, to which he retired after his abdication. The city and the palace were destroyed in 641 by the Avars, but on the site of the palace and out of its ruins arose the modern town of Spalato—*Salonæ Palatium*. See SPALATO. Revised by M. W. HARRINGTON.

Salonî'ca [Turk. *Selanik*, anc. *Θεσσαλονίκη*, Thessalonica, whence the modern name]: city; capital of the Ottoman vilayet of Salonica, which nearly corresponds to the ancient Macedonia (see map of Turkey, ref. 4-B). It occupies a most advantageous site on the *Ægean*, rising amphitheatrically on Mt. Kortiasch from the northeast shore of a fine harbor of the Gulf of Salonica. It was rebuilt on the site of a city named Therma by Cassander, who named it Thessalonica in honor of his wife, the sister of Alexander the Great; after the battle of Pydna (168 B. C.) it became capital of the Roman province of Macedonia; 15,000 citizens were massacred by order of Theodosius (390); it was pillaged by the Saracens (904); taken by the Marquis of Montferrat (1204), who founded the empire of Salonica; and conquered by the Ottomans (1430). The massacre of two foreign consuls by a Mussulman mob on May 6, 1876, contributed to bring on the Russo-Turkish war. As the chief station on the Via Egnatia, which connected the eastern provinces with Rome, it was to St. Paul a center for the dissemination of Christianity, and to it he addressed two epistles. It was called for centuries the Orthodox City, and was largely instrumental in the conversion of the Bulgarians and Slavonians. Along its narrow and crooked streets many architectural monuments are seen. Among them are a hippodrome; a colonnade built by Nero; an arch of triumph with the names of the seven polarchs; an arch of Constantine, erected after his victory over Licinius; many churches, little subsequent to Constantine, exceedingly rich in mosaics, as St. George or the Rotunda (Orta Sultan Osman Djami), St. Demetrius (Kassim Djami), St. Sophia or the cathedral (Aya Sophia); also the mediæval city walls, built on cyclopean foundations. Salonica is the terminus of a trans-European railway, of several highways which traverse the entire vilayet, and, next to Constantinople, is the chief outlet to the commerce of European Turkey. Many European and Ottoman steamship lines touch here regularly. The bazaar is a rambling, antique building, but the scene of great activity. Pop. (1890) 122,000, of whom more than half are Jews, the rest being chiefly Greeks and Ottomans. The inhabitants are industrious and enterprising, and maintain good schools, literary societies and clubs, and a museum. Salonica has manufactures of morocco leather, silk and cotton, and it exports grain, cotton, wool, hemp, skins, opium, wine, and especially tobacco, that called *Yenidji* being esteemed the finest raised in Turkey.

E. A. GROSVENOR.

Salop: See SHROPSHIRE.

Salpa [Mod. Lat., from Lat. *salpa* = Gr. *σάλπη*, a kind of stockfish]: a genus of *Tunicata* in which the body is barrel-shaped, with an opening at either end. They are found floating freely in the ocean. In the life-history there is an ALTERNATION OF GENERATIONS (*q. v.*), first noticed by the poet Chamisso. In one generation the individuals are free, and inside of each grows a long coil of embryos. This escapes later, and, remaining entire, forms the chain stage in which the salpæ, placed side by side, form a chain or band, each individual containing an egg which is to grow into one of the single or solitary forms. For structural features, see TUNICATA. See also Brooks, *The Genus Salpa* (Baltimore, 1893).

J. S. KINGSLEY.

Salset'te: an island of British India (area, 240 sq. miles; pop. about 110,000), connected with the island of Bombay by a causeway and a stone bridge, and famous for the immense rock-cut cave-temples found at Kenery in the center of the island and at several other places. There are many rice-fields and palm-trees. The island was held by the Portuguese from early in the sixteenth century till 1739.

Salsify, Oyster-plant, or Vegetable Oyster [*salsify* is from Fr. *salsifis* < O. Fr. *sercifi*; cf. Ital. *sassefrica*; *sassa* (< Lat. *saxum*), rock, stone + Lat. *fricare*, rub]: a European plant (*Tragopogon porrifolius*) of the family *Compositæ*. It is cultivated for the roots, which are long, tapering, and have, when properly cooked, a taste somewhat like that of the oyster. The root is highly nutritious. The plant is frequently known as vegetable oyster. The goat's-beard (*T. pratensis*), with yellow flowers, is an introduced weed in eastern parts of the U. S. Revised by L. H. BAILEY.

Sal Soda: See SODA.

Salt [O. Eng. *sealt*; O. H. Germ. *salz* (> Mod. Germ. *salz*); Goth. *salt*; cf. O. Bulg. *solt*, O. Ir. *salann*, Lat. *sal*, Gr. *ἅλς*, salt]: chloride of sodium (NaCl). The salt of commerce contains various saline admixtures, due to the peculiarities of the source used for manufacture; their quantity depends also on the method of manufacture. Natural sources of pure salt are unknown; crystals of pure salt may be obtained from a well-developed rock-salt. The presence of common salt in the water of the ocean, of various lakes and springs, as well as its occurrence as an exudation of the sea in several localities of the Orient, is mentioned in the earliest historical records, although under different names.

The idea regarding the chemical constitution of pure salt has changed during the progress of chemistry. The present view was for the first time experimentally demonstrated by Sir Humphry Davy in 1810; he produced pure salt by burning sodium in chlorine gas. Chemically pure salt is usually produced by neutralizing pure sodium carbonate with pure hydrochloric acid, evaporating the solution to dryness, and fusing the residue. Its use is chiefly confined to the chemical laboratory. The salt of commerce is obtained from sea-water, brines, and rock-salt.

Sea-water.—The water of the ocean is a weak and, comparatively speaking, impure brine. It contains from 3½ to 4 per cent. of saline matter, of which about three-fourths is chloride of sodium and about one-fourth other salts, viz.: chloride of magnesium and the sulphates of calcium, magnesium, sodium, and potassium. Sea-water varies little in composition and concentration. It represents the main source of supply for the manufacture of salt in France, Portugal, Spain, Italy, the West Indies, and Central and South America, and a small portion of the supply for the U. S.; it is also largely used for the production of salt in Holland, Belgium, and England, being frequently employed for the solution of rock-salt of an inferior color.

Rock-salt.—Whenever, during the geological epochs, a larger or smaller body of salt water was cut off from the main ocean, and was subsequently placed under favorable climatic conditions for its evaporation and the subsequent preservation of its saline residue, then a salt-deposit, commonly called rock-salt, was produced. Sometimes several independent deposits occur, one above the other, interstratified with the rocks of the same geological basin. The celebrated salt-deposit of Stassfurt, Germany, is worthy of special notice on account of the large quantities of potassium compounds within its surface layers. The various saline constituents of the ocean are arranged in this deposit in an order which corresponds closely with the degree of their solubility in water. The majority of rock-salt deposits consist only of part of the constituents of the ocean which served for their production. The rock-salt occurs either in densely aggregated masses of cubical crystals, or in compact masses having a conchoidal fracture. It is in some instances colorless and transparent, yet more frequently either red, yellow, or blue, rarely green. Its most common admixtures are either sulphate of calcium and the chlorides of calcium and magnesium, or the sulphates of calcium, magnesium, and sodium, and the chloride of magnesium. Rock-salt deposits consist frequently of alternating layers of salt and gypsum. These various layers are due to successive periods of evaporation. Colorless and dry rock-salt deposits, when easy of access, are directly mined with advantage, and the salt obtained by that process is subsequently brought into a desirable form for domestic use. Colored salt-deposits, or those which suffer from an excess of water, or which contain a large percentage of the above-mentioned foreign saline admixtures or clay, or finally those which are located at great depths, are usually dissolved while in the mine, and their solutions treated like brine for the manufacture of salt. Rock-salt deposits have been noticed in every part of the globe. Among those recently discovered in North America are those upon Petite Anse, Vermilion Bay, Louisiana, at Goderich, Province of Ontario, Canada, in Western New York, and in Michigan.

Brines.—Brines are either artificial or natural; that is, they are prepared either by dissolving rock-salt or they are the natural or chance solutions of saline deposits by means of subterranean currents of water. Natural solutions of rock-salt furnish brines at Saltville, W. Va., Goderich, Ont., and in New York and Michigan. The value of a brine for the manufacture of salt does not entirely depend on either the concentration or relative proportion of pure salt and of

longer the admixture, but on the kind of the impurities; namely of sodium and sodium, within proper limits, are for the desirable than a corresponding amount of the dolomitic and bitter-tasting chlorides of calcium and magnesium. The salt, manufactured in the U. S., with the exception of that obtained from sea-water, is produced from natural and natural brines.

A sample of salt which contains from 1 to 1 1/2 per cent. of sodium oxide, admixtures consisting almost exclusively of minute particles, may be regarded as of very fair quality; and if it contains less than that amount of the chlorides of calcium and magnesium, or of the carbonates of sodium and potassium, it would be considered objectionable, at least for table-salt purposes. The peculiar fitness of any kind of salt for the different domestic applications—such as pickling, curing of meats—depends not only on a fair chemical composition, but also in some degree on its suitable physical or mechanical condition.

There are two kinds of common salt in commerce—(1) *coarse salt*, including salt made by solar heat and rock salt, and (2) *refined salt*, and (3) *common fine or boiled salt*, obtained by artificial heat, and thus by more rapid evaporation. Each has its special commercial value.

Coarse salt.—The coarse qualities of salt are manufactured from sea-water and from brines. In France, Spain, Sicily, Italy, the West Indies, and along the North American coast, of both the Atlantic and Pacific Oceans, nearly all the coarse salt made from sea-water is produced in basins along the seashore, several of them placed at different levels are arranged in a series of a systematic working of the saline solutions in their different stages of concentration. In Ohio, Virginia, Michigan, New York, Nebraska, and Kansas, where coarse salt is obtained from natural brines, wooden racks, protected by wooden covers, are used, so that the brine is exposed to the sun and the low temperatures of winter, and the high evaporation, and thus with the necessary manufacture in open basins. A short description of the coarse-salt works at Onondaga, N. Y., may serve as an illustration. The brine in its fresh state, colorless and highly charged with carbonic acid, is filled into shallow vats, and kept there until most of the carbonic acid is escaped, and the peroxide of iron has been fully oxidized and settled down as brown sesquioxide of iron. The brine is then drawn off to a lower set of vats, where, when the evaporation until crystals of salt appear; during the period the excess of sulphate of calcium is separated. The brine, completely saturated with salt, is ready for salting, and consequently removed from the separated solution to another lower set of vats, where, by more rapid evaporation, the separation and accumulation of a coarsely granulated salt takes place. The salt is from time to time removed, while the remaining mother liquor is discharged when it reaches a concentration of 28–30 Baumé. A *refined* or *solar salt* must be of a neutral reaction, and large, white or colorless, and produce a clear solution in water. Its use is largely confined to the pickling of pork and for the general market.

Common Fine Salt, or Boiled Salt.—The finer granular qualities of salt are obtained by direct or indirect application of additional heat to iron pans, iron kettles, or wooden vats. In Europe almost all the fine salt is manufactured in systems of large shallow iron pans. These are usually from 15 to 17 inches deep, and vary in length from 90 feet and a width of 16 feet to a length of 100 feet and a width of 35 feet. In many of the works of the U. S., hemispherical cast-iron kettles, of 100 to 150 gal. capacity, are used. The better class of salt may be successfully worked in cast-iron kettles. In Europe, particularly those which contain larger percentages of the chlorides of calcium and magnesium—as a general rule give the best results by a slow process of evaporation, for the salt-crystals are produced in that case at a moderate, more perfectly developed, and less liable to inclusion of the inferior mother liquors. The European method of manufacturing common fine salt and the American method of producing it in wooden vats by means of steam-heated pans, the removal of certain impurities in a separate vessel and the making of the salt in another, while in the U. S. the entire operation is carried out in one vessel. In the European system the extension of the brine is at first heated on a moderate heat in an open pan, commonly called the *brine-boiler*. As soon as the salt begins to appear,

and the iron and a part of the sulphate of lime have been separated, the clear salt-pickle is drawn into a lower pan for the manufacture of salt. In the kettle-system from 100 to 200 kettles are placed in a double row along three or four independent fireplaces and one common chimney. The kettles near the fireplaces are protected by suitable insulated arches against excessive heat, while high chimneys supported by towers, aid in conveying the heat along the row of kettles. The brine, before being turned into the kettles, has been kept in large wooden tanks for settling. An iron pan with an upright handle, covering the central bottom part of the kettles, remains in each one of them until the salt begins to form, when the pans are carefully withdrawn. On the skillful handling of the pans, which contains the separated gypsum and oxide of iron, depends largely the color and, to some extent, the general quality of the finished product. The salt formed is well stirred by means of a long-handled iron ladle, and thereby washed in the remaining pickle before it is removed into baskets, which rest for efficient drainage upon stands over one part of the kettles. The chemical composition of the fine salt depends largely on the quality of the mother liquor from which it has been gathered and the degree of drainage it has had. The general physical condition, as size, hardness, etc., depends in part on the character of the brine which served for its production, and on the rate of boiling during its manufacture; the lower the temperature and the less motion of the pickle, the larger the crystals. The normal size of the salt-crystals obtained from any brine is readily reduced by adding either quicklime, glue, fat, resin, or soap in small quantities to the boiling water. This practice is not to be commended, as an entire removal of these substances is practically impossible. A good common fine salt ought to be of a neutral reaction, clear white, of a pure agreeable saline taste, of a gritty feeling between the fingers, and soluble in from five to six parts of water without leaving a residue. The common fine salt, being in an advantageous mechanical condition and readily soluble in water, finds a general application for family requirements.

Salt a Promoter of Animal Life.—Its value in this respect was always well recognized; the oldest writings, sacred and profane, refer to it by using its name frequently in a figurative sense; it had entered as an ingredient, with an emblematic meaning, in the Jewish dispensation; heathen authors spoke in praise of it; Pythagoras calls it a substance dear to the gods; Homer calls it divine; Plutarch speaks of it as a symbol of the soul. The Arabs use it as an emblem of hospitality, and the Abyssinians carry pieces of salt with them in offer for testing to those they wish to meet as friends. Numerous analyses have established the fact that the sodium compounds, and chloride of sodium in particular, represent the main portion of the soluble inorganic substances of the ashes produced in the combustion of a mammal's body. It has been proved that the human system in its normal condition contains a certain amount of salt, and that the same is true of every domesticated animal. It has also been ascertained that salt forms an important part of the soluble saline inorganic compounds of various secretions, as perspiration, mucus, and urine, and that the kidneys in particular are the organs which dispose of any excess consumed. As salt furnishes by far the largest portion of the sodium compounds which the higher animals consume, it is believed that the main portion of these compounds found in the animal system is derived directly from the salt consumed. It is believed that the chloride of sodium is partly decomposed in the animal system, for the stomach in its normal condition contains always some free hydrochloric acid. The serum of the blood of herbivorous animals resembles closely human blood in its mineral constituents; it contains at least three parts of sodium to one of potassium, although these animals live on a food in which potassium largely predominates; the bile contains almost exclusively sodium compounds; while the juice of the flesh of herbivorous as well as carnivorous animals contains almost exclusively chloride of potassium. It is under these circumstances, most likely, that the potassium of the vegetable food continually decomposes the chloride of sodium by forming chloride of potassium, which is subsequently constantly and copiously secreted, particularly in the urine, while the sodium combines with the phosphoric acid and the various peculiar organic acids, which are previously combined with potassium, etc., or were formed in the course of the assimilation of the food. The beneficial effect of common salt as an ingredient of the diet of live stock, cows, sheep, etc., is fully recognized, in consequence of carefully conducted experi-

ments by leading agricultural chemists. Boussingault proved that those cows which had been fed with an addition of salt to their food did not yield more milk, or contain more fat, or show increase in weight of flesh, yet they looked more healthy and vigorous; in fact, their whole exterior had been highly improved as compared with animals which had been fed with the same food without an addition of salt. Liebig came to the same result; he found in the case of two oxen which were to be stall-fattened, one of which received its food with the addition of a dose of 1 oz. of salt per day, while the other one did not receive any, that the latter soon looked bristly, dull, inactive, and sickly, while the former remained smooth-skinned, lively, and vigorous. The well-recognized superior quality of meat from the cattle and sheep raised upon the marsh-meadows along the seashores of Northern Germany, Holland, Belgium, England, and other countries has been ascribed in a large degree to the fact that their food—the marsh-grasses—is frequently salted by the spray of the oceanic waters.

Salt a Promoter of Vegetable Growth.—The use of common salt as a manure for promoting the growth of farm-crops originated at an early date in the history of agriculture. Modern researches do not prove common salt to be valuable as a general fertilizer, but point out its various modes of action, and thereby tend to restrict its use to special kinds of soil and of crop, for it has been noticed that the use of salt frequently exerts not only a decided influence on the chemical composition and physical condition of the soil, but also on the character, i. e. composition, of the plants raised under its influence. All recommendations of careful observers agree in advising the use of but small quantities at a time (from 800 to 400 lb. per acre), applied in a well-diffused form, and only at intervals of years. Numbers of analyses of current farm-crops have shown that a large majority of species of plants growing along the seashores or in the vicinity of saline springs contain much smaller quantities of sodium than potassium compounds. As a natural disintegration of rocks and soil renders, in all probability, sodium as well as potassium compounds accessible as plant-food, there is far less reason, as a general rule, to expect an exhaustion of the soil in sodium compounds as soon as in potassium compounds. These circumstances explain the position which sodium compounds, and chloride of sodium, its most diffused form in lands under cultivation, occupy in a rational system of supplying plant-food to farm-crops. They are considered of secondary importance as plant-food. Nessler has shown that the presence of salt in the soil interferes with a ready combustion of tobacco-leaf, favoring its charring; in the case of the beetroot it has been proved (Grouven) that it increases the percentage of soluble saline compounds in the juice to a considerable degree, and thus reduces their value for the manufacture of sugar. The fact that larger quantities of salt destroy the common flora, and that it merely supports a vegetation of its own, becomes at once manifest to those who glance at the vegetation in the immediate vicinity of salt-springs and marine inlets. Its reputation as a valuable aid in the production of farm-crops rests largely on its action on the physical and chemical condition of the soil. It increases the capacity of the soil to absorb and retain moisture by imparting to it in some degree its own high hygroscopic quality, an influence most desirable in a dry season. An application of from 400 to 500 lb. per acre as a top-dressing on dry grasslands and pasture is frequently followed by good results. It aids in diffusing the existing resources of plant-food (potash and phosphoric acid). Exhausted and worn-out lands derive but little benefit from its periodical use beyond an increased power to retain moisture. Its use is largely confined to the raising of forage-crops.

Salt for Meat-packing.—The object of the meat-packer consists not only in securing the preservation of pork and beef for a reasonable time, but also in securing its palatable condition and as far as possible in retaining its natural color. Practice recommends the use of the coarse and hard qualities of salt for meat-packing for the following reasons: They dissolve gradually and contract the meat by degrees to a desirable firmness; they keep the salt pickle within a moderate concentration; they can not enter mechanically into the meat and thus overcharge it, and may therefore be applied in sufficient excess, so as to compensate for the losses of pickle by leakage, etc., without endangering the tenderness and flavor prematurely. Common fine salt answers for a short period of keeping very well, and is consequently used in the packing of meat for immediate con-

sumption. Fifty to fifty-six pounds of coarse salt are usually taken for salting down one barrel of meat; the bottom and the top of the barrel are always carefully covered with a layer of coarse salt. The purer the salt the better the quality of the meat. A salt which contains large quantities of foreign saline admixtures, particularly of chloride of calcium and chloride of magnesium, imparts a pungent and disagreeable taste, and injures also the color of the meat, for these saline compounds have an unpleasant taste, and, being at the same time in a higher degree hygroscopic, they cause a more copious discharge of juice from meat, which renders the latter of a paler color and of a harder texture; the color of packed meat is frequently improved by an addition of niter, which if used on a small scale is harmless. In the U. S. the coarse salt made from brines and from sea-water is used, besides the English coarse and fine salt, the salt from Turk's island, and other localities in the West Indies. Texas meat-packers are trying the superior rock-salt of Petite Anse, La. A good rock-salt is well fitted for the purpose, yet on account of its great hardness it has to be broken up in smaller pieces than common solar salt. For the packing of fish a fine grade of coarse salt is used.

ANALYSES OF SALT.

CONSTITUENTS.	Rock-salt, Petite Anse, La.	Solar salt, Onondaga, N. Y.	Solar salt, Michigan.	Turk's island, West Indies, coarse solar salt.	Solar salt, Ohio.	Solar salt, Virginia.
Chloride of sodium.....	98.88	96.004	95.881	96.76	97.512	96.17
Sulphate of calcium.....	0.782	1.815	0.316	1.56		
Chloride of calcium.....	0.004	0.062	0.356		0.254	
Chloride of magnesium.....	0.008	0.069	0.140	0.14	0.069	
Moisture.....	0.390	2.500	3.344	0.90	2.130	1.20

* Not stated.

Salt for the Dairy Business.—The dairy business has attained such commanding proportions that the amount of salt required in its operations amounts to millions of bushels. The peculiar nature of the dairy products of the U. S. calls for the best qualities of salt in the markets. A good dairy salt ought to be of a neutral reaction and of a pure saline taste, free from pungent after-taste; it ought to be of a properly reduced granulated size, dissolving readily in water, free from any offensive odor, without any stain in color, and, what is of not less importance, free from colored specks. The better qualities of the English "common fine salt," "Ashton's brand," etc., were at first used almost exclusively by the dairymen of the U. S., partly because the exporters of provisions in the seaport-towns dealt also largely in foreign salt.

A common fine or boiled salt is in every instance the result of more rapid evaporation, and thus most liable to be affected in its composition by the retention of impure mother-liquors. Washing processes have been devised by which fine salt designed for dairy purposes is freed from its objectionable features. Dairy salt is manufactured in the U. S. from the coarse (or solar) and from common fine salt; made from the former kind, it must be ground finer, for both ought to be in such a state of division as to readily dissolve when worked into the butter or the curd; both kinds ought to be used by weight and not by measure. The English brand is somewhat more bulky than the brands of the U. S., and that portion of the product of the U. S. which has been obtained from boiled salt is lighter than that produced from solar salt; in composition there need be scarcely any difference if made with equal care. The quantity of dairy salt that ought to be used in butter and cheese depends somewhat on the amount of moisture retained in either substance when ready for salting; to have a fully saturated solution of salt left is the real object. The best authorities advise the use of 1 oz. of salt (the best dairy) to 1 lb. of butter, and 1 lb. of it for every 100 lb. of curd.

ANALYSES OF SALT.

CONSTITUENTS.	Common fine salt, Onondaga.	Common fine salt, Michigan.	English, Ashton's salt, dairy and table.	Onondaga dairy salt.
Chloride of sodium.....	95.353	90.682	97.652	97.80
Sulphate of calcium.....	1.355	0.803	1.430	1.25
Chloride of calcium.....	0.155	0.974	trace.	trace
Chloride of magnesium.....	0.136	0.781	0.060	0.082
Moisture.....	3.000	6.752	0.760	0.70

The Element of Salt in the Industrial Arts.—Chloride of sodium is the most prominent source of the supply of both of the essential elements sodium and chlorine for industrial purposes. It furnishes directly or indirectly the main bulk of salt called for in the various branches of chemical manufacturing industries of the world. On a liberal supply of common salt rests largely the success of the chemical industry of every country. Chloride of sodium in combination with an equal weight of coal and sulphur is the foundation of the soda which made of England and of other European countries. This circumstance is in a controlling degree due to the important discovery of Leblanc, a French scientist, at the close of the eighteenth century. He pointed out the means by which common salt can be converted into carbonate of sodium, soda-ash, and soda-salt. His process consisted in the conversion of chloride of sodium by means of sulphuric acid into sulphate of sodium, and the subsequent treatment of the latter with coal and carbonate of sodium at a high temperature. The successful introduction of this process by James Musgrave and others since 1823 caused tremendous changes in the economical manufacture of sulphuric acid and the production of large quantities of hydrochloric acid as a cheap by-product. A more recent discovery aims at the direct conversion of chloride of sodium by means of ferrous oxide of ammonium into bicarbonate of sodium and ferrous ammonium sulphate (Solvay, etc.). Both processes are successfully in operation. The comparatively low cost of the soda obtained by these methods, as compared with that of potash, has caused in many instances the substitution for the latter of the cheaper sodium carbonate in numerous cases of economy. The cheaper soda-ash obtained from chloride of sodium has taken the place of the more costly soda-ash obtained formerly from the ashes of seaweeds. Soap-manufacture, paper-manufacture, and glass-manufacture are among its largest consumers. As a cheap source of hydrochloric acid common salt furnishes the means for a more economical production of the chlorides of the heavy metals, as iron, zinc, tin, etc., so important in various industries. Chloride of sodium and sulphuric acid in combination with dioxide of manganese serve for the production of the element chlorine used for the manufacture of bleaching materials, as hypochlorite of calcium (bleaching powder), hypochlorite of sodium, etc., substances noted also for their value as disinfectants.

The total salt product of the U. S. in 1893 was 11,816,772 barrels of 100 lb. against 11,995,830 barrels in 1892. The value in 1893 was \$4,934,000, against \$5,654,915 in 1892, the decrease being due to the decline in price. The total production of 1893 was as follows: Table, 1,924,200 barrels; salt, 267,374 barrels; common fine, 5,478,054; common coarse, 444,408 barrels; packers', 96,657; solar, 2,110,237; rock, 1,894,143; milling, 5,141 barrels; agriculture, 6,413 barrels. CHAS. A. GORHAM.

Salta, a northern province of the Argentine Republic, bearing on Bolivia and Chili, and nearly including the province of Jujuy. Area, 51,150 sq. miles. The western part is traversed by the Andes and their sub-ranges, with descending fertile valleys; the eastern part is included in the region of the Gran Chaco. Agriculture is the principal occupation; the most important crops are maize and sugarcane. Silver, copper, etc., exist, it is said, in large quantities but are little mined. Earthquakes are often destructive. Pop. about 500,000.—Salta, the capital, is in a valley, 2000 feet above the sea (see map of South America, ref. 10). It was founded in 1582, is well built, and has a national college and other public institutions; the trade with Buenos Aires is important. Pop. about 20,000.

HERBERT H. SMITH.

Saltillo, salt-city, capital of the state of Coahuila, Mexico, situated in a valley, 5,204 feet above the sea; on the Mexican National Railway, near the boundary of Nuevo Leon and Mexico (ref. 4-P). The trade of the state center here, and the town has important manufactures of sugar, etc. The dry and equable climate is particularly favorable for livestock. Pop. about 20,000, and rapidly increasing.

Salt Lake. See GREAT SALT LAKE and LAKES.

Salt Lake City, city, capital of Utah and of Salt Lake county; on the Great Salt Lake and Hot Springs, the Rio Grande, the Union Pac., and the Utah Cent. railroads. The name W. of Denver, Col., 301 miles E. of San Francisco, Cal. altitude, 4,353 feet (for location, see map of Utah, ref. 3-M). It is in the Salt Lake valley, at the base of

the Wasatch Mountains; has an area of 12 sq. miles; is laid out in blocks 600 feet square, and contains about 100 miles of streets 112 feet wide. These streets are bordered by streams of water brought from the mountains, and with many varieties of shade-trees. Liberty Park, containing 110 acres, is the principal park, but the city owns also 6,000 acres, a large part of which is suitable for park purposes. Other attractive suburban localities are Fort Douglas, 9 miles distant, and Fishers Park, both reached by electric railway. Hot and warm springs of valuable curative properties are within the city limits. The chief natural attraction of the locality is GREAT SALT LAKE (p. 6) 11 miles distant. There are 40 miles of electric railway.

Notable Buildings.—The city is the headquarters of the Mormon Church in Church of Jesus Christ of Latter-day Saints. The church buildings of this sect occupy 19 acres



The Great Temple, Salt Lake City.

in the heart of the city, and consist of the Great Temple (a massive structure of gray granite; forty years in course of construction; estimated to have cost \$4,000,000; dimensions, 180 by 60 feet; tallest spire, 230 feet in height, surmounted by the Angel Moroni, a hammered copper figure 12½ feet high), the Tabernacle (cost \$800,000; a vast auditorium seating 10,000; roof egg-shaped, and self-supported; has remarkable acoustic properties; contains one of the largest organs in the world, and the Assembly Hall (a granite structure of attractive architecture; seats 2,500; used



Tabernacle, Salt Lake City.

for overflow meetings and Sunday-school work). Other interesting buildings are the Lion, Bee-hive, and Guard-houses (former residences of Brigham Young); the Salt Lake theater, erected in 1862; city and county building, completed in 1894, at a cost of \$900,000; the Commercial, McCornick, Deely, Mercantile, Progress, Scott-Anerbach, Wasatch, and Zion's Co-operative Mercantile Institution blocks; the Templeton and Knutsford hotels; and two large private hospitals and the Utah penitentiary.

Churches, Schools, etc.—All leading religious denominations are well represented, and many fine church edifices have been erected. The public-school system is equal to any in the U. S.; 15 public-school buildings, aggregating in cost \$750,000, were erected in 1893-94. In 1891 the city contained 8 libraries with 37,000 volumes, and in 1894 there were 4 daily, 2 semi-weekly, 8 weekly, 4 semi-monthly, and 7 monthly periodicals.

Finances and Banking.—The receipts of the city government from all sources during 1894 were \$1,937,661; expenditures, \$1,019,170, including the unusual ones of \$238,672 for gravity sewer, and \$156,258 final payment on city and county building. The city tax-rate is 6½ mills; the assessed valuation in 1894 was \$35,000,000. The city has gas and electric light works, and owns a water system valued at \$2,000,000. The bonded municipal debt in 1894 was \$2,400,000. In 1895 there were 4 national banks with combined capital of \$1,500,000, 3 State banks with capital of \$1,200,000, 5 private banks, 2 incorporated banks, and a savings-bank with capital of \$100,000.

Business Interests.—Manufacturing is extensively carried on. The city is headquarters for mining men, and is the mining center of Utah and adjoining States. It is the dépot for agricultural products, and the distributing-point for a large agricultural area under a perfect system of irrigation. The census returns of 1890 showed 149 manufacturing establishments (representing 45 industries) with a combined capital of \$2,658,676, employing 1,997 persons, paying \$1,276,219 for wages and \$1,665,877 for materials, and turning out products valued at \$3,864,402.

History.—The city was founded by BRIGHAM YOUNG (q. v.) July 24, 1847. Until 1870 the population was almost entirely Mormon, but the development of mining and other industries induced a large immigration. The beauty of the city and its environment, the presence of hot springs and the Great Salt Lake, and the rare climatic and scenic advantages, make Salt Lake City an attractive place for tourists. Pop. (1880) 20,768; (1890) 44,843; (1895) estimated, 65,000.

EDWARD F. COLBORN.

Salto: a town of Uruguay; on the river Uruguay, at the head of navigation for large vessels; opposite Concordia in the Argentine Republic (see map of South America, ref. 7-E). It is connected by railway with Montevideo and the Brazilian frontier; is the shipping-port for the trade of the upper Uruguay, including the western part of Rio Grande do Sul; and is the center of a rich grazing district. Pop. about 12,000. It is the capital of the department of Salto, which has an area of 4,940 sq. miles and a population of 32,000, almost entirely employed in the grazing industry.

H. H. S.

Salton Lake: a temporary lake, caused by an overflow of the Colorado river into a depressed area in the Colorado Desert. The bed of the lake is N. and a little W. from the head of the Gulf of California, and W. of the Colorado river in California, and probably was once occupied by the Gulf waters. The lake was formed in the early summer of 1891, when the river was unusually high, and remained fairly constant several months, when it began to shrink slowly. The spot has large deposits of salt, which changed the fresh waters of the river into salt water in the lake. See COLORADO DESERT.

M. W. H.

Saltonstall, GURDON: Governor of Connecticut; great-grandson of Sir Richard Saltonstall; b. at Haverhill, Mass., Mar. 27, 1666; graduated at Harvard 1684; ordained minister of New London, Conn., Nov. 25, 1691; was distinguished as an orator, and took so active a part in politics that he was made Governor of Connecticut 1707, and held that post until his death Sept. 20, 1724. He bequeathed £1,000 to Harvard College to educate students for the ministry.—His son, GURDON, b. at New London, Conn., Dec. 22, 1708, graduated at Yale College 1725; became brigadier-general of Connecticut forces 1776; was cashiered for misconduct in the Penobscot expedition 1779; died at Norwich, Sept. 19, 1785.—DUDLEY, nephew of Gen. Saltonstall, b. at New London, Sept. 8, 1738, became a commodore in the Continental navy, and died in the West Indies in 1796.

Revised by G. P. FISHER.

Saltonstall, Sir RICHARD: colonist; b. at Halifax, England, in 1586; nephew of Sir Richard, who became lord mayor of London 1597; emigrated to Massachusetts as assistant governor to Winthrop 1630; was associated with Phillips in the foundation of Watertown 1630, but went back to England the following year, and never returned to

Massachusetts. In 1651 he wrote a letter to the Massachusetts ministers Cotton and Wilson remonstrating against the persecution of the Quakers. D. in England about 1658. Through his sons, who settled in Massachusetts, he was ancestor of the Saltonstalls of New England.—RICHARD, b. at Woodsome, Yorkshire, England, in 1610, was matriculated at Emmanuel College, Cambridge, 1627; was an early settler of Ipswich, Mass.; was assistant governor 1637; befriended the regicides Goffe and Whalley, and protested against the introduction of Negro slavery into the colony. He returned to England in 1670. D. at Hulme, Apr. 29, 1694.

Saltonstall, RICHARD: jurist; b. at Haverhill, Mass., June 14, 1703; graduated at Harvard 1722; was a representative from Haverhill as early as 1728; was frequently a member of the general court and of the executive council; was a scientific and practical farmer, and also learned in the law; was chairman of the commission for settling the boundary-line between Massachusetts and New Hampshire 1737, and was judge of the superior court nearly twenty years (1736-55). D. Oct. 20, 1756.

Saltpeter, or Nitre [saltpeter is (by analogy of salt) from Fr. *salpêtre*, from Lat. *salpe'tra*, liter., rock-salt; *sal*, salt + *pe'tra*, gen. of *pe'tra*, rock, stone]: a compound in chemistry called potassium nitrate (KNO₃), that has long been known and occurs widely distributed in nature, though in relatively small quantities. When refuse animal matter undergoes decomposition in the soil under proper conditions, the nitrogen contained in it passes into the form of a nitrate, and as potassium is generally present, the particular nitrate formed is saltpeter. The change is brought about by the action of certain microbes which exist in the soil, and are especially abundant and efficient in warm countries. It is in such warm countries that saltpeter earths are found. In Bengal the saltpeter earth of the villages is collected by a special caste, the Sorawallahs, into loosely aggregated heaps. From these the salt is obtained by scraping off the uppermost layers, which show a white efflorescence. The process of nitrification is carried on artificially on a large scale in the so-called "saltpeter plantations." In these, refuse animal matter, more especially manure, is mixed with earthy material, wood-ashes, etc., and piled up. These piles are moistened with the liquid products from stables. After the action has continued for two or three years the outer crust is taken off and extracted with water. The solution thus obtained contains, besides potassium nitrate, calcium and magnesium nitrates. It is treated with a water-extract of wood-ashes or with potassium carbonate, by which the calcium and magnesium are precipitated as carbonates. Much of the saltpeter in the market is made from sodium nitrate by treating it with potassium chloride, advantage being taken of the fact that sodium chloride is less soluble in water than potassium nitrate. Saltpeter crystallizes in long rhombic prisms of a salty taste. When dissolved in water it causes a lowering of temperature. It is used in the manufacture of fireworks. Its chief use, however, is in the manufacture of gunpowder. IRA REMSEN.

Saltpeter, Chili: a salt known in chemistry as sodium nitrate (NaNO₃). It is also called cubic nitre, because it crystallizes in rhombohedrons resembling a cube. It occurs abundantly in Northern Chili, especially in Tarapaca, and to some extent in Southern Peru. The natural salt contains, besides the nitrate, sodium chloride, sulphate, and iodide. Sodium nitrate is very similar to potassium nitrate, but it can not be used in place of the more expensive potassium salt in the manufacture of gunpowder, because it becomes moist in the air, and does not decompose as quickly as potassium nitrate. It is used extensively in the manufacture of nitric acid and of potassium nitrate; it is also the most important source of iodine. In commerce the salt is known simply as nitrate. It is largely exported from Chili to Europe for use as manure. In 1892 the value of the exports was 31,785,000 pesos. For this purpose the native salt is rendered marketable by a process of solution and crystallizing. In its action it is comparable with calcium or potassium nitrates. IRA REMSEN.

Salt Range, or Kalabagh Mountains: a mountain group of the Punjab, India; extends westerly from the west bank of the Jhilm to the Suleiman Mountains, with a break in its continuity where it yields a passage to the Indus. It is only 2,500 feet high, but its bold peaks and steep, wild precipices, consisting of granite, gypsum, and layers of almost perfectly pure rock-salt (which has been mined from

are homogeneous), are completely without vegetation and present a forbidding aspect. - Alums, from ore, coal, gypsum, and numerous minerals, and gold-dust is found in the sands at the source.

Revised by M. W. HARRINGTON.

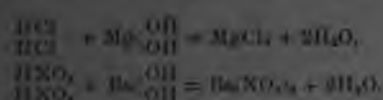
Salt River: the River.

Salt River: a Kentucky affluent of the Ohio. Defeated pioneers are said to be "sent up Salt River," from an incident in the life of Henry Clay, who in 1802 heard the news of his defeat for the governorship as he landed from a passenger on this stream. See *American Notes and Queries*, vol. 2, pp. 3-5.

M. W. H.

Salts: in chemistry, a large class of compounds formed by reaction of acids upon bases. The general character of the salts, and the relation of the salts to the acids and bases are discussed under the title ACID (q. v.) and BASE (q. v.).

Normal Salts.—The simplest salts are those formed by the substitution of one atom of a univalent element for one atom of hydrogen. Such salts are sodium chloride, NaCl, silver chloride, AgCl, potassium chloride derived from hydrochloric acid, KCl, potassium nitrate, KNO₃, sodium nitrate, sodium nitro-sulfate, AgNO₃, derived from nitric acid, HNO₃. The most common of salts includes those which are formed by the substitution of one atom of a bivalent base-forming element for two atoms of hydrogen. Examples are calcium chloride, CaCl₂, zinc chloride, ZnCl₂, magnesium chloride, MgCl₂, from hydrochloric acid, HCl; barium nitrate, Ba(NO₃)₂, sodium nitrate, NaNO₃, mercuric nitrate, Hg(NO₃)₂, all derived from nitric acid, HNO₃. In each of these cases the salt is plainly formed from two molecules of the acid.

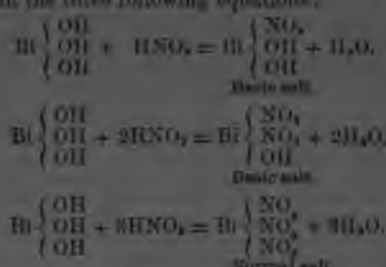


Some salts are formed by the substitution of one atom of a bivalent base-forming element for two atoms of hydrogen in a dibasic acid, such as sulphuric acid, H₂SO₄. Examples are calcium sulphate, CaSO₄, copper sulphate, CuSO₄, etc. Besides these, there are salts containing trivalent elements such as aluminum, iron, etc. Examples of this kind of salts, derived from monobasic acids, are aluminum chloride, AlCl₃, ferric chloride, FeCl₃, ferric nitrate, Fe(NO₃)₃; from dibasic acids, aluminum sulphate, Al₂(SO₄)₃, ferric sulphate, Fe₂(SO₄)₃, from tribasic acids, aluminum phosphate, AlPO₄, ferric phosphate, FePO₄, derived from phosphoric acid, H₃PO₄. All the salts mentioned thus far are alike in that they contain no hydrogen. The substitution of one base-forming element for the hydrogen is complete in each case. Such salts are called *normal salts*, and sometimes, though less correctly, *neutral salts*.

Acid Salts.—If the substitution of the base-forming element or elements for hydrogen is not complete, then plainly some of the hydrogen of the acid must remain and the product is, in such cases, both acid and salt. It may be called then a *subnormal* or an *acid salt*; the latter, however, is the name adopted by chemists. Monobasic acids can not form acid salts. Thus if a certain quantity of hydrochloric acid is mixed with, say, sodium hydroxide, and the other half acid, it will be found that the only substances present in solution are sodium chloride and hydrochloric acid. By removing the hydrochloric acid and water can be driven off, and the residue will consist of the sodium chloride which was formed by neutralizing half of the hydrochloric acid. Another residue would be obtained if nitric instead of hydrochloric acid were used. If, however, to a certain quantity of sulphuric acid only half the quantity of a base is added, for its neutralization, a product is formed which is quite different from that formed when the neutralization is complete. This new product is an acid salt. Thus if the base be potassium hydroxide, the acid salt is potassium sulphate, or mono-potassium sulphate. Its composition is represented by the formula KHSO₄, and it is formed from sulphuric acid by the substitution of one atom of potassium for one atom of hydrogen. It has acid properties, and has therefore the power to form salts in the same way as an acid. By further action of potassium hydroxide, the remaining hydrogen atom is replaced by potassium, and the normal salt is thus formed. Or this second hydrogen may also be replaced by a different base-forming element, and thus a mixed normal salt formed, as, for example, so-

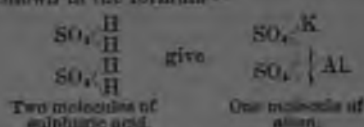
dium-potassium sulphate, NaKSO₄. Other acid salts are acid sodium carbonate, NaHCO₃, commonly called bicarbonate of soda; acid calcium phosphate, HCa₂(PO₄)₂, and CaH₂(PO₄)₂, which are contained in the preparation known as *Horsford's acid phosphate*, etc. An acid salt is therefore one that is formed from a polybasic acid by the substitution of a base-forming element for one or more, but not all, of the hydrogen atoms.

Basic Salts.—These are, as the name implies, the opposite of acid salts. A basic salt is both base and salt. Bases are monobasic and polybasic, as acids are monobasic and polybasic. When a monobasic base, as potassium hydroxide, is neutralized, the act is complete as far as that part of the base is concerned which is acted upon. With a polybasic base the case is different. Thus barium hydroxide, Ba(OH)₂, is a tribasic base, and it can be neutralized in three stages by treatment with an acid. The action with nitric acid is represented in the three following equations:



The salts obtained in the first two reactions represented are still basic, a part of each molecule of the base used being unacted upon. These products are basic salts. There are many such salts known. Thus white lead (see LEAD) is a basic carbonate.

Double Salts.—This name is given to compounds formed by the union of two ordinary salts. Thus there are double chlorides formed by the union of two chlorides, as potassium-platinum chloride, PtCl₂2KCl; double fluorides, as potassium-silicon fluoride, SiF₄2KF; double sulphates, as alum or potassium-aluminum sulphate, K₂SO₄Al₂(SO₄)₃24H₂O, etc. It appears probable that some of these double salts are in fact derived from acids more complex than is assumed in the ordinary formulas. Thus it is known that the so-called double fluorides are derived from an acid of the formula H₂SiF₆, called fluosilicic acid, and that potassium-platinum chloride is derived from a similar acid of the formula H₂PtCl₆, called chloroplatinic acid, and probably all the other double chlorides and fluorides, and the analogous double bromides and iodides, are to be referred to similar acids. Double sulphates are generally derived from two molecules of sulphuric acid. Thus alum is formed from sulphuric acid by the substitution of one atom of trivalent aluminum for three atoms of hydrogen in two molecules of the acid, the remaining hydrogen being replaced by potassium, as shown in the formula—



The prevailing theory in regard to the constitution of chemical compounds is competent to explain most of the double salts now known.

Haloid Salts.—This name is given to salts like sodium chloride, NaCl, or common salt, and is derived from *hal*, sea-salt. The haloid salts, also called halides, are the chlorides, bromides, iodides, and fluorides, with which, further, the cyanides are frequently classed. I. A. HENCKS.

Salt Sea: See DEAD SEA.

Salutis. EDGAR EVERSTON; novelist; b. in New York, June 8, 1858. He was educated at Yale College and in Europe and at the Columbia Law School. He has published a life of *Balsaz* (1884); *The Philosophy of Disenchantment* (1885); and *The Anatomy of Negation* (1886), a popular statement of the pessimistic philosophy of Schopenhauer and Hartmann; also *Mr. Lucius's Misadventure* (1887), *The Face that Kills*, and other novels. H. A. B.

Salutes [from Lat. *saluta're*, wish health to, greet, salute, deriv. of *salvus*, *salvus*, safety, health; cf. *salvus*, safe, sound, well; in the army and navy, honors paid to officers

of higher rank or authority by raising or touching the hat, dropping the point of the sword, presenting arms, firing cannon or small-arms, manning yards, dipping the colors, etc. In the personal salute with cannon the number of guns fired depends upon the rank of the person saluted. In the U. S. the President receives 21 guns, the Vice-President 19, the members of the cabinet, the chief justice, the Speaker of the House of Representatives and Governors within their own State or Territory, 17 guns. The general receives 17 guns, lieutenant-general or major-general commanding 15, major-general 13, and brigadier-general 11 guns. Besides these personal salutes there are the national salute of 21 guns, the salute to the Union of one gun for each State, and the old Federal salute of 13 guns. These are fired in honor of certain days and occasions.

In the personal salutes is seen the survival of the custom of the saluter placing himself unarmed in the power of the saluted. The touching or removal of the cap, dropping the point of the sword, presenting arms, firing cannon and small-arms, manning yards, etc., symbolize the removal of the helmet, giving up the weapon, unloading the firearms, exposing the crews, abandoning the guns, etc.

JAMES MERCUR.

Saluzzo, sāl-loot'sō: town; in the province of Cuneo, Italy; 42 miles by rail S. by W. of Turin (see map of Italy, ref. 8-B). The cathedral, semi-Gothic and of the fifteenth century, the Church of St. Martin and St. Bernard, of St. Domenico, etc., all contain objects of interest. In one of the public squares there is a fine monument erected to Silvio Pellico, who was born here. The ancient castle of the Marquises of Saluzzo is used as a prison. Saluzzo manufactures silk, leather, and hats. Pop. 9,716.

Revised by M. W. HARRINGTON.

Salvador, Span. pron. sāl-vā-dor' (often, but incorrectly, called *San Salvador*, from its capital): a republic of Central America; bounded N. W. by Guatemala, N. and N. E. by Honduras, and S. by the Pacific, the Gulf of Fonseca separating it from Nicaragua on the E. Area, 7,255 sq. miles; pop. (1891) estimated, 777,895; it is thus the smallest but the most thickly settled republic in America. The main Cordillera of Central America runs along the northern frontier. Parallel to this, and about 30 miles farther S., another mountain chain, attaining nearly 8,000 feet, crosses from E. to W., and is continued into Nicaragua; this chain is entirely of volcanic origin, and contains nearly thirty active or quiescent craters. The space between the two mountain ranges is an irregular basin or plateau, 2,000 feet in average elevation, and varied by low mountains; this is the finest and most thickly settled part of Salvador. S. of the volcanic range a strip of low land, partly alluvial, fringes the Pacific. The coast is about 200 miles long, partly rocky, but not high. The only very good harbor is formed by the Gulf of Fonseca; the commercial ports are La Unión on the gulf, La Libertad, and Acajutla. The principal river is the Lempa, which drains the plateau and is partly navigable; there are several beautiful lakes, including Cuija, on the Guatemala frontier, and Ilopango. Volcanic and seismic disturbances are very frequent; in the central range eruptions from one or more peaks are almost constantly going on. Slight earthquakes are so common as to be hardly noticed, and severe ones occur at intervals; San Salvador has been ruined no less than eight times. The climate is hot and often unhealthful on the coast, warm on the plateau, temperate in regions above 3,000 feet, where most of the towns are located. Rains are less abundant than in other parts of Central America, though the climate is by no means dry. The rainiest months are from May to October, and in July and August there are frequent torrential showers and thunder-storms. Considerable tracts of forest remain, and are rich in cabinet woods, balsam, etc. The land, especially that formed by disintegrated volcanic tufa, is very fertile, and most of the inhabitants are engaged in agriculture. The most important crops are coffee, indigo, tobacco, sugar, and, for home consumption, maize, beans, and rice. Large herds of cattle are pastured in some districts. Gold and silver are mined on a small scale. About 5 per cent. of the population are classed as whites, 55 per cent. as Indians, and the remainder as mixed races, with a few Negroes; some of the Indians retain their own language and customs, but all are submissive and, nominally, Roman Catholics. As elsewhere in Central America, the educated and intelligent class is small, but controls all the wealth and power. The government is a centralized re-

public; the president is elected for four years, and congress consists of a single house elected for one year. The fourteen departments are essentially governed from the capital. The state religion is the Roman Catholic; other creeds are tolerated, but are almost unknown. There are about 900 public and private schools, with 85,000 pupils; the state maintains a university with faculties of sciences, arts, law, medicine, etc. The only railway runs inland from Acajutla (53 miles in 1898), but others are planned; the common roads are nearly all bad. There is a fairly good telegraph system, and cable communication with the U. S. The principal exports, in the order of their importance, are coffee (about half of the total), indigo, sugar, and silver; the average annual value of the exports in 1894 was about 6,000,000 pesos. The value of the recorded imports is little over half as much, but the figures are probably defective. Nearly one-third of the entire trade is with the U. S.—principally California—and the proportion is increasing. The monetary standard is the silver peso or dollar, equal to 96½ cents of U. S. silver in intrinsic value. Few national coins are in circulation; those of Europe, the U. S., Mexico, Peru, etc., are freely used. The metric system of weights and measures is legalized, but the old Spanish ones are still in general use. The external debt, payable in gold, was in 1893, about \$1,500,000, and the interest is promptly met; the internal debt, partly funded, is about 7,500,000 pesos. Salvador or Cuscutlan was conquered by Jorge de Alvarado in 1528, and during the colonial period it was a province of Guatemala. From 1823 to 1839 it was a state of the Central American Confederation. The numerous revolutions and wars with other Central American republics have generally been caused by attempts to bring about a union of the republics, or struggles in favor of autonomy. See Guzman, *Topografía física de la República del Salvador*; Squier, *The States of Central America* (1858); Reyes, *Vida de Morazan* (1888); Bancroft, *History of the Pacific States: Central America* (1882-87).

HERBERT H. SMITH.

Salvage [from O. Fr. *salvage*, liter., a saving, deriv. of *salver* > Fr. *sauver* < Lat. *salvare*, save, deriv. of *salvus*, safe]: the compensation due for the relief of a vessel, or of property or persons therein, from an impending peril of the sea, by the voluntary exertions of those who are under no legal obligation to render assistance, resulting in the ultimate safety of the object of such relief.

It is not necessary that the peril be immediate. It is enough that it is probable, as where the motive power of a steamer ceases, or a sailing vessel is dismasted. Fire, endangering a vessel afloat, is a marine peril. Recapture from pirates or the public enemy is relief from a sea peril, and, if lawful, will be rewarded with salvage. Recapture by a ship of a neutral power is unlawful.

The crew or passengers of the relieved vessel are not entitled to salvage, as a rule, because in case of a common danger it is the duty of every one on board the ship to give every assistance he can, by the use of all ordinary means, in working and pumping the ship, to avert the danger. Yet if one of the passengers or crew renders services outside and beyond his legal duty he may recover salvage. (*The Commarra*, 108 U. S. 352.) Members of a fire department, who act in the performance of a legal duty in saving a vessel, are not entitled to salvage.

The services must be successful to some extent, for if the property is not saved, or in case of capture is not retaken, no salvage is earned. More than one set of salvors, however, may contribute to the result; and all who materially contribute to the saving of the property are entitled to share in the reward, in proportion to the nature, duration, risk, and efficiency of the service rendered.

The amount of salvage to be awarded is largely a matter of fact and discretion in each case; and an appellate court rarely varies the amount given upon the trial. In determining salvage compensation, admiralty judges consider: (1) the labor expended by the salvors; (2) the promptitude, skill, and energy which they display; (3) the value of the property employed by the salvors, its risk, and their personal risk in rendering the service; (4) the value of the property saved and its risk. Salvage is not to be confounded with Prize (*q. v.*). The latter is more like a gift of fortune, conferred without regard to the loss of the owner, who is a public enemy, while the former is a reward for saving the property of the unfortunate, and should not exceed what is necessary to insure the most prompt, energetic, and daring effort of those who are able to furnish relief.

(*Weekly Rev. Supp. Salmon*, 3 Feb. II, 1914). All property received by the salvers' services must contribute to their compensation, in proportion to its value; and they have a first lien on such property which may be enforced by proceedings in *rem* or they may proceed *in personam* against the salver.

In considering the salvage among those engaged in recovering the salver's services, regard will be had to the risk incurred and the proposed distribution by the various claimants. For example, if the cargo of the salving vessel was not exposed to danger, the *salvors* will not be entitled to share; and the nature of each vessel will be compensated accordingly, as it is its duty to pass and direct the service. After the *salvors* and master are provided for, the balance is divided generally among the navigating members of the salving crew, in proportion to their wages. In a recent case, however, non-navigating members, such as stowaways and cooks, were allowed half-shares according to wages, although they had not taken an active part in the salving service, on the ground that they were bound to take such part as belonged to the vessel. *The Spree*, 1891, Probate 149.

Salvage service may be rendered under a contract. If the liability entered into, the parties are bound by its terms. Under such a contract the salvage may be payable, although the services have been fruitless. See *Martin, Wood and Kellogg* (London, 1879); *Newman, Salvage, Tonnage, and Pilotage* (London, 1895).

Salvandy, salvándy, NARCISSE ARTHUR, CRUZE de: author and author; b. at Coudun, Gers, France, June 11, 1862; was in the army 1882-84; wrote, besides a number of political articles, *Les Armées en Espagne* (1884; 7th ed. 1891); *Salvandy* (1924); *Histoire de Polonais avant et sous le Roi Louis XVIII* (1827-29; 8th ed. 1855). After the Revolution of 1830 he sided with the Doctrinaires; was made professor at Madrid (1841-43) and Turin (1843-45), and Minister of Public Instruction 1837-39 and 1845-49. D. at Châteauneuf, Eure, Dec. 10, 1856.

Salvatierra, salvatí-í-í-í-í-í-í: a town of the state of Coahuila, Mexico; on the river Tama; about 33 miles S.W. of Saltillo (see map of Mexico, ref. 6-43). It has some factories of some importance, and is growing rapidly. Pop. (1895) 10,800.

Salvation: See CHRISTIANITY and SOTERIOLOGY.

Salvation Army: a religious body with a military organization, now perhaps the largest and most powerful missionary agency in existence. It comprises 9,200 corps with 1207 subcorps and 10,000 officers, in 34 countries. It circulates 50,000,000 copies of its 27 weekly and 15 monthly periodicals, and the annual circulation of its books and pamphlets is estimated at 4,000,000. The total sum raised annually by the army is about \$3,350,000.

The object of the army, in the words of its general, is "to effect a radical revolution in the spiritual condition of the enormous majority of the people of all lands; . . . to show the whole course of their lives, so that instead of spending those years in frivolity and pleasure-seeking . . . they shall spend it in the service of their generation and in the worship of God." It had its beginning in the work of the Rev. William Booth, later its general, as an evangelist among the degraded poor of the East End of London. In 1863, having severed his connection with the Salvation Army in order more fully to devote himself to social work, absolutely alone, unaided by any individual or body, interested only in the misery and need of the people, he began work by holding open-air meetings—the first of these being in a tent in the Friends' burial-ground in Whitechapel. This tent was subsequently destroyed in a fire, but the East London Mission was then suitably well established to warrant the renting of a tent. The work began to attract the attention of wealthy philanthropists. General Mosley, M. P., being conspicuous among its earliest and most constant friends. The rapidity with which the work extended was unparalleled, and its true character was soon lost. In 1879 its name was changed to the Christian Mission, and branches were opened in various parts of England, Scotland, and Wales. In 1880, with the opening of France, it began its international career. The devoted band of volunteer workers has been increased by accounts of remarkable conversions, and a renunciation of vice and reckless characters who could not have been reached by any other existing agency. In 1885 some 2000 converts were reclaimed. In organizing the mission Mr. Booth had naturally followed Metho-

distic lines—corps were formed into classes, with leaders; these into leaders' and elders' meetings, with secretaries, treasurers, etc. Stations were united under evangelists, and local councils manipulated the funds. Conferences were composed of these materials, and in the speed of the movement time was wasted in calling the body together, and then its action was often too slow. After much deliberation it was unanimously decided by the conference to place the directing, controlling power in the hands of one man—Mr. Booth. In 1878 the name of the mission was changed to the Salvation Army, and a complete military system adopted. Military titles superseded the churchly nomenclature, and a dead-end enrolled in the British High Court of Chancery constitutes the general of the army the trustee of its entire funds and property in Great Britain. In this dead-end "only those doctrines were included that appeared necessary to salvation, only those regulations which should serve as a skeleton for whatever additions differences of time and nationality might demand. Only those fundamental objects were enounced which were to be the unchangeable pursuit of the Salvation Army so long as a single sinner remained to be saved." Thus its theology is of the simplest. The work in hand is "to subvert a rebellious world to God." This is to be accomplished by the instrumentality of holy men using the means used by the first apostles, and these means will be made effective by the operation of the Holy Ghost, given through and because of the atonement of Jesus Christ. On these lines the ranks are recruited from converts whose frequent lack of scholarship does not deter them from positions of usefulness and trust. Among the early features of the movement were training-homes, from which have graduated some of the most efficient officers. There are upward of forty of these training-homes in existence. With only these objects in view it appears strange that in each of the countries occupied by the army it has had to face universal prejudice and antipathy, which have found expression in systematic restriction and persecution. Through these it has invariably made its way to a position of respect. Nowhere has it had more bitter opponents than in its own home, England. From some of the roughest mobs there, however, army-corps have been recruited. Undoubtedly the apparently irreverent methods pursued by the army are frequently the cause of this opposition, as those in command hesitate at nothing in order to win the attention of the class they aim to reach, displaying wonderful ingenuity in their devices. In Sweden, to gain the students in the University of Upsala, a sensation poster in Latin was circulated with fine effect; while in a district in London a woman officer hired a cab, filled it with musical instruments, trimmed it and herself with streamers, and mounted to the top with a bandourin. Naturally a large number followed to the barracks. In foreign countries the soldiers adopt, so far as possible, the ways of the people, and their ordinary garb conforms to the customary dress of the poorest native. A decided feature from the beginning has been the army's music. It appropriates with the utmost freedom tunes with which all are familiar; and all sorts of musical instruments are used in the meetings and in the open-air parades.

In the army women are not barred by their sex from any position. They compose about half the officers in charge of corps. Though the discipline is strictly military the service is entirely voluntary, any one being at liberty to retire at any time. Having given satisfactory evidence of conversion and signed the articles of war, in which he promises, for love of Christ, to live for God and the army, be obedient to lawful orders, and lead a pure life, a recruit is expected to become an active worker. His tastes, circumstances, and adaptations are well considered, and scope is given for all his talents to find employment. The principle of self-support is applied to every corps, division, and territory. No salaries are guaranteed, and no officer receives more than is required for the supply of actual wants. Gen. Booth's private income is derived from other sources, and he has never drawn any salary or allowance from the army funds.

The memoir of Mrs. Booth, "the mother of the Salvation Army," *The Life of Catherine Booth* (New York and London, 1893), contains a history of the movement which embodied her life's work. All her children are actively engaged in "the war." William Bramwell, the eldest son, is chief of staff at the international headquarters, 101 Queen Victoria Street, London, England. Ballington, the second son, is commander of the forces in the U. S., with headquarters in New York; and Herbert, the third son, is in

command of the Canada forces. Of the daughters, the eldest, Catherine, has since 1881 been in charge of the French work, with the title of *La Maréchale*, and two, Emma and Lucy, have India especially in charge—the latter living with and as the native poor. Other notable names identified with the army's progress are those of Commissioners Booth-Clibborn, Booth-Tucker, Railton, Hanna Ouchterlony, Howard Carleton, Cadman, Coombes, and Ridsdell.

The auxiliary league is composed of persons who, not necessarily indorsing every method used by the army, yet sympathize in its desire to reclaim the fallen and to save the lost, and who are precluded from taking any other part in it by pressure of other duties or ill health. Many persons of influence and position in this way assist in removing prejudice and encouraging the work.

In Oct., 1890, Gen. Booth published *In Darkest England, and the Way Out*, a book in which he dealt with and solved the problem of destitution and crime from the standpoint of the Salvation Army, through which alone it would be practicable to carry out such a scheme as he proposed. Five million dollars would be required, by the general's estimate, to put the whole in working order, but half a million would be sufficient to start it. On Jan. 30 following Gen. Booth publicly signed a deed of trust for the half million dollars, and two parts of the plan—the City Colony and the Farm Colony—are in successful working order and self-supporting, and negotiations are well under way (1894) for the third—the Over-the-sea Colony. Should the plan be fully carried out, the general declares that in England in twenty years no man or woman willing to work would be unemployed. Perhaps in no country has the Salvation Army made more rapid strides, or taken deeper hold, than in the U. S. On Mar. 10, 1880, Commissioner George Scott Railton, in company with seven illiterate yet earnest young women, landed at Castle Garden, New York. After a time the work was very prosperous, but unfortunately, owing to the unfaithfulness of one in its command, a secession took place in Oct., 1884, which resulted in the loss of the official organ, property, and many officers. Commissioner Frank Smith followed in office and was in command some three years, during which a hard struggle was experienced. Commander and Mrs. Ballington Booth took command of the work in the U. S. in Apr., 1887, and since 1890, in particular, the progress of the movement has been rapid. In Nov., 1892, the army was established in 553 cities and towns, having 656 corps and outposts, and during that month the 1,500th officer was commissioned. Five-eighths of the officers are by birth or naturalization citizens of the U. S. In Jan., 1895, there were 2,002 officers. The official organ is the *War Cry*, and there are also a Swedish and a German *War Cry* and a monthly magazine known as *The Conqueror*. It was reported that 14,000,000 persons had attended the army's services during the year 1891 throughout the U. S.

BALLINGTON BOOTH. MAUD BALLINGTON BOOTH.

Salvator Rosa: an anglicized form of the name. See ROSA, SALVATORE.

Salvianus: presbyter of Marseilles; an important Christian writer of the fifth century; b. probably at or near Treves; author of several works, of which the following are extant: 1. *Ad Ecclesiam*, in four books, a tractate against avarice, published under the pseudonym of *Timotheus*; 2. *De Gubernatione Dei*, composed between 439 and 451, in eight books, in defense of God's constant providence; 3. Nine letters. Salvianus's Latin is excellent for the period, and bears evidence of a study of Lactantius, but he is diffuse and very rhetorical. Of the vices of his time he gives a most vivid picture. Best editions by C. Halm (Berlin, 1877) and F. Pauly (Vienna, 1883). M. WARREN.

Salvini, sal-vee-nē, TOMMASO: tragedian; b. in Milan, Italy, Jan. 1, 1830. His father abandoned the profession of literature for the stage. His mother was also an actress. Young Salvini showed a rare talent for acting, and he was placed under the tuition of Gustave Modena, and about 1847 joined the Ristori troupe, and achieved success. In 1849 Salvini took an active part in the war of Italian independence, and became the friend of Mazzini, Garibaldi, and Saffi, with whom he was taken prisoner at Genoa. Retiring to Florence he devoted a year to professional study, preparing among others the rôles of Othello, Saul, Hamlet, and Orosmanes. His theatrical tours in Italy, Spain, and Portugal were a series of ovations. In 1872 Salvini visited South America, where he was received with equal enthusiasm, and in 1873-74 he made a tour in the U. S., giving 128 perform-

ances, as well as twenty-eight in Havana, Cuba. In 1881-82 he again visited the U. S., and made a third tour in 1885-86, since which he has retired from the stage, and lives in Florence. Salvini also acted in Great Britain, Germany, Austria, and Hungary, producing everywhere a profound impression. B. B. VALLENTINE.

Salzburg: capital of the duchy of Salzburg, Austria; 195 miles by rail W. by S. of Vienna (see map of Austria-Hungary, ref. 5-D). It is picturesquely situated at the foot of the Noric Alps, on both sides of the Salza, which here rushes forth from a narrow defile and winds through the city toward the Inn. The city is old, with crooked and narrow streets, but it contains many fine monuments and edifices built of white marble. It is surrounded with walls, pierced by twenty gates, of which the most remarkable is the Sigismund Thor, 425 feet long, hewn through the Mönchsberg. It has a fine cathedral (1614-34), a Benedictine monastery with a library of 65,000 volumes and 900 MSS., a botanical garden, a college, a theological seminary, a medical school, a museum of antiquities, and a public library with 82,000 volumes and 1,400 MSS. After 798 Salzburg was the seat of archbishops who became noted for their ecclesiastical severity. In 1498 the Jews were expelled, and in 1732 30,000 Protestants were compelled to leave their homes. Salzburg has manufactures of paper-hangings, musical instruments, lead-pencils, mirrors, and type, several oil-mills and factories for spinning and weaving cotton, and carries on an active trade with Vienna and Bavaria. Pop. (1891) 27,644.

Salzkammergut: district of the Austrian province of Upper Austria, between Salzburg and Styria; remarkable for the beauty of its scenery and for its salt-works. It comprises an area of 255 sq. miles, with 19,000 inhabitants. On account of the alpine character of the district, agriculture is almost impracticable; the inhabitants are mostly engaged in cattle-rearing and dairy-farming, and in the manufacture of salt from the salt-springs. The most striking feature of the scenery is the lakes, inclosed by forest-clad mountains. The highest peak, Hoher Priel, reaches an elevation of 7,361 feet. The most celebrated of the lakes is Traun, formed by the river Traun. The richest salt-works are those of Ischl and Hallstadt. Revised by M. W. HARRINGTON.

Samana' Bay: a deep indentation in the eastern end of the island of Santo Domingo (Dominican Republic), West Indies. It is 37 miles long and 12 wide, with two entrances, which could be easily defended by forts; it forms a very large and fine harbor, perfectly safe except in the rare event of a cyclone from the E. The principal ports are Sabana la Mar on the south side and Santa Bárbara de Samaná on the north. Although it lies near the route from New York to the Isthmus of Panama, the U. S. Congress refused to ratify a treaty for its purchase in 1870.

HERBERT H. SMITH.

Samar: one of the Visaya group, Philippine islands, East Indies; area, 5,167 sq. miles; pop. (1887) 185,386 inhabitants, most of whom are mestizoes. The mountains of this island are higher and wilder than those of the other islands. The capital is Catbalonga, on the west coast. The principal articles in which trade is carried on are wax, cabinet woods, palm oil and mat-work. Revised by M. W. HARRINGTON.

Samara, sâ-mâ-râ: government of European Russia; bounded E. by the Kirghiz steppes and W. by the Volga. Area, 58,321 sq. miles. It is very fertile and well adapted to agriculture, but thinly peopled. Pop. (1890) 2,665,300.

Samara: capital of the government of Samara, European Russia; on the Volga (see map of Russia, ref. 7-H). It has an extensive trade in grain, fish, caviare, tallow, and hides. Pop. (1891) 99,856.

Samarang: town of Java, East Indies; the capital of the Dutch residency of Samarang; on the northern coast of the island, at the mouth of the river Samarang (see map of East Indies, ref. 8-D). It is tolerably well built, and has an important trade, though its climate is unhealthy and its harbor shallow, and in the wet season even unsafe. Sugar, rice, and pepper are extensively cultivated in its vicinity, and it is the entrepôt for the products of the central part of the island. Pop. 71,440, of whom 3,600 are Europeans.

Samaria [from Lat. *Samari* = Gr. *Σαμάρια*, from Heb. *Shômron*]: an ancient city of Central Palestine, 6 miles N. W. of Shechem, and about half-way between the Mediterranean and the Jordan. It was founded 923 B. C. by Omri, the sixth of the nineteen kings of the northern kingdom of Israel, who

which he captured, and called it after the name of the man (Samari) of whom he bought the hill on which the city was built (1 Kings xvi. 24). This hill, called and Bithenai, sitting on the height of some 800 feet out of a basin about 10 miles in diameter, surrounded on every side by mountains of basalt. The Mediterranean is in full view from the top of the hill. "It would be difficult," says Dr. Robinson, "to find in all Palestine a situation of equal strength, fertility, and beauty combined. In all these particulars it has no equals. The advantage of Samaria." The city shared the ordinary fortunes of the upper kingdom. Twice it was destroyed when besieged by the Syrians. In 722 B.C. it was a scene of two years' looting by Sargon of Assyria, was taken by Ashurbanipal, Sargon, who put an end to the kingdom of the ten tribes. Rebuilt by Sargon, it was very captured by Alexander the Great (332 B.C.), and again by John Hyrcanus (100 B.C.). It was splendidly rebuilt by Herod (40-4 B.C.), who named it Sebaste, in honor of the emperor, the Emperor Augustus. The modern Arabic name is a corrupt form of the Greek name. Nearly no Samaritan colonies still standing attest the magnificence of the Hasmonean city. The partially ruined church of St. John on a steeply faced promontory from the twelfth century, in the fourth century it was claimed that John the Baptist had been buried there, as well as the prophets Elishah and Ishaiah. The modern village on the eastern slope of the hill contains about sixty houses. The population 450 to 500 are noted for their rudeness and insensibility. Samaria was also the name of one of the three provinces into which Western Palestine was divided by the Romans. Its boundaries are given by Josephus (J. W., 3. 7. 10).

Revised by S. H. JACKSON.

Samar'ites (from *Samari*, Samaritan, Samaritan, a Samaritan, from *Samari* a Samaritan, *Samari*, of *Samari*, the ancient inhabitants of the province of Samaria; the ancient inhabitants of the province of Samaria). After the destruction of the kingdom of Israel in 722 B.C., in the first year of Sargon, King of Assyria (1 Kings xvi. 24; xviii. 1), Central Palestine was devastated and annihilated except by a remnant of the Israelites and fugitives (2 Chron. xxxv. 8, 9; Jer. xli. 17). The Samaritan tribes, by Sargon in 722, and again in 722 B.C. (2 Kings xvi. 24, and Esarhaddon in 680 (Jer. i. 20), of exiles from Babylon, Syria, Arabia, and the Eastern lands. Hence the people became an exceedingly mixed race, the main body, however, being of the Israelite stock. Every tribe at first worshiped its own god, but being plagued by the wild beasts, they united in the worship of the God of the land, being entrusted thereto by a prophet sent to them from the palace by the King of Assyria. He restored the worship at Bethel (2 Kings xvii. 34-41). When the Jews returned to Jerusalem (538 B.C.), the Samaritans desired to unite with them in their work, but were rejected by the Jews, owing to their corrupt religion and idolatry (Ezra iv. 1-3). Henceforth, the Jews and Samaritans entertained the most bitter hatred of each other. Time was intensified by the secession of one of the sons of Jeroboam, the son of Nebat, the high priest (Neh. xiii. 26), who became of Manasseh, the Samaritan governor called by Josephus, *Idol.* vi. 7, 2, Manasseh, the brother of the high priest. Under the leadership of this man and others of the Jews, who with him were expelled as a result of their refusal to separate themselves from idolatrous worship, the worship was reorganized (488 B.C.) on the basis of a copy of the Pentateuch that Manasseh carried with him. Bethel was made the center of worship, in accordance with the tenth commandment added by the Samaritans to Ex. xii. and Deut. v., and a temple was built there, probably in the time of Alexander the Great, which continued until it was destroyed by John Hyrcanus (100 B.C.). Temple, *Idol.* viii. 9, 1). The Samaritans lost the fortress of Palestine during the constant wars between Egypt and Syria, and also under the Roman domination. They were severely chastised by Pilate for their religious spirit, then again by Vespasian and others, until, in the reign of Nero and Justinian, on account of their resistance against Christians, they were almost completely destroyed. A remnant clung to their holy place, Bethel, in Nabulus, the successor of the ancient Shechem, as reported by Alexandria, Cairo, Damascus, Aleppo, etc., where they retained the religion of their fathers. And thus they continued during the Muhammadan rule, dwindling day by day, until they are limited to a community of from 100 to 200 at Nabulus. They were lost sight of by the

learned world until the sixteenth century, when Joseph Scaliger opened a correspondence with them. They then gained an interest that they have since retained, owing to their ancient copy of the Pentateuch, and their religious ideas and doctrines, as well as their language and literature.

The Samaritan Pentateuch.—The original MS. is in the synagogue at Nabulus. This, it is claimed, was received by tradition from Abishai, the great-grandson of Aaron, whose name is inscribed upon it. It is mentioned by Cyril of Alexandria, Eusebius, Jerome, Procopius of Gaza, etc., among the Fathers, but was lost sight of subsequently until 1616, when Pietro della Valle procured a copy of it at Damascus, which was then published in the Paris Polyglot of 1645, and subsequently in Walton's Polyglot of 1657. At once a hot dispute arose as to its value, which continued for two centuries—Morinus, Brachmont, Panson, and Hasecamp calling it almost the Samaritan text; Heringer, Heringer, J. D. Michaelis, and Tychsen advocating the superiority of the latter. Griesbach, in his work *De Pent. Sam. Origine* (1815), was the first to compare the two texts thoroughly. His results have been generally accepted by modern scholars—that while the text is an independent one in its origin, it has yet been improved by the Samaritans in order to a cold obscurity and in the interest of their own religion, at times betraying an ignorance of Hebrew grammar and exegesis. It has many features of resemblance to the LXX. Griesbach calculates them at more than 1,000, which have attracted the attention of scholars, so that on the one side Heringer, Hasecamp, Eichhorn, and Ruhn have contended that the LXX. had been translated from the Samaritan, and on the other side Griesbach, Usher, etc., that the Samaritan was made from the LXX. But these views are impossible, and have been abandoned by most recent scholars, who give the text as an independent authority. It was, then, either with the LXX. derived from a common older MS. of Jerusalem, as Griesbach, Nott, and others, or, as the difference between them are quite numerous; they are based on independent original MSS., the original of the Samaritan text having been brought from Jerusalem by Manasseh. The text has been published since Walton by Heringer (Oxford, 1700) in Hebrew square characters, and the variations from the Samaritan text have been noted in the appendix to Petermann's *Versuch einer hebräischen Formelbuch nach der Auslegung der heutigen Samaritaner* (Leipzig, 1868; also *Deutsch. Morph. Gesells.*, v. 1). The text has been discussed in Smith's *Bib. Diet.* by Deissel, and in Kitt's *Cyclop.* (3d ed.) by Samuel Davidson, as well as by those mentioned above.

The Samaritan religion is based on the Pentateuch, and differs from that of the Jews in the rejection of the rest of the Old Testament, and in their regarding as the tenth commandment the obligation to worship God on Mt. Gerizim. Their religion is monotheistic, the name *YHWH* being lost, and *Shema* (the name) substituted for it. They believe in the existence of good and evil spirits, *Qados* (Lev. xvi. 10) being interpreted as a "devil," and the *Qados* of Gen. vi. 4 as "evil spirits." They believe in the Messiah (John iv. 25), on the basis of Deut. xviii. 15, as a prophet, who is like Moses, but not greater than Moses, who remains for all time the greatest. The Shihah passage, Gen. xlix. 4, they refer to Solomon, in whose time the scepter departed from Judah. The Messiah will appear 6,000 years after the creation, and enter into judgment of the world on Mt. Gerizim. Here they find all the sacred places of the past and future. Here Adam was created; here the ark rested; here Adam and Noah erected their altars, Abraham offered Isaac, and the heavenly ladder appeared to Jacob, etc. They do not offer sacrifices, on account of the destruction of the temple, but keep the feasts of the Pentateuch, circumcise their boys on the eighth day, and observe the Sabbath in their synagogues like the Jews. The Samaritans had their sects after the analogy of the Jewish sects, called Essenes, Sabaeans, Gorthonians, and Donibans, mentioned by Epiphanius, *Adv. Haeres.*, i. 11, fourth century. For these, and a full description of their present customs in the keeping of the feasts, see Petermann, *art. Samaria*, Herzog's *Realencyclopädie*; Stanley's *Jewish Church*; and Nott's *Samaritan History, Dogma, and Literature* (London, 1874).

The Samaritan language is a mixture of the Aramaic and Hebrew, in many cases having side by side the two forms; e. g. the article of the Hebrew and emphatic state of the Aramaic; the relatives *Qados* and *Qados*; the Niphal and *Qados*, *Qados*, and *Qados*; the plurals in *Qados* and *Qados*.

and י—. The letters are twenty-two in number, their order being the same as in Hebrew, but their *form* is like the ancient Hebrew and Phœnician, and not like the square character adopted by the Jews subsequent to the Exile. In pronunciation they are the same as Hebrew, except the gutturals, which are all quiescent and interchange readily with one another, being exceedingly weak. The vocabulary is essentially the same as the Hebrew and Chaldee, although many words have been introduced from Arabic, Latin, and Greek. See Uhlemann, *Inst. ling. Samarit.* (Leipzig, 1837); Nicholls, *Grammar of the Samaritan Lang.* (London, 1858); Petermann, *Brevis Ling. Samarit. Gr.* (Berlin, 1873).

The Samaritan literature is limited in extent. (1) The Samaritan Targum is ascribed by tradition to Nathanael the high priest, who died 20 b. c. There is no reason to doubt that it was composed about the same time as the Targum of Onkelos, with which it has many points of agreement, although certainly an entirely independent version. The translation is exceedingly literal and close, even where the sense was not clear to the translator. (Cf. Winer, *De Versionis Pent. Samaritanæ indole* (Leipzig, 1817); Petermann, *Pent. Samarit.*, fasc. i. Genesis (Berlin, 1872); Brüll, *Samarit. Targum zum Pent.* (Frankfort, 1875), in Hebrew square characters. Cf. also *Fragments of a Samaritan Targum*, with an introduction by Nutt (London, 1874), and *Krit. Studien über manuscr. Frag. des Sam. Targ.* von Brüll (Frankfort, 1875).) This Targum is also printed in the great Paris and Walton Polyglots. The Samaritans had also a Greek version, mentioned by some of the Fathers as τὸ *ῥαφαηριανόν*, which has been lost; also an Arabic version, which they still possess. (2) *Chronicles*.—First in importance is the Samaritan Chronicle, or book of Joshua, composed probably in the thirteenth century, taking some of its material from the Hebrew book of Joshua, but adding thereto much of a legendary character, showing that the Jews were from the time of Eli apostates and their oppressors, continuing the narrative until about 850 A. D., where it concludes abruptly. It was published by Juynboll (Leyden, 1848), with Latin translation and commentary. There is also the chronicle *El Tholadoth* (The Generations), professedly by Eleazar ben Amram (1142 A. D.), and then continued by many others until 1859, giving the calculation of sacred times, the age of patriarchs, list of high priests until the present. It was published by Neubauer in *Journal asiatique* (1869). Then comes the chronicle of Abulfath, in the middle of the fourteenth century, a digest of the two previous works, with fresh legendary material, published by Vilmar (Gotha, 1865). Other minor works, corresponding with the Jewish Hagada literature, are found. (3) *Liturgies and Hymns*.—Nutt (p. 143) says that there are nineteen volumes of these in the British Museum, besides those known in the *Carmina Samarit.* of Gesenius (Halle, 1824) and *Karne Shomeron* of Kirchheim (Frankfort, 1851). Petermann publishes specimens in his *Gram. and Chrest.* The present Samaritans have two collections, called *Durrân* (String of Pearls) and *Defter* (Book). These hymns and prayers belong to widely different periods. The earliest are ascribed to the angels. Heidenheim has published many of them in his *Vierteljahrsschrift*. (4) There are also commentaries, theological tracts, and a few recent grammatical works, written in Arabic. See the article *Samaria* in Herzog's *Realencyk.*, by Petermann; Smith's *Dict.*, by Deutsch; Kitto, *Cyclop.* (3d ed.), by Davidson; and Nutt, *Samaritan Hist., Dogma, and Literature* (London, 1874). C. A. Briggs.

Samarkand', or **Samarcand** (probably the ancient *Mara-canda*): capital of the province of Serafshan; comprising the southern part of Russian Turkestan; situated at an elevation of 2,154 feet above the level of the sea, 8 miles S. of the river Serafshan (see map of Asia, ref. 4-D). By the Arabian poets of the Middle Ages it is described as a paradise on account of its beautiful surroundings, and under the dynasty of the Sassanides (833-1000 A. D.) it flourished as a home for learning and all the arts of peace. It lost much by the occupation of Genghis Khan in 1219, but it rose again toward the close of the fourteenth century, when Timur made it the capital of his immense empire, and adorned it with architectural monuments of all kinds—the tomb of Kasim-bin-Abbas, the mosque of Timur, the citadel, Timur's tomb, the Medresse, etc. By the Mohammedans of Central Asia the city is still considered the principal seat of Mohammedan learning, and its eighty-six mosques and twenty-three colleges attract numerous pilgrims and students. In 1868 it was seized by Russia, with the whole dis-

trict of the Serafshan. The Transcaspian Railway has been completed to Samarkand. Pop. in 1889, according to Curzon, 40,000, of whom 6,000 are in the European quarter.

Revised by M. W. HARRINGTON.

Samar'rah: town; in the vilayet of Mesopotamia; on the left bank of the Tigris; 62 miles N. W. from Bagdad (see map of Turkey, ref. 7-J). It was founded by the Caliph Motassem (836) with frightful extravagance. The stable of the caliph could contain 100,000 horses. The city is revered by the Shi'ite Mussulmans, and annually attracts great numbers of pilgrims. Pop. 8,000. The ruins of ancient Opis and of the Median wall, which extends for several miles along the river, are close by. E. A. G.

Sambation [through Heb. from Gr. *σαββατικὴ νόμος*]: a river said by Oriental folk-lore to flow during the week, but to rest on the Sabbath. It is first mentioned by Pliny (*Hist. Nat.*, xxxi., 2). Josephus (*Bell. Jud.*, vii., 5, 1) reverses the order, and says it flows only on the Sabbath. In the Midrash and later Jewish saga it is connected with the reported dwellings of the ten lost tribes (*Jew. Quart. Rev.*, i., p. 20, seq.). It is useless to attempt to identify the river, but the belief had its origin in the many intermittent springs in Palestine, and in the wish to make nature witness to the holiness of the Sabbath. There existed another saga on a river which flowed sand and stones (Bar Hebraeus, in *Mittheil. d. Acad.-Orient. Ver. zu Berlin*, iii., 38), which, because of its name (*Nahar hól*, Sand or Week river), was confounded with the Sambation (*All. Zeit. d. Judenth.*, May 20, 1892, p. 247; *Zeit. f. Assyriol.*, viii., p. 273). Similar traditions exist in the East. See also Neubauer, *Geogr. du Talmud* (1868, p. 33); Brüll, *Jahrbücher f. Jüd. Gesch.* (i., p. 64; *Zeit. f. Volkskunde* (ii., p. 297). RICHARD GOTTHEIL.

Sambre, *sañbr*: a small river of Europe which rises in the department of Aisne, France, flows in a N. E. direction, and joins the Meuse at Namur in Belgium after a course of about 100 miles. It is navigable for a great part of its course, and forms an important part of the system of canals in Northern France and Belgium.

Sam'sen [Jap., liter., the three pleasing threads]: the most popular of Japanese musical instruments. It consists of a neck or finger-board 2½ feet long, and a square drum (7½ by 7 inches), rounded off at the corners and covered with parchment. There are three strings of silk, which the player strikes with a broad pecten, 8½ inches long, of wood, ivory, or tortoise-shell. The parchment covering the drum is of cat-skin, and is double at the point where the player strikes. The instrument is held by the left hand, close to the left shoulder, transversely, so that the drum comes under the right arm. The drum receives the first blow from the pecten or *bachi*, and thus two vibrations are set up. In the fingering the nails are made to press the strings. The instrument is said to have been introduced from Loos about 1560. J. M. DIXON.

Sammon'icus, **QUINTUS SERENUS**: a Roman poet of the third century A. D., whose didactic poem, *De Medicina*, in 1,115 hexameters, is a collection of medical receipts drawn largely from the elder Pliny; correct in versification, but dull and prosaic. Edited by Ackermann (Leipzig, 1786), and in Bachrens's *Poet. Lat. Minores*, vol. iii., pp. 102-158. M. W.

Sam'nites [from Lat. *Sam'nis*, plur. *Samnites*, a Samnite, deriv. of *Sam'nium*, for older *Sabinium*, name of their country, deriv. of *Sabi'nus*, Sabine]: a people of Sabine origin occupying Samnium, the territory of Central Italy S. of the *SABINES* (q. v.). Like the latter, they were a confederation of tribes, but their organization seems to have been more perfect than that of the parent race. They gradually moved beyond the natural boundaries of their territory, and occupied points on the Adriatic, and in the territory of Campania and Lucania, coalescing with the Oscan peoples who inhabited this region. In the northern part of Campania they came in contact with the Romans, and thus was inaugurated the long series of wars which resulted in Rome's conquest of the whole of Southern Italy (272 B. C.). The Samnites probably found the Oscan language in the original territory which they occupied, as well as in Campania, but as their own (the Umbro-Sabellian dialect) was so closely related to it, the mingled product does not seem to have differed much from the original Oscan. G. L. HENDRICKSON.

Samnium: See **SAMNITES**.

Samo'a: group of fourteen volcanic islands of Polynesia, N. E. of the Fiji islands; lying nearly E. and W. between

the parallels 13° 31' N. and 14° 30' S. and lon. 172° 45' W. and 173° W. It consists of three larger islands—Savat (area, 528 sq. miles; Upele 680 sq. miles) and Tutuila (54 sq. miles)—and the smaller Manua group in the northeast. Total area, 1,761 sq. miles. Pop. 34,000. Upele is the most populous, containing 16,500 inhabitants, and on its northern coast is Apia, the principal port and capital of the group. The Samoans are polynesian, though native tradition relates migration on Savat, and in 1996 Olesung, one of the eastern groups, had a submarine eruption close to its shores, so-called by a shower of ashes. The climate is tropical, the rainfall (occurring in December to April) reaches sometimes 150 inches. The soil is very fertile, the vegetation luxuriant, the aspect picturesque. The natives are of pure Polynesian race, gay, kind, pleasure-loving, indolent, fairly civilized, devoted to agriculture and fishing. They are all nominal Christians, almost everywhere being Protestants, the remainder Roman Catholics. In 1861 there were 304 British subjects on the islands, about 60 Germans, and a lot of other nationalities. The chief products are copra, sugar, and coffee. In 1899 considerable plantations of cocoa were begun. U. S. copra was the recognized medium of exchange. The archipelago was discovered in 1792 by Roggeveen. Bougainville visited the islands in 1769 and named them Navigator Islands. They are in direct steam-communication with New Zealand, Australia, and California. The date used on the islands, formerly derived from the East, was in 1862 changed to time from the West, July 5 of that year being changed to July 4, making the date correspond with the rules of navigation.

The islands have been the scene of much strife, much of which can be traced to the efforts of a German company with large interests there to bring about German control. Formerly the islands, with the exception of Tutuila, which had independent chiefs, were governed by the royal houses of Malietoa and Tupua. In July, 1881, by an agreement between Germany, Great Britain, and the U. S., Laupepa became king of all Samoa, and Tanamasesi vice-king. These two chiefs frequently changed places until, Aug. 25, 1887, the Germans proclaimed Tanamasesi king, and Laupepa was deposed as the German king. Mutaafa, the chief of the loyalist party and a relative of the exiled king, made war against Tanamasesi. The Germans, after an encounter (Dec. 19, 1888) resulting from an attempt to disarm Mutaafa's forces, proclaimed martial law. A truce was finally arranged with Tanamasesi pending diplomatic negotiations. At a conference in Berlin between representatives of Germany, Great Britain, and the U. S., Samoa was declared (June 14, 1889) independent and neutral; the Samoans were secured in their right to elect their king and govern themselves according to their native laws and customs; and a supreme court was created to secure the rights of foreigners. Laupepa was re-elected king to the people Nov. 9, 1890. By the treaty signed Apr. 15, 1892, Apia was converted into a municipal district, or international port, and placed under a municipal magistrate. See Robert Louis Stevenson, *A Footnote to History, Eight Years of Trouble in Samoa* (1892).

MARK W. HARRINGTON.

Samos, a mountainous island of the Aegean Sea; separated by the Strait of Kutchuk Boghas, 1½ miles wide, from the promontory of Mt. Nyssa, at whose foot the fleet of Xerxes was defeated on the day of the battle of Plataea (479 B. C.). It is 44 miles long, 15 miles broad, with area of 500 sq. miles. The island is exceedingly fertile, producing an abundance of wheat, olives, grapes, and fruit of superior quality, but its crops, lemon, and pomegranate groves were ruined by the vigorous winter of 1849, and have been only partially recovered. The mountains, lined with forests of oak, cypress, and pine, are rich in marble and silver, lead and copper ores. Mt. Kerki, the loftiest peak, is 5,223 feet high, the summit usually covered with snow. In grand scenery and variety of scenery, Samos is unsurpassed among the Aegean islands. The tunnel, mentioned by Herodotus, which supplied the ancient seaport with pure water, exists in good preservation. In all ages the Samian women have been famous for intrepidity and skill. In former days the island was wealthy and flourishing. Sometimes independent, but constantly attacked, it often changed masters, until in 1453 it was conquered by the Ottomans, and the inhabitants exterminated. Abandoned during a century, it was repopulated in 1587. It took an heroic part in the Greek revolution (1821-27), and asserted its independence, but was handed over to the Ottomans by the allied powers

on conclusion of peace. Since Dec. 11, 1898, it has been a principality, paying an annual tribute of 60,000 piasters, and governed by a Christian prince appointed by the sultan. The inhabitants, almost exclusively Greeks, are industrious, no despising, and ambitious. Valley, the real capital (pop. 7,675), was among the first places in the East to introduce the electric light. Chora, the residence of the governor, is a miniature European town. The annual exports, mostly agricultural products, amount to \$4,000,000. Pop. of the island (1889) 46,001, residing in thirty-one towns and villages.

F. A. GOSWORTHY.

Samothrace, island in the Aegean Sea; N. W. of the Dardanelles; belongs to Turkey. Inactive of harbors, it is really a wooded mountain, 30 miles in circuit, rising to the height of 5,240 feet. Its peak, Mt. Saron, whence, according to Homer, Neptune watched the battles of the Greeks and Trojans, is visible from the plain of Troy. The island was the center of the ancient Cabiric worship, monuments of which are still seen. An earthquake, Feb. 14, 1880, destroyed most of the buildings on the island and many lives. Pop. 1,600.

F. A. GOSWORTHY.

Samoyeds: a people of Northern Russia, in Europe and Asia, from the White Sea on the W. to Cape Chelyuskin on the E., along the Arctic Ocean, and to a considerable but varying distance inland. They appear to be allied to the Lapps and Finns, but are more degraded than either. They are small, filthy, indolent, and much addicted to intoxication, but peaceable and harmless. The herding of reindeer and the collection of fish and furs afford them subsistence. They are said to number 20,000, of whom one-fourth are European. They speak several dialects. Their country is one of the coldest and most desolate of inhabited lands. They are nominal Christians, but preserve much of their old worship.

Revised by M. W. HARRINGTON.

Sanspore [for earlier *sanspore*, from O. Fr. *Saint Pierre* in *herbe de Saint Pierre*, sanspore, later, *Saint Peter's grass*]: an umbelliferous plant, *Crithmum maritimum*, growing on cliffs near the sea in Europe. It is a choice salad-herb and makes a very fine pickle. It is extensively raised in English market-gardens. The golden sanspore is *Isula crithmoides*, a composite sea-coast plant resembling sanspore, growing in the same situations and having the same uses. Marsh-sanspore is *Salicornia herbacea*, a chenopodiaceous salt-marsh plant of Europe and North America.

Revised by CHARLES E. BASKET.

Sampi: an ancient Greek numeral sign (Ϟ) for 900. In form it undoubtedly represents the so-called "Doric *sem*" (M), a symbol inherited from the Phoenician alphabet, and originally indicating a syllable distinct from *sigma*. The old Greek local alphabet seldom made use of both signs, but generally decided in favor of one or the other. Some of the Asiatic-Ionic towns, notably Halicarnassus and Teos, used the *sem* in the form T to denote the sound *ts* (or *sk*), otherwise commonly written with double sigma (*ts*-). That the symbol was generally regarded even in Asia Minor as a superfluous sign is shown by its place after *omega* (800) in the scale of numerals which originated in Miletus. The name *sampi* is due either to the fancied resemblance of the later form to the letter *pi* (π), or, if the name is really old, more probably to the position of the letter after *pi* in the original (Phoenician) alphabet.

Revised by WHEELER.

Sampierdarena: See SAN PIER D'ARENZA.

Sampson, EZRA: clergyman and editor; b. at Middleborough, Mass., Feb. 12, 1742; graduated at Yale College 1773; became pastor of the Congregational church at Plympton, Mass., Feb., 1775; was chaplain in the army at Cambridge 1775-76; removed to Hudson, N. Y., 1796; was there associated with Harry Crosswell in the editorship of *The Balance*, one of the first literary journals established in the U. S., 1801-04; contributed essays for many years to *The Unitarian Current*, which he edited 1804; became judge of Columbia County 1814, but soon resigned. D. in New York, Dec. 12, 1823. Author of *Remains of the Bible* (1802); *The Sham Patriot Unmasked* (1803); *The Historical Dictionary* (1804), which passed through several editions; and *The Brief Remark on the Ways of Man* (1817; new ed., 1855).

Revised by G. P. FISHER.

Samson [from Heb. *Shimshon*, later, like the sun, deriv. of *shemesh*, sun]: one of the Hebrew judges, whose history is related Jud. xiii. 2-xvi. 31. Few narratives in the Bible have been studied so carelessly as this. The opening formula (Jud. xiii. 2) shows that it is a story like those in

Jud. xvii.-xviii. and xix.-xxi. The author took pains to divide the story into two parts. The first part (xiii. 2-xv. 20) gives an account of the birth and the wild youth of Samson, up to the time when, after the battle of Lehi, "he became judge of Israel, in the days of the Philistines, twenty years." The second part (xvi.) gives an account of the last few weeks or months of his life, when he relapsed into folly, and perished thereby, "he having been judge of Israel twenty years." Samson is the son of the Danite Manoah of Zorah (xiii. 2), living in Mahaneh-Dan (xiii. 25, xvi. 31; comp. xviii. 11-12). To his mother, long barren, the birth of a son was announced by an angel (comp. Luke i. 7, 13). He is a Nazirite by birth (xiii. 5, 7, xvi. 17; comp. 1 Sam. i. 11), a different thing from being a Nazirite temporarily by vow (Num. vi. 2-21). Through his passion for a Philistine woman, he providentially becomes involved in a series of personal quarrels with the Philistines. In these, though he is not blameless, he has the sympathy of the reader. One exploit leads to another, until he becomes judge. No details of his career as judge are given. In his youth, however, the Philistines ruled Israel (xiv. 4), and Israel, judging by the conduct of the men of Judah (xv. 10-13), was in an abject condition; while in his later years the Philistines kept their own side of the border (xvi.). The inference is inevitable that the twenty years of his administration were a success, and fulfill the promise made before his birth (xiii. 5). Many imagine that he was merely a local judge, but, if language means anything, the statement that he "judged Israel" indicates that he was chief magistrate of the nation. Ussher assumes that the twenty years of Samson followed the forty years of Eli, and dates them B. C. 1140-1120. It is more probable that Samson belongs to the time of Philistine oppression, some decades earlier (Jud. x. 7). Revised by W. J. BEECHER.

Samson, GEORGE WHITEFIELD, D. D.: theologian and critic; b. at Harvard, Mass., Sept. 29, 1819; graduated at Brown University 1839, at Newton Theological Institute 1843; was for many years pastor of a Baptist church at Washington, D. C., and president of Columbian College, D. C., 1859-71, when he became president of Rutgers Female College, New York. He traveled in Europe and the East 1848, publishing a series of letters and essays on Italy, Egypt, Palestine, and Sinai; has written several theological pamphlets and critical essays on art, and is author of *To Dæmonion, or the Spiritual Medium* (1852), reissued in an enlarged form under the title *Spiritualism Tested* (1860); *Outlines of the History of Ethics* (1860); *Elements of Art Criticism* (1866); *Physical Media in Spiritual Manifestations* (1869); *The Atonement as assumed Divine Responsibility* (1878); *Bible Revisers' Greek Text* (1880); *Bible Wines* (1883); *Idols of Fashion and Culture* (1887); *Tested Truths as to Relations of Capital and Labor* (1890); *Guizot's Harmony of Historic, Philosophic, and Religious Instruction in French Colleges* (1891); *Classic Text of Authorship, Authenticity of Authority applied to the Old and New Testament Scriptures* (1893).

Samsun' (anc. *Amisus*): town; in vilayet of Trebizond, Asia Minor; a port of large importance on the Black Sea; northern terminus of several trans-Anatolian commercial routes (see map of Turkey, ref. 4-G). It exports wool, silk, sheepskins, goatskins, wax, gums, opium, grain, fruit, wine, valonea, and tobacco. Pop. (1889) 14,500. E. A. G.

Samuel [from Heb. *Sh'mū'el*, for *sh'mū'a'el*, heard of God]: a Hebrew judge, lawgiver, and prophet, whose history is recorded in the first of the two biblical books of Samuel; b. at Ramathaim Zophim, in Mt. Ephraim, probably in the twelfth century B. C.; was consecrated by his mother, Hannah, to the service of Jehovah as a Nazirite before his birth; brought up in the household of the chief priest, Eli, at Shiloh; received in childhood a divine message foreboding the downfall of the family of Eli; assumed the judgeship of Israel about twenty years after the death of Eli, at which time he headed a successful expedition against the Philistines; resided at Ramah (probably the same as Ramathaim Zophim); visited annually the three principal sanctuaries, Bethel, Gilgal, and Mizpeh, and made his sons deputy judges, but in consequence of their misconduct was commissioned by Jehovah to accede to the popular clamor for a king; to which end he anointed Saul as first monarch of Israel, and on his disobedience to a divine command anointed the youthful shepherd David in his place. He died shortly before the close of the reign of Saul, and his spirit was successfully invoked by the "witch of Endor" to announce to Saul the fatal result of the battle in which he

lost his life. Samuel is regarded as the father of prophecy. This does not mean that there had been no prophets before him, but that he gave organized form and increased power to the prophetic activity in Israel. The "companies" of prophets of his own time and the "sons of the prophets" of later times probably owed their origin to him. In connection with prophetic training he gave an impetus to literary and musical culture, thus making possible the great development of these that characterized the reigns of David and Solomon.

The chronology of the life of Samuel is obscure, and great differences of opinion exist. Probably, however, he was a grown man at the death of Eli (1 Sam. iii. 19-iv. 1); then for twenty years he made his influence felt as a prophet, neither he nor Samson, nor any other man, being at that time judge of Israel (vii. 2); then for perhaps eighteen years he was judge (vii. 6, *seq.*), chief magistrate of Israel; then Saul was made king, and Samuel, being thus out-ranked, was no longer chief magistrate, though he continued to be judge till his death (vii. 15). His administration was brilliantly successful, though the accounts of it are very brief. Israel became independent of the Philistines (vii. 13-14). He settled the Amorite question, which had been a source of trouble from the time of Joshua (vii. 14). He organized the administration of justice (vii. 16-17). Though his sons failed to walk in his footsteps, he handed over to his successor a strong and prosperous nation.

Revised by W. J. BEECHER.

Samuel, The Books of: called in the LXX. and Vulgate the first and second books of Kings. The books of Judges and Samuel, either with or without Ruth, are a connected whole, evidently formed, to a large extent, by the process of combining earlier writings. The Talmud attributes the series to the prophet Samuel, with supplementary work by the prophets Nathan and Gad. This can not be correct in the sense that Samuel personally wrote the larger part of these books, but it is probably correct in the sense that the work was initiated by him, and dominated throughout by his spirit. In 1 Chron. xxix. 29 we are told that the affairs of King David, first and last, "with all his reign and his might, and the times which passed over him and over Israel and over all the kingdoms of the countries," are written "upon the words of Samuel the seer, and upon the words of Nathan the prophet, and upon the words of Gad the observer." Evidently, the sources thus described are either a collection of the writings whence the present series, Judges, Ruth, and Samuel, was compiled, or else that series itself, the second alternative being the more probable.

Scholars hold various opinions as to the time when the books of Samuel were composed in their present form, but really there is no reason for dating them later than the lifetime of Nathan, that is, some time in the reign of Solomon. All the many alleged reasons for assigning to them a later date fade out when closely examined.

In any case, the books of Samuel are not continuous, as a literary work, with the books of Kings, though the latter take up the history at the point where the former leave it. The author of Kings habitually names his sources (1 Kings xi. 41, xiv. 19, e. g.), passes a sentence of formal approval or condemnation on each ruler (2 Kings xvi. 2, 3, e. g.), gives his chronology in a formulated system, while the author of Samuel habitually does none of these things. And many additional particulars might be cited to show that the authors of the two series were men very dissimilar in their point of view and their literary habits.

In their contents the books of Samuel are a history of David and his reign, with a preliminary account of the calamities that preceded Samuel, the brilliant administration of Samuel himself, the establishing of the kingdom, the reign of Saul, and especially Saul's relations to David.

Revised by W. J. BEECHER.

Samurai, sā'mōō-rī' (literally, guard): the name given to Japanese warriors under the feudal régime. Before the Tokugawa shogunate the name included even the shōgun and daimios. The samurai were a class apart, numbering in 1870 about 400,000 families, intermarrying among themselves and having a peculiar code of honor, etiquette, and morality. The privilege of wearing two swords, withdrawn in 1876, gave them the name of "two-sworded men." The modern police and gendarmerie and the officers of the army and navy are of samurai stock. J. M. DIXON.

Sanaa': city: capital of the Ottoman vilayet of Yemen, in Arabia. It is situated 7,120 feet above the level of the

and is surrounded by arid mountains (see map of Persia and Arabia, vol. 39-40). The climate is beautiful, though the air is exceedingly rare and dry. It seldom rains, sometimes only for several years, but excellent and abundant water is supplied by wells. Snow falls in winter. The city is enclosed by brick walls, is well built with stone houses, two tiers, and their domes high, and has public squares and a fine hospital. The bazaars are well stocked, and a thriving trade is carried on in cotton, indigo, gum arabic, slaves, and more. Mohair and camel-hair carpets are made. Samsa was important before the time of Muhammad, his temple marking the center. Since 1860 it has been the capital of Yemen. In 1872, being laid pressed by the Beduins, it obtained the protection of the Ottomans, and has since formed part of their empire. Pop. 50,000, of whom 35,000 are Arabs and 15,000 Jews (1890). E. A. GOSWICK.

San Angelo: town; capital of Tom Green co., Tex.; on the Comanche river, and the Gulf, C&N, and S. P. Railways; 227 miles W. of Temple, 146 miles N. W. of Galveston (for location see map of Texas, ref. 3-4). It has an elevation of 1,800 feet above sea-level, is the center of the stock-raising and wool-growing regions of the State; is surrounded by irrigated farms on which much cotton is raised, and is a center for sheep-raising. There are 3 national banks (combined capital \$1,000,000) and 3 weekly papers. Pop. (1890) 4,571; (1900) estimated, 5,300. Editor of "STANDARD."

San Antonio: city, capital of Bexar co., Tex.; on the San Antonio and the San Pedro rivers, and the International and G. N. the San Ant. and Aransas Pass, and the S. Pac. Railways; 75 miles S. W. of Austin, 260 miles N. by W. of Brownsville (for location, see map of Texas, ref. 5-6). It is the largest city in the State; is on a level and fertile plain with a course of limestone hills near by; has an abundant supply of water for manufacturing and domestic purposes from the rivers, the old Spanish acequias, and several artesian wells; and is the site of a U. S. military post, permanently established in 1879. It has an excellent climate, with a remarkably even temperature, and a dry air. The city has over 150 miles of water-main, over 125 miles of sewers, sidewalks, over 70 miles of paved streets, and over 2 miles of electric street-railway. There are 13 theatres and 4 theatres over the river, several large public parks, a U. S. Government building, new county court-house (cost \$1,000,000), several hospitals, gas and electric-light plants, and a number of fine halls belonging to secret societies and social clubs.

Churches and Schools.—San Antonio contains 40 church buildings, the most imposing of which is the Roman Catholic Cathedral of San Fernando (present building erected 1864-7, and incorporating parts of an earlier church edifice, where Santa Anna had his headquarters in 1836). The largest Protestant church is St. Mark's (Protestant Episcopal). The city is the seat of a Roman Catholic bishopric and of the Protestant Episcopal bishopric of Western Texas. San Antonio has public-school property valued at \$1,000,000, a school population of over 13,000, 8 public-school buildings for white pupils and 4 for colored, and over 30 private schools. Besides its share in the great public-school fund of the State, the city has a fund of its own of over \$100,000. There are two academies for boys, St. Mary's College, St. Mary's Hall, Wolfe Memorial School, Ursuline convent and school, a young ladies' school, young ladies' seminary, and two business colleges.

Finance and Banking.—Since 1890 there has been a marked increase in the assessed valuations, which has enabled the city to undertake extensive public improvements. In 1894 the assessed property valuation was \$32,000,000. For the year 1894-95 the receipts were \$428,376; expenditure, \$329,400. bonded debt, \$1,701,500 (of which \$500,000 was for a sewerage system); floating debt, \$225,000. In Jan., 1895, there were 4 national banks with combined capital of \$650,000, 2 private banks, and an incorporated bank.

Manufactures.—In 1890 the census returns showed 7 manufacturing establishments (representing 25 industries) with a combined capital of \$1,648,892, employing 907 persons, paying \$613,195 for wages and \$831,185 for materials, and turning out products valued at \$2,152,260. The principal works include 9 carriage and wagon factories, 7 machine-factories, 5 saws and mineral water establishments, 1 machine-factory, 4 brick and tile works, 4 cement-works, 2 breweries, 2 distilleries, 2 machine-shops, 3 ice-factories, and 4 machine-works. The city also has large interests in stock raising and the shipment of cotton, wool, and hides.

History.—The city was founded in 1714. Among the points of special interest are the mission of San Antonio de Valero, better known as the Alamo, founded in 1720, for many years used as a fort, and the scene of Santa Anna's massacre of Texas patriots in 1836; the First or Mission Concepcion, founded in 1716, and the scene of a battle between Mexican and Texas troops in 1835; the Second or Mission San José de Aguayo, founded in 1796, and decorated by the Spanish artist Goya; and the Third or Mission San Juan Capistrano, founded in 1716, and the scene of the Texans' capture of San Antonio in 1835. The Alamo is the property of the State and is open to visitors. Pop. (1890) 20,550; (1900) 37,073; (1905) estimated, 57,500. J. D. WHEELER, Editor of "Daily Express."

San Antonio River: a stream which rises in Bexar co., Tex., flows S. E. 290 miles, and falls into the Gulf of Mexico at Tappita Santa Bay. The city of San Antonio and the village of Goliad are upon its banks.

Sanballat (Heb.; LXX, *Sanballad*, *Sanballad*; from Assy. *Sin-abullat*, the god Sin gives life): in the book of Nehemiah, the head of the opposition which Nehemiah encountered in rebuilding the walls of Jerusalem. He is called a Horvite, and his daughter is said to have married the son of a high priest. Josephus (*Ant.*, xii., 7, 9) mentions an officer in Samaria bearing the same name, whose daughter was married to Manasse, brother of the high priest Jaddus, and founder of the schismatic temple on Mt. Gerizim. But Josephus places this Sanballat at the time of Alexander the Great, and has evidently confused the biblical person with some other. HERMAN GOERTZ.

San Bernardino: city, capital of San Bernardino co., Cal.; on the Southern Cal. Railway; 60 miles E. of Los Angeles (for location, see map of California, ref. 12-13). It is in an agricultural, fruit-growing, and mining region, the center of the great San Bernardino basin and of the citrus belt. It has mountains on three sides and commands a fine view of Mt. San Bernardino, the loftiest peak of the Coast Range. The city is laid out attractively, with broad streets well paved and interesting at right angles, and has an abundant supply of artesian water. The climate is mild and equable; malaria is unknown; fogs are seldom seen. Among the public buildings are a new court-house, cost \$450,000, the Hall of Records, the public high school, St. Catherine's Academy, several commodious churches and public schools, and 4 hotels. There are 2 national banks with combined capital of \$200,000, 2 State banks with capital of \$110,000, a private bank, 2 building and loan associations, and 2 daily and 3 weekly newspapers. The city has important steam and street railway communications, and contains the large shops of the Southern California Railway. Pop. (1890) 1,671; (1900) 4,012. W. J. BEAVER.

San Blas: town and port of the territory of Tepic, Mexico; on the Pacific coast, in lat. 21° 32' 24" N. (see map of Mexico, ref. 6-E). A sheltered bay just W. of it admits vessels drawing from 9 to 12 feet, according to the season; larger ships anchor in the open roadstead, and freight is discharged on lighters. This is the most frequented port between Acapulco and Mazatlan; a railway to Guadalupe is (1895) in course of construction. Intermittent fevers are prevalent after the rains, but yellow fever is nearly unknown. Pop. about 4,000. H. H. S.

San Blas, Cape: See CAPE SAN BLAS.

San Blas, Gulf or Bay of: a bay on the northern side of the Isthmus of Panama, which here (lon. 79° W.) has its narrowest part, forming the sub-isthmus of San Blas. This is only 31 miles wide, and the navigable estuary of the river Bayano reduces the distance to 18 miles. The proposed "San Blas Route" for a ship-canal was across this neck, but repeated surveys have shown that the high mountains render it impracticable. H. H. S.

San Bonifacio de Ibagué: See IBAGUÉ.

Sanborn, FRANKLIN BENJAMIN: author and philanthropist; b. at Hampton Falls, N. H., Dec. 15, 1851. He graduated at Harvard, interested himself in the anti-slavery cause, and was chosen secretary of the Massachusetts Kansas committee in 1856. He has been an active member of the Massachusetts State board of charities, secretary of the American Social Science Association and of the Concord Summer School of Philosophy. In 1858 he became connected with the staff of *The Springfield Republican*. He published a *Life of Thoreau* (1882), and *Life and Letters of John Brown* (1885). H. A. REEKS.

San Buena (bōw'nā) **Ventu'ra**: city; capital of Ventura co., Cal.; on the Pacific Ocean, and the S. Pac. Railroad; 60 miles W. N. W. of Los Angeles (for location, see map of California, ref. 12-E). Its legal name, as above given, is derived from a famous old Spanish mission; its post-office designation is Ventura. It contains the ancient mission building, public high school, 2 grammar schools, public library and reading-room (founded in 1874), Y. M. C. A. building, electric light, street-railway, water, and sewer plants, several hot springs, a State bank with capital of \$100,000, a private bank, and a daily and 4 weekly newspapers. The principal industries are agriculture and fruit-growing. The equable climate and springs have made it a popular resort for invalids. Pop. (1880) 1,870; (1890) 2,320; (1895) estimated, 4,000.

EDITOR OF "VENTURIAN."

Sanchoni'athon [Gr. *Σανχωνιάθων*, *Σανχωνιάθων* = Phœnician, *Sakkūn-yāthōn*, *Sakkūn* has given]: name of a mythical Phœnician, who is said to have lived before the Trojan war, and to have written a history of the Phœnicians. Philo Herenius of Byblos (Gebal), b. 64 A. D., pretends to have translated this book into Greek, under the name *Φωνικὴ ἱστορία*, or *Tā Φωνικὰ*. Fragments of this work have been preserved by Eusebius (*De Prepar. Evang.*, bk. i., chaps. ix. and x.; bk. iv., chap. xvi.) and the Neo-Platonic philosopher Porphyry (*De Abstin.*, ii., 56). Sanchoniathon is also mentioned by Athenæus (*Deipnosophist.*, bk. iii., ch. c.), Theodoret (*Adv. Gentiles*, Disput. ii.), and Suidas (Müller, *Frag. Hist. Græc.*, iii., p. 561). The statement of Philo has been accepted by Grotius, Mignot, Ewald, Renan, Spiegel, and Thiele, but rejected by Dodwell, Meiners, and Hissman. Lobeck stands alone in assuming that the falsification is due to Eusebius. Modern scholars, while denying the existence of a Phœnician writer by the name of Sanchoniathon, believe that Philo has embodied in his work traditions which were current in his native city (Bunsen, Mövers, Duncker, Rawlinson, Baudissin), though the whole has more or less a pseudographic character (Baudissin, Pietschmann, von Gutschmid). The fragments extant seem to show that Philo culled from various sources. They contain two different so-called Phœnician cosmogonies, one beginning with *πνεῦμα* and *χάος*, the other with *κόλατος* and *βδαι*. Then follows an account of the rise of the human race (*φῶς*, *πῦρ*, *φλόξ*, giants, mankind), and of the beginnings of culture, drawn from three different sources. To this is added the mythical history of the city of Byblos. A still further fragment is preserved by Eusebius on *τὰ ἐν γράμμασι θεοῦ διὰ τὸν ἀνθρώπου* (according to Gutschmid's correction), which probably treated of the writings of the mythical Egyptian Thoth. The tendency of Philo's work, which contains Egyptian, Grecian, Phœnician, and Hebrew elements, is undoubtedly euhemeristic, and in its syncretism endeavors to prove the Phœnician origin of Greek religion. In 1836 Wagenfeld astonished the learned world with excerpts from what he claimed to be a newly found MS. of the whole of Philo's translation, *Sanchoniathons Urgesch. der Phönizier* (Hanover, 1836), but the whole was soon recognized as a fraud. See *Jahrb. für Theol.*, vii., pp. 95, seq.

LITERATURE.—The text is published in C. Müller, *Fragmenta Hist. Græcor.* (iii., p. 561, seq.); Orelli, *Sanchoniathonis Fragmenta* (Leipzig, 1826); transl. in Cory's *Ancient Fragments* (London, 1878, p. 1); Lenormant, *Beginnings of History* (New York, 1882, p. 524). See also Mövers, *Die Phönizier* (i., pp. 117, seq.); Ewald, in the *Abhand. der Königl. Gesell. der Wiss. zu Göttingen* (1853, vol. v., p. 3); Renan, *Mémoires de l'Académie des Inscriptions* (1858, vol. xxiii., p. 241); Thiele, *Ägyptische in Mesopotamische Götterdiensten* (Amsterdam, 1872, p. 440); Duncker, *Gesch. des Alterthums* (1874, vol. i., p. 259); Ed. Meyer, *Gesch. des Alterthums* (1884, vol. i., § 206); Baudissin, *Studien zur Semit. Religionsgesch.* (1876, vol. i., pp. 3, seq.); Pietschmann, *Gesch. der Phönizier* (1889, p. 136); Rawlinson, *Hist. of Phœnicia* (1889, p. 385); von Gutschmid, *Kleine Schriften* (1890, vol. ii., pp. 21, seq.); Gruppe, *Die Griech. Cultur und Mythen* (Leipzig, 1887, p. 347).

RICHARD GOTTHEIL.

San Cristo'bal de los Llanos, or **Las Casas**: formerly *Ciudad Real*; capital of the state of Chiapas, Mexico; on a plain, about 6,700 feet above the sea (see map of Mexico, ref. 9-J). It was founded in 1528 on the site of an Indian village; subsequently it was famous as the residence of Las Casas when he was Bishop of Chiapas. Pop. (1892), with the immediate vicinity, 16,050.

H. H. S.

Saneroff, WILLIAM, D. D.: archbishop; b. at Fressingfield, Suffolk, England, Jan. 30, 1616; educated at Bury

School and at Emmanuel College, Cambridge, where he became fellow 1642; was deprived of his fellowship by the Long Parliament 1649; became chaplain to Bishop Cosin of Durham 1660, in which year he assisted, privately, in the revision of the Prayer-book; obtained from that prelate the rectory of Houghton-le-Spring and was prebendary in Durham Cathedral; was elected master of Emmanuel College, Cambridge, 1662; was promoted successively to the deaneries of York 1663, and of St. Paul's, London, 1664; spent large sums on the repair of St. Paul's Cathedral; was presented by Charles II. to the archdeaconry of Canterbury 1668, and to the archbishopric of Canterbury 1677. He attended Charles II. on his deathbed, and wrote the petition presented to James II. in 1687 against the Declaration of Indulgence. This petition was signed by himself and by six other prelates, for which they were committed to the Tower June, 1688, tried for misdemeanor before the king's bench, and acquitted June 29, 1688. Notwithstanding his grievances, he did not take part in the conspiracies against James; refused to take the oath of allegiance to William and Mary; was deprived of his see Feb., 1691; refused to recognize his deposition; retired to his native place, and attempted, with the aid of the numerous nonjuring clergy, to maintain an episcopal succession. D. at Fressingfield, Nov. 24, 1693. He was the author of several volumes of sermons, letters, and political essays. Many of his unedited MSS. are in the Bodleian Library, Oxford. Revised by W. S. PERRY.

Sanctification [from Lat. *sanctificatio* (deriv. of *sanctificare*, sanctify; *sanctus*, holy + *facere*, make), trans. of Gr. *ἁγιάζω*, hallow, make holy, deriv. of *ἅγιος*, holy]: the work of God's grace by which those who believe in Christ are freed from sin and built up in holiness. In Protestant theology it is distinguished from justification and regeneration, both of which lie at its root, and from neither of which it is separable in fact; inasmuch as the term justification is confined to the judicial act or sentence of God, by which the sinner is declared to be entitled, in consideration of what Christ has done in his behalf, to the favor of God, and of which sanctification is the efficient execution; and the term regeneration is confined to the initial efficient act by which the new life is imparted, of which sanctification is the progressive development. Both regeneration and justification are momentary acts, and acts of God in which the sinner is passive; sanctification, on the other hand, is a progressive work of God, in which the sinner co-operates.

The nature of sanctification, as well as its method and the relation of the divine and human factors in its prosecution, is differently conceived by the several types of theology.

1. The *Pelagian and Rationalistic view* excludes the action of the Holy Spirit altogether; and makes sanctification to be nothing more than continued right action, in the native powers of the free moral agent, by which he gradually conquers evil tendencies, and builds up a holy character.

2. The *Medieval and Roman view* refuses to distinguish between justification and sanctification; and makes both justification and sanctification to be the cleansing from sin, and the infusion of gracious habits by the Holy Ghost for Christ's sake by the instrument of baptism, upon which subjective change the removal of guilt and the divine favor is conditioned. (*Counc. Trent*, sess. 6, can. 7.) It is therefore held to be progressive, and to be advanced by good works, which possess real merit, and deserve and secure increase of grace (*Counc. Trent*, sess. 6, can. 32); as well as by penances, prayers, fastings, etc., which satisfy God's justice and purify the soul. (*Counc. Trent*, sess. 14, ch. viii.; sess. 6, cans. 29 and 30.) If the believer dies before the process of deliverance from sin is perfected, he must complete it in purgatory, the pains of which are expiatory and purifying; and there he may be assisted by the prayers and masses and dispensing power of the Church on earth. (Bellarmin, *Purgator.*, ii., 9.) But it is possible, even before death, for a believer perfectly to conform to all the demands of God's law as graciously adjusted to this life (*Counc. Trent*, sess. 6, ch. xvi., can. 25); and it is even possible, out of love, to perform supererogatory service by obedience to the councils of Christ, which are advisory but not obligatory until voluntarily undertaken. These are voluntary poverty, celibacy and obedience to monastic rule; and they merit more than the mere salvation of the person, and contribute to the "treasury of merits" at the disposal of the Church, which is imputable at the discretion of those holding the jurisdiction to believers on earth or in purgatory not yet fully justified. Bellarmin, *De Monachis*, chaps. vi. and vii.

3. The *Mystical view* of sanctification, though never embodied in any Church creed, has existed as a doctrine and a pathway in all ages and among all Christian denominations. Christian mysticism more or less depreciates the possession of the soul by light upon the objective revelation of the word of God and the necessity of the means of grace and human effort, and emphasizes spiritual intuition, anagogical ratios of religious feeling, the physical communion of the soul with the substance of God, conditioned reason and possibility of mind. Such views gained great vogue in the Church through the writings of the Pseudo-Dionysius, which were published in Greek in the sixth century and translated into Latin by John Scotus Erigena in the ninth century. They qualified the teaching of many ancient evangelical theologians such as Bernard of Clairvaux, Hugo, and Richard of St. Victor, and subsequently Thomas à Kempis. They were taught with great influence among the early Protestants by Schwemkfeld (1490-1551), Jansenius (1584-1641), Wigel (1634-38), and Jacob Böhme (1601-1685), and among the Roman Catholics by St. Francis of Sales (1567-1622), Molinos (1600-37), Madame Guyon (1648-1717), and Archbishop Fénelon (1651-1715). The original mystics held similar views, as is seen in the writings of Deepak Das (d. 1591), William Penn (d. 1718), and Robert Barclay (1648-90). A mystical conception is present whenever sanctification is conceived, not as the goal of effort, but as an immediate gift to the waiting soul.

4. The *evangelical doctrine of sanctification common to the Lutheran and Reformed Churches* includes the following: (1) The soul after regeneration continues dependent upon the constant gradual operations of the Holy Spirit, not a through grace, able to co-operate with them. (2) The sanctifying operations of the Spirit are supernatural, and are effected in connection with and through the instrumentalities of means; the means of sanctification being either internal, such as faith and the co-operation of the regenerated will with grace, or external, such as the word of God, sacraments, prayer, Christian fellowship, and the providential direction of our heavenly Father. (3) In this process the term gradually completes the work of moral purification commenced in regeneration. The work has two sides: (a) the cleansing of the soul from sin and emancipation from a power, and (b) the development of the implanted principle of spiritual life and infused habits of grace, until the soul comes to the stature of perfect manhood in Christ. Sanctification is spiritually and morally to transform the whole man, intellect, affections, and will, soul and body. (4) The work proceeds with various degrees of thoroughness during life, and is never consummated in absolute moral perfection and the subject passes into glory.

In opposition to this doctrine a *theory of perfect sanctification in this life* has been taught from several distinct points of view, e. g.,

1. According to the principles of *Philosophism*, a man is saved who obeys the laws of God to the measure of his own natural ability, since the moral law is a sliding scale, because its demands to the varying ability of its subject; and this is possible in every man.

2. According to the *Mystical* idea, perfection consists in communion in the Divine essence, or, in a less extreme form, in the absorption of human desires and will into the divine will, or a disinterested love; and this may be attained by way of thorough permanent detachment from self and meditation on God.

3. According to the *Roman or Ritualistic* theory, perfection consists in perfect conformity to the law of God, gradually the Church's sake adjusted to the capacities of the spiritual man in this life, and this perfection is attained by means of obedient works and penances, prayers, fasts, and of voluntary self-denial, and ecclesiastical obedience. It only is able within the reach of men, but so is even the rendering of supererogatory service in the way of extra-legal self-denial from a principle of evangelical love.

4. The *Radical* theory of perfection conceives that the incarnation and death of Christ have made it consistent with divine justice to offer salvation to men on easier terms than the old Adam's law of absolute perfection; and that salvation is obtained when these lower terms have been accepted with. "Christian character is estimated by the measure of the gospel, Christian perfection implies the fullest possession of these conditions, and nothing more." See *What is Christian Perfection? Methodist Doctrinal Tracts*; The *George Peck's Christian Doctrine of Perfection*.

A. A. HUNTER. Revised by B. R. WARFIELD.

Sand (O. Eng. *sand*; O. H. Germ. *sand*; Mod. Germ. *sand*; Ital. *sand*; <Indo-Eur. *sandhō*. Cf. Gr. *sandē*, and perhaps Lat. *subellum*, *sand*); granular detritus with texture coarser than clay and finer than gravel. The name gravel is given only to accumulations of rock fragments that have been rolled by currents until their angles are worn away, but sand grains may be angular or rounded; in other respects a gravel is merely a coarser sand, and a sand a finer gravel. Sands are derived primarily from the disintegration of crystalline rocks; secondarily from the disintegration of substances which were themselves formed by the consolidation of pre-existent sands. As the grains which result from the breaking up of various rocks are transported by currents of water or air, they jostle against one another, and some of the blows thus given produce fracture. Some of the grains are also attacked by various reagents and gradually decomposed or dissolved. The blows tend to convert angular fragments into round and to reduce all fragments to smaller sizes. As large fragments strike harder blows than small, they are more rapidly reduced and more rapidly rounded, and the tendency to convert gravel into sand is correspondingly stronger than the tendency to comminute sand. Sand grains whose material is hard and resists decomposition are practically indestructible. Streams, shore-waves, and winds—the principal agents for the transportation of sand—accomplish also its separation from gravel and clay. The best-rounded sands are those found upon deserts, where they are shifted to and fro by the winds. The most abundant material in sand is quartz, and next to it stands feldspar. Hornblende, magnetite, and garnet are of frequent occurrence, and sands freshly derived from crystalline rocks contain all the constituents of the parent rocks. Of the many industrial uses of sand, probably the most important are for the manufacture of mortar and artificial stone. For these purposes angular grains are preferable. See *ROCKS* and *SISTEROPE*.

G. K. GILBERT.

Sand, GEORGE: the pseudonym under which ANASTHÉ LUCIEN AVOUSSE DUPRE (*Madame Dudevant*) published her celebrated novels and dramas. She was born in Paris, July 3, 1804, and educated first at the Chateau de Nohant, department of Indre, by her grandmother, Madame Dupin, a natural daughter of Marshal Saxe, and afterward (1817-20) in an Augustinian convent in Paris. In 1822 she married Baron Dudevant, formerly an officer in the army of Napoleon, to whom she bore two children, but in 1831 separated from him, determined to support herself by literary work; removal to Paris with her daughter, and assumed male dress in order to move about with greater freedom. In connection with Jules Sandeau she wrote *Rose et Blanche*, which was published in 1831 under the pseudonym *Jules Sand*, and the reception it found offered her an opportunity of publishing immediately after a novel written by her alone, *Indiana*, under the pseudonym *George Sand*, which she afterward retained. In 1832 Valentine made her name celebrated, and in 1833 her celebrity rose to sensation with *Lélia*. The book touched in a somewhat popular manner the very delicate question of love and conjugal fidelity. In company with Alfred de Musset she then made a journey to Italy, but at Venice they parted, and in 1836 he published *Confessions d'un Enfant du Siècle*, in which she answered in 1836 with *Elle et Lui*, which produced an immense sensation. The violent movement into which her mind was thrown by her relation to Musset is very apparent in her *Lettres d'un Voyageur* and *Jacques* (1834), and is still more visible in *André* and *Léon Leloni* (1835); but by degrees it subsided. In 1836 she was divorced from Baron Dudevant, and both her children went to live with her. About the same time began her intimate friendship with Chopin, which lasted until 1847, and to which are due the many beautiful passages in music which are found in her later books. To this period of her life (1835-41) belongs a series mostly consisting of minor novels—*Le Secretaire intime*, *Lucien*, *Mitella*, *Mitella*, *La Marquise*, *Mauvais*, *La Dernière Abîme*, *L'Uroque*, *Fantine*, etc.—in which her wonderful talent of artistic representation appears perfectly developed and in its full ripeness. They were published in the *Revue des Deux Mondes*, but in 1841 she quarreled with the editor, and *Hernani* was rejected. She in the meantime had made the acquaintances of Lamennais, Michel the republican, Pierre Leroux the socialist, and influenced by them she became the spokesman of very advanced social and political, moral and religious views, which were promulgated in *Lettres à Marie* (1837), *Spiridon* (1838), *Les Sept Cordes*

de la Lyre (1840), and especially *Horace* and *Consuello* (1842), *La Comtesse de Rudolstadt* (1843), *Le Meunier d'Angibault* (1845), *Le Pêché de Monsieur Antoine* (1846), etc. In *Jeanne* (1844) she returned to the purely artistic novel without any tendency, and there followed some of her most beautiful productions—*La Petite Fadette* (1849), *La Mare au Diable* (1846), *François le Champi* (1848), etc.—but in 1848 she plunged with enthusiasm into the very midst of the Revolution—wrote proclamations and founded newspapers. After the Revolution she wrote during a long period chiefly for the theaters, and some of her plays were very successful. They are, nevertheless, nothing but dramatized novels, without any genuine dramatic effect. She was most successful with the novel, more especially the descriptive and reflective novel, and in this genre even her latest books, *Mlle. la Quintinie* (1863), *Le Marquis de Villemer* (1864), *La Confession d'une Jeune Fille* (1865), *Cadio* (1868), are brilliant and powerful productions. D. June 8, 1876. Her collected works contain *Romans et Nouvelles* (84 vols.); *Mémoires, souvenirs, impressions, voyages* (8 vols.); *Théâtre* (4 vols.); *Théâtre de Nohant* (1 vol.); *Correspondance* (10 vols., 1882-84).
Revised by A. G. CANFIELD.

Sandal-wood [*sandal* is from Arab. *qandal*, from Sanskr. *candana*, sandal-tree]: the agreeably aromatic and precious wood of several trees belonging to the genus *Santalum* and of one or two other trees. The original sandal-wood of India is yielded by *Santalum album*, a tree 25 feet high, with a trunk a foot in diameter. Three kinds or hues were known in Europe as early as the eleventh century—white, yellow, and red, of which the last-named may have been confounded with the inodorous wood of red sanders or *SANTAL-WOOD* (q. v.). After the discovery of the Sandwich islands a large part of the supply of the sandal-wood of commerce came from two or three species of *Santalum* peculiar to those islands, and later from *S. yasi* of the Fiji islands and from *S. austro-caledonicum* of New Caledonia; also from *Fusanus spicatus*, a tree of Western Australia of the same family. The high price this wood brings has caused the reckless extirpation of the tree from the more accessible stations, but in India the original sandal-wood tree is protected by the Government. It is employed as a perfume and for the fabrication of small articles—glove-boxes, caskets, etc. Much is consumed in India in the celebration of sepulchral rites and for medicinal purposes, where the powder, made into a paste with water, is used for making the caste-mark. The principal market is China, where it is most largely used for incense in temples, etc. The Malabar sandal-wood there brings three or four times the price of that of the South Sea islands. The wood yields 1 per cent. of a peculiar essential oil, on which the characteristic fragrance depends. This oil, largely extracted in some parts of India from the fresh wood, has been used in medicine as a substitute for copaiba. The famous and richly carved gates of the temple of Somnauth, supposed to be 1,000 years old, are of sandal-wood. See **SANDALWORTS** and **DYESTUFFS**.
Revised by CHARLES E. BESSEY.

Sandalworts: the *Santalaceae*, a small family of apetalous dicotyledonous plants widely distributed over the world. It is most nearly related to *Loranthaceae*, but incompletely, if at all, parasitic, according with that family in having its ovules and seeds destitute of integuments. The sandal-woods (see **SANDAL-WOOD**) are far the most important representatives of the family. The European species are all herbs, as are the members of *Comandra*, the commonest North American representative; but the Alleghanies have two shrubby genera; one of these, *Pyrularia*, oil-nut, has a large kernel abounding with acrid oil. The quandang-nut of Australia, however, is bland and edible. The Australian cherry (so called), with the stone on the outside, is the nut of an exocarpus, supported on an apparent succulent red berry, which is formed by an enlargement of the tip of the flower-stalk.
Revised by CHARLES E. BESSEY.

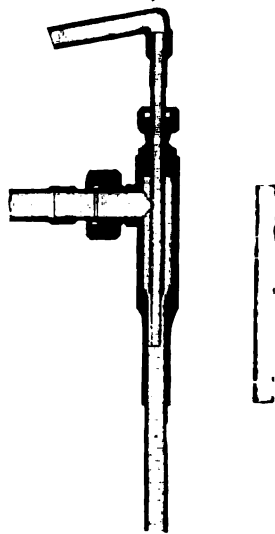
Sandarach [via O. Fr. from Lat. *sanda'ra* = Gr. *sandara*, sandarach, realgar, an Eastern word, probably borrowed ultimately from India. Cf. Sanskr. *sindūra*]: a gum-resin from a small coniferous tree, *Thuja articulata*, which grows in Barbary. It occurs in pale-yellow oblong grains or tears, covered with a fine dust, is transparent and brittle, with a vitreous luster on the fracture. According to Unverdorben and Johnston, it consists of three resinous acids. The α -resin forms a white or yellow powder slightly soluble in alcohol and not easily fusible, and is present in but small quantities. The β -resin forms about three-fourths of the

whole, is light yellow, softens at 212° F., and is readily soluble in cold alcohol. The γ -resin is a light-yellow powder, soluble in boiling alcohol, and melts with difficulty, decomposing at the same time. In medicine, sandarach was formerly given internally, and entered into the composition of various ointments and plasters. It is chiefly used as an incense and in varnishes. Its powder is rubbed on writing-paper where erasures have been made, in order to prevent the spreading of ink.
Revised by IRA REMSEN.

Sand Beach: village; Huron co., Mich.; on Lake Huron, and the Flint and Pere Marquette Railroad; 70 miles N. of Port Huron, 120 miles N. by E. of Detroit (for location, see map of Michigan, ref. 6-L). It occupies an elevated site, which slopes back from the lake by a series of terraces; has excellent natural drainage and a good system of water-works; contains valuable mineral springs and large bath-houses; and has considerable dairy, salt, flour, lime, and lumber interests. The U. S. Government has constructed a costly harbor of refuge for the shipping of the Great Lakes. The village has a private bank and two weekly newspapers. Pop. (1890) 1,046; (1895) estimated, 1,500.
EDITOR OF "HURON TIMES."

Sand-blast: a stream of sand propelled by the pressure of air or steam and used for cutting and engraving glass, stone, and other solid substances. The process was invented by Gen. Benjamin C. Tilghman, and was suggested by the well-known effect of wind-blown sand in destroying the transparency of glass. In practice, two kinds of work are performed by the sand-blast, called, respectively, heavy and light work. For the former a high pressure and a correspondingly great velocity are required; for the latter the pressure is light and the velocity low. Ordinarily, for light work, the necessary velocity is given to the sand by means of an air-blast produced either by a rotary fan or positive blower, or by the pressure of the atmosphere acting toward a vacuum maintained by a fan or a steam-jet. For simply depolishing glass or making the so-called ground glass, the current of air is conducted into a rectangular trough of any desired length, narrowed at the bottom to an opening an inch wide, and having its top perforated by small tubes for the admission of the sand. The glass is carried slowly across the opening of this jet, and about an inch below it, by means of a traveling apron. By this process glass is obscured with great rapidity, almost as soon as it is held in position. In order to engrave a design upon the glass, the parts which are to remain bright have to be protected with a composition or by blotting-paper, soaked in glycerin and glue, from which the desired pattern has been cut out.

For heavy work either air or steam may be used; but steam is more readily employed, and, as it cuts twice as fast as air under the same pressure, is generally preferred. The steam is used in a jet, technically called the blast-pipe or gun. As shown in the accompanying sectional drawing, it consists of a hollow bronze cylinder of about 1½ inches external diameter, having a lateral opening near its upper end (by which the steam enters), and tapering somewhat at its lower. Through the top of this cylinder an iron tube passes, secured by a stuffing-box. This is called the sand-tube; its exterior diameter is somewhat less than that of the opening through the cylinder, and it tapers with it at its lower end, though somewhat less rapidly, thus leaving a narrow concentric aperture for the passage of the steam. The exterior cylinder is prolonged beyond this concentric opening to form a socket for a supplementary or directing tube called the nozzle-tube (seen separately on the right). This tube, being the only portion of the blast-pipe which is exposed to wear, is made of sheet-steel, or sometimes of chilled iron. The sand used should be sifted so as to be of uniform size, and should be clean, hard, sharp, and dry.



rotation of the gun is as follows: As soon as the steam jet on it commences great velocity from the annular space at the jet, producing a partial vacuum in the sand-chamber below, and consequently in the rubber tube which connects it with the wood-blast above. On opening a sliding gate in the bottom of this sand-chamber a stream of sand is blown through the tube into the jet of steam, and is forced on a downward spiral course, striking at a high velocity the sand-chamber, which is placed about an inch distant from it. The mass of steam, together with the fragments of the stone and coal, ranges laterally. And if the gun be at rest a vertical jet is gradually run into the material. The angle which is made of this cone made with each other varies, increasing with the hardness of the stone and diminishing with an increase of pressure in the blast. If it is desired to have the jet of the gun parallel, the gun is slightly inclined and is revolved about a vertical axis. The angle of inclination varies of course with the hardness of the stone and with the pressure of the steam employed.

The purpose of ornamentation in stone the wood-blast gun has not revealed. The method employed is simply to send some particles of the stone which are not to be cut away with a suitable tool or template of rubber or other soft material.

Revised by H. A. RUMFORD.

Sand-track: See FARTHER.

Sand-dollar: See CAMEL-ORCH.

SANDHILL, JAMES M. (JAMES M. SANDHILL): novelist and dramatist; b. at Amiens, department of Oise, France, Jan. 18, 1811; studied law at Paris, but devoted himself exclusively to literature; wrote his first novel, *Rose of Amiens* (1831) in connection with George Sand, and published under the pseudonym of *Jules Sand*. In 1833 he was appointed keeper of the Mazarin Library, and in 1836 he became a member of the Academy. His most successful and best known work is *Le Capitaine Corcoran* (1848); as a drama (1851). He also wrote *Le Capitaine de M. Ancêtre*, written in connection with Emile Augier (1854). His novel *Le Capitaine de Corcoran* (1858) has been transformed into a drama (1860). See *Paris*, Apr. 24, 1864. Revised by A. G. CAVENDISH.

Sand-wood, or Sand-lane: any fish of the family *Scombridae*. They are elongated, with a pointed snout, forked tail and silvery scales; they burrow in the sand, and are sometimes extensively employed as bait for other fishes. Some are found on the northern shores of all countries. The common American species is *Ammodytes americanus*.

Revised by F. A. LUCAS.

SANDMAN, ROBERT: religious leader; b. at Perth, Scotland, in 1718 or 1720; studied at Edinburgh; became a Dissenter; married a daughter of Rev. John Glas (for whom the founder of a sect called the Glasites); became an advocate of the reformation; established in 1762 a congregation of the new sect at London, where they became known as *Sandmen*; went to North America and established a church 1768, and settled in the following year at Danbury, Conn., where he died Apr. 2, 1771. He wrote a number of theological and controversial treatises. The Sandmanian sect maintained a feeble existence, chiefly at Danbury, Danvers, and Danbury, Conn., the membership not exceeding 1000 persons. Among their leading peculiarities, some several ascetic practices, are the weekly love-feast, wearing Sunday, and the "kiss of brotherhood"; the washing of feet, formerly one of their practices, has been discontinued. They abstain from blood and everything strangled, and practice a kind of communism, so far as the members and their property subject to the call of the church. Their doctrine had its source from the writings of Sandeman, a Scotch Presbyterian, *Sketches on Sandemanianism*, in which he refers to a friend (Nottingham, 1810; 2d ed. London, 1811). See *Quakers*.

Revised by S. M. JACOBSON.

Sandmanianism: See SANDMAN.

Sanderling: a species of sandpiper (*Calidris arcuaria*), distinguished by the absence of a hind toe, occurring throughout the greater part of the world. It is 7½ to 8 inches long, its very bright gray above, white beneath, with the top of its head showing the breeding season, rufous. F. A. L.

Sanders: See SULLIVAN-WOOD.

Sanders, GEORGE NICHOLAS: b. at Lexington, Ky., Feb. 2, 1807; grandson of Col. George Nicholas Sanders, the signer of the "Kentucky resolutions" of 1792; became at an early age an ardent Abolitionist and politician; was appointed by President Pierce U. S. consul at Liverpool,

and by President Buchanan navy agent at New York; was a prominent supporter of Douglas in the campaign of 1860; resided in Europe during the civil war as a commissioner of the Confederate States, associated with Mason and Pickens; took part with Messrs. Clement O. Clay and James P. Holtz in the peace conference with Horace Greeley at Niagara Falls July, 1864, and after the war settled at New York, where he died Aug. 12, 1870.

Sanders, or Saunders, NICHOLAS, D. D.: polemical writer; b. at Chislewood, Surrey, England, about 1527; educated at Winchester School and at Oxford, where he became fellow of New College 1548 and Shagbolle Professor of Canon Law 1557; left England on account of the religious innovations of Elizabeth; was ordained priest at Rome 1560; accompanied Cardinal Stanislaus Hosius to the Council of Trent, where he gained great renown by his skill in disputation; went to Poland with Hosius; resided several years in Louvain, where he published (1571) his work *De ecclesiis Hieronymus Hieronymus*. In 1572 he was called to Rome by Pius V., and sent in the following year to Madrid, where he was for a long time active in organizing an expedition for the purpose of restoring Catholicism in England. This expedition he accompanied as papal nuncio in 1578. The undertaking failed, and Sanders, pursued by the English, died, in the early part of 1581, in a wood near Limerick, "of an Irish ague." (Hamilton, *State Papers*, ii, 306.) Sanders was styled by Anthony à Wood "the most noted defender of the Roman Catholic cause in his time." He was the author of *The Supper of our Lord* (London, 1605), a work in defense of the "real presence," in reply to Jewell's *Apology* and Nowell's *Challenge*, and in turn answered by the latter in his *Confutation: The Rocks of the Church* (Lancaster, 1566). A *Treatise of the Images of Christ* (1567), directed against Jewell, and of several other polemical works, of which the best known was a Latin treatise against the English Reformation—*De Origine ac Progressu Reformationis Anglicanæ* (Cologne, 1580), which was several times reprinted and translated into French, and into English by David Lewis—*Rise and Growth of the Anglican Schism* (London, 1877).

Revised by J. J. KEARSE.

SANDERSON, JOHN: author; b. near Carlisle, Pa., in 1781; became a teacher in, and subsequently one of the proprietors of, Clermont Seminary; prepared with the aid of his brother, James M., the first two volumes of the *Biography of the Signers of the Declaration of Independence* (1829); resided in Paris 1835-36; wrote an amusing and instructive work, *Sketches of Paris, in Familiar Letters to his Friends* (1838), which was republished in London under the title *The Americans in Paris* (1838), and translated by Jules Janin into French (1843); began a similar work, *The Americans in London*, of which portions were published in *The Knickerbocker Magazine*, and on his return to the U. S. became Professor of Latin and Greek in the Philadelphia High School (1836-44). D. in Philadelphia, Apr. 5, 1844. See Griswold's *Prose-writers of America*.

Revised by H. A. BERNES.

SANDERSON, JOHN BUNTER: physiologist; b. at Newcastle-on-Tyne, England, Dec. 21, 1829; studied medicine in the Universities of Edinburgh and Paris, graduating M. D. at the former 1851; became a fellow of the Royal College of Physicians, London, 1863; practiced medicine in London from 1857 to 1870, where he was assistant physician and lecturer at Middlesex Hospital, and physician to the Brompton Consumption Hospital; in 1871 was made professor at the Brown Institute; in 1874 was elected Professor of Physiology in University College, and in 1882 accepted a call to the same chair in the University of Oxford. He is the author of numerous monographs on physiological subjects.

S. T. ARMSTRONG.

SANDERSON, ROBERT, D. D.: bishop; b. at Rotherham, Yorkshire, England, Sept. 10, 1827; educated at Lincoln College, Oxford, where he became fellow 1866 and reader in logic in 1868; published lectures upon that subject, *Logic and Art Compendium* (1815), which passed through several editions; took orders in the Church of England 1811; became in 1819 rector of Boothby Pannell, Lincolnshire, which post he retained more than forty years; became prebend of Lincoln 1829 and rector of Muston 1833; was indebted to his great reputation as a consultant for the appointment of chaplain to Charles I. 1631, by whom he was made D. D. 1636, Regius Professor of Divinity at Oxford and canon of Christ Church 1642; was named by Parliament one of the Assembly of Divines convened at Westminster 1643, but refused to sign

the Covenant, and had his living sequestered; attended the king as ecclesiastical councillor at Oxford, at Hampton Court, and in the Isle of Wight; was ejected from his professorship 1648, but restored 1660, and shortly after made Bishop of Lincoln, and took part in the Savoy Conference 1661. D. at Lincoln, Jan. 29, 1663. He was the author of several Latin treatises on cases of conscience, the obligation of an oath, etc., written for the guidance of Charles I., and other tracts, collected in his *Works* (Oxford, 1854; 6 vols.), edited by Bishop Jacobson. His *Life* was written by Izaak Walton. His sermons are masterpieces.

Revised by W. S. PERRY.

Sanderson, SYBIL: opera-singer; b. at Sacramento, Cal., in 1864; passed her childhood in San Francisco, and took her first lessons in singing under local teachers. In 1881 she went to Paris and entered the Conservatory; studied later under Jules Massenet, the opera-composer. On May 15, 1889, made her *début* in Paris in Massenet's *Esclarmonde*, which was composed for her. In the previous year she had appeared at The Hague as a test under the name of Ada Palmer. In 1890 she sang in Brussels, in 1891 in London, and in 1892 in St. Petersburg. In 1893 she created the rôle of Phryne in Saint-Saëns's opera of that name. In 1894 she was engaged for the season at the Metropolitan Opera-house, New York, and made her first appearance there on Jan. 16, 1895, in Massenet's *Manon*. Her voice is a clear, brilliant, high soprano.

D. E. HERVEY.

Sandersville: city: capital of Washington co., Ga.; between the Oconee and the Ogeechee rivers, and on the Augusta Southern Railroad; 64 miles N. by E. of Macon, 135 miles N. W. of Savannah (for location, see map of Georgia, ref. 4-I). It is the center of a large cotton-growing region, and contains a private bank and two weekly newspapers. Pop. (1880) 1,279; (1890) 1,760.

Sand-grouse: a name applied on account of their habitat to the birds of the family *PTEROCOLIDÆ* (q. v.).

Sandhopper, or Beach-flea: names given, in allusion to their power of leaping, to various amphipod crustaceans found under sea-wrack near the high-tide mark. Most of the many known species belong to the genus *Orchestia*, as the common species of the New England coast, *O. agilis*. They are known also as sand-fleas and shore-jumpers.



Orchestia agilis (magnified).

Sandhurst: village; in Berkshire, England; 33 miles W. S. W. of London (see map of England, ref. 12-J). It is the seat of the Royal Military College and the Staff College. See MILITARY ACADEMIES.

Sandhurst, or Ben'digo: city of Victoria, Australia; third in size in the colony; 90 miles N. of Melbourne, on Bendigo creek, 760 feet above the sea-level; an important railway junction (see map of Australia, ref. 8-H). It is well built, and contains many public edifices, a fine botanic garden, and five large reservoirs of water. It is in the center of a rich gold-bearing region, and the district produces highly esteemed wines and considerable quantities of cereals, especially barley. The mining industry gives employment to about 7,000 persons, and one of the mines, the Lansell, has reached a depth of over 2,500 feet, the deepest on the continent. The climate is hot and variable; a maximum temperature of 126° F. in the shade has been observed. The mean annual rainfall is 24 inches. Pop. (1891) 37,238.

MARK W. HARRINGTON.

San Diego, -di-ā-gō: city; port of entry; capital of San Diego co., Cal.; on San Diego Bay and the National City and Otay, the San D., Cuyamaca and East., and the S. Cal. railways; lat. 32° 41' N., lon. 117° 13' W.; 480 miles S. E. of San Francisco (for location, see map of California, ref. 13-G). The bay, discovered by Cabrillo in 1542, is pronounced next in excellence on the Pacific coast to that of San Francisco. The first settlement was made in May, 1769, when Father Junipero Serra established here the first of the California missions, that of San Diego; but the present city dates in growth from 1867, when the new town was begun on the water front of the bay. The climate is the mildest and most uniform known, and has made the city a popular resort for invalids from all parts of the U. S. San Diego County is the principal honey-producing county in the State, and markets in the city

large quantities of wheat, wool, honey, fruit, and live stock. There are several gold mines within 50 miles of the city. The principal industry of the region is fruit and nut culture, inaugurated in 1869, and represented by over 2,000,000 trees. The city contains 3 public parks, one with 1,400 acres; U. S. custom-house; free public library (founded in 1882); public-school district library; county hospital; 16 public-school buildings; public-school property valued at about \$200,000; Academy of Our Lady of Peace (Roman Catholic); board of trade and chamber of commerce; gas and electric lights; electric street-railways; water-works; 2 national banks with combined capital of \$400,000, 3 State banks with capital of \$180,000, and a private bank; and 2 daily, 5 weekly, and 4 monthly periodicals. There are several flour and planing mills run by steam-power, large saw-works, factories for carriages and wagons, foundry and machine-shops, a tannery, and other industries. The city has an assessed property valuation of over \$14,000,000, and a bonded indebtedness, chiefly incurred for improved sewerage, of \$375,000. On the peninsula on the opposite side of the bay and connected with the city by steam ferry is Coronado Beach, which contains many fine residences and a hotel with accommodations for 1,200 guests, costing nearly \$1,000,000. Pop. (1880) 2,637; (1890) 16,159; (1894) estimated, 20,000.

H. W. TALCOTT.

Sand-lance: See SAND-EEL.

San Domingo: See SANTO DOMINGO.

Sandpaper: paper one side of which is covered with glue, upon which sharp sand or powdered glass has been evenly sifted and is held by the glue when dry. It is made of many grades and degrees of fineness, and is used in smoothing the surface of wood, by the carpenter and joiner, when giving it its final finish.

Sand Piles: See FOUNDATION.

Sandpiper: any one of several small birds of the family *Scelopacidae*, that frequent sandy shores and utter a piping note. They have a bill about equal to the head in length, covered with a soft skin; the toes, four in number, except in *Calidris*, the hindmost being very small. They are mostly distinguished from the true snipes by their shorter bills and uniformly colored tail-feathers. They are mainly birds of the northern hemisphere, and breed far north, occurring at times in great flocks during their fall migration. They feed along the shore, picking up small crustaceans, molluscs or insects, or probing for them in the mud.

There are about twenty-five species, some of wide range, twenty of which occur in North America, although one or two, like the ruff (*Machetes pugnax*) and the spoon-bill sandpiper (*Eurynorhynchus pygmaeus*), are stragglers from other regions. Among the most common is the spotted sandpiper (*Actitis macularia*), familiarly known as tip-up, which breeds in many parts of the U. S., often at some little distance from the water, and is not so gregarious as most species. The broad-billed sandpiper (*Tringa platyrhynchos*) is an Old World species.

F. A. LUCAS.



The broad-billed sandpiper.

Sands, BENJAMIN FRANKLIN: rear-admiral U. S. navy, b. in Baltimore, Md., Feb. 11, 1811; entered the navy as a midshipman Apr. 1, 1828. Served on the east coast of Mexico during the war with that country; commanded the steamer Fort Jackson in both the Fort Fisher fights in the civil war; promoted rear-admiral 1871. He was long identified with the building up of the U. S. Naval Observatory. He served as an assistant in the very earliest days of that institution, and it was through his earnest efforts that it was equipped with what was then the largest telescope in the world. During his superintendency the observatory ranked among the highest of similar institutions. See Report No. 726, House of Representatives, 52d Congress, first session, Naval Observatory. D. at Washington, D. C., June 30, 1883.

Revised by C. BELKNAP.

Sand star: a genus sometimes given to species of starfish of the orders *Asterasteria* and *Ophiasteria*.

Sandstone: a rock consisting of grains of sand held together by some cementing material. Commonly the grains are made of quartz; sometimes they are almost exclusively quartz; in a few instances feldspar predominates. The cementing material is usually calcareous, more oxide, clay, or siliceous. It more rarely cements the grains or may fill all interstices. Sandstones are generally composed of parallel layers or beds of more or less equally separable, and a thick layer is sometimes divided by thinning planes, an arrangement known as cross-bedding or false bedding. The name arises as it applies to sandstone derived from the disintegration of granite or gneiss, with little rounding or sorting. Sandstone grades successively into conglomerate or concretionary gravel, and into sand, in which the cemented fragments are large and angular. A sandstone easily quarried and wrought is called a freestone, and sandstones are otherwise characterized, according to the nature of the cement, as calcareous, ferruginous, argillaceous, and siliceous. A quartzite is a siliceous sandstone with the interstices completely filled. Sandstone is one of the most important of all building materials, and is extensively employed in the manufacture of grinders, millstones, etc. See *Barnum's Stone*, *Flaxman's Sandstone*, and *Woods*.

(J. K. Gilman.)

Sandusky: city; port of entry; capital of Erie co., O.; 8 miles from the mouth of the Sandusky river, and on the E. and O. of the Cleveland, Cin., Chi. and St. L., the Cleveland and Huron, the Lake Erie and W., and the Lake, Shore and Mich. S. railways; 41 miles W. of Cleveland (for location, see map of Ohio, ref. 2-F). The city is built on regularly with broad streets, has one of the best harbored harbors on the Great Lakes, and is supplied with gas, electric light, electric railway, sewerage, and water-works, the latter on the stand-pipe system. Steamships connect the city with Cleveland, Detroit, Toledo, and the islands in Lake Erie. There are two popular summer resorts, Cedar Point, called "The Coney Island of the West," and Johnson's Island, on which many Confederate prisoners were confined during the civil war. Put-in-Bay, Hilsenhall, and Middle Bass and Pelee islands are easily accessible by steam, and are favorite resorts for fishing-parties. The city contains 18 churches, 7 public-school buildings, 3 parochial schools, 4 national banks with combined capital of \$650,000, and 3 daily, 2 weekly, 2 monthly, and 2 other periodicals. The public buildings include a U. S. government building, United warehouse, court-house, county infirmary, jail, Public Library, and the Ohio State Soldiers' and Sailors' Home, comprising 24 buildings of blue limestone cost, exclusive of ground, \$235,070, with accommodations for 1,400 inmates. Most of the public, business, and residence buildings are made of limestone from local quarries.

Sandusky is noted for its fresh-fish industry, which has an annual value of over \$1,500,000; for wine production, which exceeds \$1,000,000 value per annum; and for its extensive manufacture and shipment of grapes and peaches. It has a prospectus of coal for rail and of iron ore, lumber, and fish for export. The principal manufactures are spokes, hubs, wheels, carpenter's tools, engines, boilers, thrashing-machines, reapers, baskets for the grape and peach trade, and boxes for wine shipments. There is also considerable ship-building. The fish industry is promoted by a large State wharf. The city has important trade relations with Canadian ports, and imports large quantities of codfish, haddock, saffron, sardines, and fish oil. In 1894 the city had an assessed property valuation of \$7,023,060, and a bonded debt of \$492,200. Pop. (1880) 15,838; (1890) 15,471; (1900) estimated, 30,000.

MARY E. LOCKWOOD.

Sand wasp: a hymenopterous insect that digs in the sand, as of the families *Pompilidae* and *Sphegidae*. See *Orthoptera*.

Sandwich: a seaport of Kent, England; at the mouth of the River, 2 miles from the sea; 12 miles E. of Canterbury (see map of England, ref. 16-M). It is one of the Cinque Ports, is surrounded by ancient fortifications, is irregularly built, and has several notable medieval structures. In the fourteenth century it was the most famous of all the English ports. The principal import is coal; principal exports, agricultural products. It forms with Deal a parliamentary borough. Pop. (1891) 2,708.

Sandwich: county-seat of Rowan County, Ontario, Canada; on Detroit river, nearly opposite DeGout (see map of Ontario,

ref. 9-A). It has a convent and Roman Catholic college, and natural springs which make it a favorite place of resort. It is the oldest place in this part of Canada. French soldiers allied to the Algonquians and Hurons were stationed here as early as 1616. Actual settlement began in 1700 or 1701 under Mathé-Cadillac and the place was then called *Polyte de Montréal*. Pop. alone (1881) 2,841.

M. W. H.

Sandwich: city (incorporated in 1850), De Kalb co., Ill.; on the Chi., Burlington, and Quincy Railroad; 36 miles S. W. of Chicago (for location, see map of Illinois, ref. 2-E). It contains a public high school, 2 private banks, and 2 weekly newspapers, and is chiefly engaged in the manufacture of agricultural implements. Pop. (1880) 2,332; (1890) 2,310.

Sandwich: town, Barnstable co., Mass.; on Cape Cod Bay, and the N. Y., N. H. and Hart. Railroad; 60 miles S. of Boston (for location, see map of Massachusetts, ref. 6-W). It lost a large part of its original territory in 1884 to the setting off of the town of Bourne (q. v.). It is a popular summer resort, and contains 10 public schools, a public library, a weekly newspaper, and manufactures of glass, jewelry, broods, and toys. Its banking business is done in Wareham or Yarmouthport. Pop. (1880) 4,242; (1890) 1,510; (1900) estimated, 2,000.

Known as "Onsetville."

Sandwich Islands: the name given by Capt. Cook, after Lord Sandwich (fourth earl), to the group now forming the independent republic of Hawaii. See *Hawaii-Nor*.

Sandy Hill: village, Washington co., N. Y.; on the Hudson river, and the Del. and Hudson Railroad; 52 miles N. of Albany, the State capital (for location, see map of New York, ref. 4-K). It derives good power from the river for manufacturing, has large lumbering interests, and contains stone-quarries, paper-mills and saw-mills, iron-furnaces, machine-shops, large bag-factory, wall-paper, print-works, two national banks with combined capital of \$160,000, a union school library founded in 1867, and a weekly newspaper. Pop. (1880) 2,487; (1890) 2,850; (1900) estimated, 3,500.

Known as "Hershey."

Sandy Hook: a low, sandy peninsula in Monmouth co., N. J.; between the Atlantic Ocean and Sandy Hook Bay, beginning at the Navasink Highlands and extending N. about 6 miles; 20 miles S. of New York (for location, see map of New Jersey, ref. 8-K). It is less than a mile in extreme width, and has a beacon-light on its northern extremity and a lighthouse, 90 feet high, less than a mile S. It was formerly the terminus of a steamboat line which there connected with a railway to Long Branch, but is now used exclusively for U. S. Government purposes. At the northern extremity is an uncompleted fortification, begun on an old plan for the defense of New York harbor and city, and S. of it is the proving-ground where ordnance and armor-plate are tested. Here are also batteries of modern rifled guns and mortars for defending the entrance to the harbor.

Sandys, Eowis: D. D.; archbishop; b. at Hawkshead, Lancashire, England, in 1519; graduated from St. John's College, Cambridge, 1539; took orders in the Church of England; embraced the principles of the Reformation; became vicar of Uxversham and master of St. Catharine's College 1547; prebendary of Peterborough 1549 and of Carlisle 1552; vice-chancellor of Cambridge University 1559; preached a sermon in favor of the royal claims of Lady Jane Grey; was consequently deprived of the vice-chancellorship in July of the same year; was imprisoned in the Tower and the Marshalsea for refusing to proclaim Queen Mary; was liberated and allowed to proceed to the Continent May, 1554; returned at the coronation of Elizabeth 1558; was made Bishop of Worcester Dec. 21, 1559, and of London 1570, and Archbishop of York 1576; was one of the translators of the Bishops' Bible 1568. A malicious plot (1582) charged him with infamous conduct, but its author, Sir Robert Stapleton, was detected and punished. D. at the archiepiscopal palace of Southwell, July 10, 1588. A volume of his *Sermons* was published 1585, was repeatedly reprinted, and was edited for the Parker Society, with a *Biography*, by Rev. John Ayre (1841).

Revised by W. S. PERRY.

Sandys, Sir Eowis: statesman; b. at Worcester, England, about 1501; studied at Christ Church, Oxford, under Richard Hooker; traveled extensively over Europe; was a supporter of the dynastic claims of King James I., by whom he was knighted 1601 and employed in several important commissions; was a leading member of the second Virginia Com-

pany, of which he became treasurer 1619; was instrumental in securing a charter for the Pilgrims of the Mayflower and in establishing representative government in the colony of Virginia, thereby becoming obnoxious to the "Spanish party" at court, and was imprisoned, along with Selden, 1621, for having opposed the royal projects in Parliament. D. at Northborne, Kent, in Oct., 1629. He founded a lectureship on metaphysics at Oxford, and wrote at Paris, in 1599, *Europæ Speculum, or a Survey of the State of Religion in the Western Part of the World*, which passed through many editions. A volume of *Sacred Hymns* (1615), containing translations of 50 select Psalms, is attributed to him.

Sandys, GEORGE: English traveler and author; b. at Bishopsthorpe, York, in 1577; educated at St. Mary's Hall and Corpus Christi College, Oxford; traveled through various parts of the Turkish empire 1610-12; published a *Relation* of his journey (1615), with illustrations, often reprinted, and considered of great value by Orientalists; went to Virginia as colonial treasurer 1621; completed at Jamestown a translation of Ovid's *Metamorphoses* (1626), of which the first five books had previously appeared; built the first water-mill, and promoted iron-manufacture and ship-building in Virginia; returned to England 1624; printed poetical paraphrases of several books of the Old Testament, and translated from the Latin of Grotius the tragedy of *Christ's Passion* (1640); was for some years gentleman of the privy chamber to the king, and passed his latter years at Bexley Abbey, Kent, where he died in Mar., 1644. A *Life* was published by Rev. H. J. Todd, prefixed to a *Selection from Sandys's Metrical Paraphrases* (1839), and a complete edition of his poetical works, with introduction and notes, was published in 1872 by Rev. R. Hooper.

San Felipe de Linares: usually called LINARES (*q. v.*).

San Felipe de los Andes, -fā-lee'pā-dā-lōs-aan'dās, or **de Aconcagua, dā-nā-kōn-kaa'gwā:** capital of the province of Aconcagua, Chili; in a valley at the foot of the Andes; 50 miles N. N. E. of Santiago, with which it is connected by railway (see map of South America, ref. 8-C). It has a considerable trade over the Andes with the Argentine Republic. Pop. (1885), 11,768. H. H. S.

San Fernan'do, formerly **Isla de Leon:** fortified maritime city of Spain; 9 miles by rail S. E. of Cadiz; on the low island of Leon (see map of Spain, ref. 20-C). It is a modern town with an arsenal, an observatory, hospitals, and barracks for troops. The population consists chiefly of Government employees, and the only industry is the extraction of salt from the neighboring tidal marshes. Pop. about 27,000. M. W. H.

Sanford: city, Orange co., Fla.; on Lake Monroe, an enlargement of the St. John's river, and the Jack., Tam. and Key W., the San. and Ind. Riv., the San. and St. Petersb., and the Sav., Fla. and West. railways; 125 miles S. of Jacksonville (for location, see map of Florida, ref. 4-J). It is at the head of large steamer navigation on the river; is an important shipping-point for oranges and for early vegetables and fruit consigned to Northern markets; and contains 10 churches, 2 public schools, railway car-shops, machine-shops, wood-turning mills, cigar and fruit-preserving factories, a national bank (capital \$50,000), an incorporated bank (capital \$31,000), and a weekly paper. It was founded by Gen. H. S. Sanford in 1870. Pop. (1890) 2,016; (1895) estimated, 3,000. Editor of "GATE CITY CHRONICLE."

San Francis'co: city, metropolis, and chief seaport of California; coextensive with San Francisco County; on the end of a peninsula 6 miles wide and 20 miles long, separating the south arm of San Francisco Bay from the Pacific Ocean, and on the N. Pac. Coast, the San Fran. and N. Pac., the S. Pac. railways (of which only the last named has a line running directly into the city); lat. 37° 48' 26" N., lon. 122° 24' 39" W. (for location, see map of California, ref. 7-B).

Site, etc.—Its area is 42 sq. miles, including, besides the entire end of the peninsula across to the ocean, Goat island, with 141 acres, 2 miles E. of the peninsula; Alcatraz island, with 30 acres, 1 mile N. of the peninsula; and the Farallones, six rocky islets, 24 miles off shore in the ocean. Nearly half the area consists of high rocky hills, rising in several points to 800 feet above the sea. The site has much level land, but a large part of this has been supplied by art, the original inequalities of the surface having been graded away. The harbor is part of a bay 50 miles long and 5 miles wide, deep, landlocked, and most beautiful. The city

is supplied with water from Pilarcitos valley, 20 miles to the S., where the rain-water is caught in a large reservoir, and artesian water is found at depths varying from 120 to 160 feet, though from many wells water must be raised by pumping. The city is laid off in rectangular blocks, separated by wide streets, which in the north run with the cardinal points of the compass, and in a portion of the south with the semi-cardinal points. Market Street, which separates the two main surveys, 125 feet wide and 3 miles long, is one of the most important and imposing business streets in the world. Among remarkable features are the peninsular position, fronting to the W. on the Pacific Ocean, to the E. on the bay, and to the N. on the Golden Gate; the wooden architecture in the residence district; the hilly site; the excellent street-car system, with cables over many of the hills; Chinatown; the fruit-market, wonderful in variety and abundance of its supplies; the wharf for Italian fishing-boats; the Seal Rocks, with their sea-lions at the entrance of the harbor; Suto Heights, a pleasure-garden kept open to the public by Adolph Suto; the Suto bath-house; the numerous large hotels; and the peculiar climate, which permits the fuchsia and geranium to blossom in the open air of mid-winter while it compels the wearing of overcoats in mid-summer. Golden Gate Park has an area of 1,050 acres, with abundant evergreen vegetation of beautiful form and color, excellent drives, commodious and elegant buildings for public entertainment, creditable statuary, a highly varied site, a steep hill 900 feet high on the S., and a magnificent ocean beach and surf at its west end.

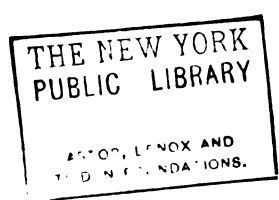
Climate.—There is almost unbroken coolness of temperature by breezes fresh from the ocean every day. The annual death-rate for each 1,000 inhabitants is 20, a proportion exceeded in most other seaport cities of equal size. The heavy fogs in summer are pernicious to asthmatics, and consumptives find better climates in other parts of the State.

Buildings.—The city-hall, though unfinished at the close of 1894, had cost \$5,000,000. It is the largest building of the city in ground plan. Its material is brick, covered in front with stucco. The branch mint has an imposing front of gray limestone in the Greek style of architecture. The Palace Hotel, of brick, seven stories high, cost with its site \$3,000,000, and is one of the largest and most famous hotels of the world. Other notable buildings are the Academy of Sciences, the Pioneer Hall, both endowed by James Lick; the Cooper Medical College and Lane Hospital (in adjoining buildings); the Hopkins Art Institute, given to the State by E. F. Searles; the Mills building, twelve stories, of brick and stone, with a framework of steel, erected at a cost of \$1,000,000; and several other high buildings of similar construction. The prevalent style of architecture is highly ornamental, with a great multitude of bay-windows designed to catch as much sunlight as possible. The material of nine-tenths of the dwelling-houses and of many of the factories is wood.

Institutions.—As an important seaport San Francisco has a large custom-house, a national marine hospital, a national military post (the Presidio), and on the northern border of the peninsula, and also on Alcatraz and Goat islands, extensive fortifications. The city has a large number of churches and educational and philanthropic institutions. The Mechanics' Institute has property valued at more than \$1,000,000; the Academy of Sciences had an endowment of about \$600,000 from the estate of James Lick, and the Lick Mechanical Art School one of \$540,000.

Government.—The city council (consisting of a board of twelve members, known as the board of supervisors) and the chief executive officers, including mayor, auditor, treasurer, assessor, sheriff, recorder, county clerk, public administrator, and coroner, are elected biennially. The expense of the municipal government in the fiscal year ending June 30, 1894, was \$5,370,000 (\$19 for every resident), including \$1,080,000 for schools, \$600,000 for police, \$400,000 for the fire department, and \$650,000 for repairing, cleaning, and lighting the streets. The debt in excess of the sinking fund was \$260,000, and the assessed value of property \$342,000,000.

Manufactures.—The city has numerous large manufacturing establishments, including a rolling-mill, machine-shops, foundries, shipyards, wire-works, ropewalk, planing-mills, sugar-refineries, and factories for carriages, furniture, boxes, shoes, clothing, tinware, etc. The gross value of the products manufactured in 1894 was estimated at \$90,000,000, including refined sugar, \$18,000,000; glass, \$8,000,000; clothing and shoes, \$8,000,000; furniture and



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manufactured merchandise, \$9,000,000; mining and other metal work, \$1,000,000; and ship building and repairing, \$500,000. The total value of metal work, exclusive of gold and silver worked at the mine, was \$90,000,000.

Climate.—The winds are strong and constant, but rarely violent. Between noon and the afternoon is only about 5 deg. or that degree can always lead and discharge at the same time. A large stone dry dock and floating dock give facilities for repairs. By possession of a central position on the west coast of the continent, the only secure deep harbor between San Diego and the Columbia river, which are 1,000 miles apart, a situation at the outlet of the only navigable river and large valleys of California, and of the best transcontinental railway route over the mountains of Nevada, and of the large extent of tributary territory and its great agricultural and mineral resources, San Francisco has a high cosmopolitan character. The merchandise imports in 1904 were valued at \$109,000,000; exports of lumber at \$19,000,000; wheat, \$5,000,000; and general merchandise, \$29,000,000. The shipping that enters the harbor in a year measures 1,300,000 tons, of which about half comes from foreign ports. The amount on deposit in the banks is \$130,000,000, and the bank clearances in 1904 were \$450,000,000.

History.—The first settlement of white men was made in 1776, by Spaniards, who then established a military post and a mission of Franciscan friars, who devoted themselves to the conversion of the Indians. After the country passed to the dominion of Mexico, a small village called *San Francisco*, inhabited by Mexicans, grew up about the mission. Another village, called *Yerba Buena*, was laid off near the old anchorage, 3 miles N. E. of the mission, in 1836. The occupation of California by the naval forces of the U. S., with an official announcement of permanence, stimulated the growth of *Yerba Buena*. In Jan., 1847, the name was changed to San Francisco, and a census showed a population of 450. In 1848 the discovery of gold in the Sierra Nevada brought a flood of people from remote countries of the world. Among the notable events of San Francisco were five great fires in 1849, 1850, and 1851; the formation of vigilance committees which in 1851 and 1856 executed criminals by extra-judicial process; the Fraser river fever in 1857, when the market value of real estate fell more than 50 per cent. because of the large migration to British Columbia; and the earthquake of 1868, 71, 1894.

Population.—(1880) 232,959; (1890) 208,000, of whom 127,000 were foreign born, including 30,000 from Ireland, 25,000 from Germany, 10,000 from England and Scotland, 5,000 from Italy, 4,500 from France, and 3,000 from Sweden.

Demography.—See the *Municipal Reports*, published annually by the city since 1901; John S. Hittell, *History of San Francisco and Resources of California*; Theodore H. Hittell, *History of California*; Hubert H. Bancroft, *History of California*. JOHN S. HITTELL.

San Francisco de la Selva de Copiapó: See **COPÍAPO**.

San Francisco Mountain: the loftiest mountain in Arizona; lat. 29° 27' N.; lon. 111° 40' W.; altitude, 12,800 feet. It stands alone, rising abruptly from the Colorado plateau, to a height of 5,000 feet, and is a conspicuous landmark from all directions. Near it are the lesser cones of Mt. Williams, Kendrick, and Saguavet. Its base is 10 miles across, and its crest takes the form of a crescent, with the concavity turned to the east. Geologically, it is partly a remnant of erosion and partly a mountain of circumduction. Its upper part is composed of lava, which was erupted before the plain had been degraded to its present level. The tough lava opposed a more stubborn resistance to the agents of erosion than did the sedimentary rocks of the plain, and not merely held its own while the latter were worn away, but protected and preserved that portion of the strata which it covered. As erosion proceeded, fragments of the volcanic rock fell down upon the sedimentary escarpment, and so nearly covered it that it can be detected at a few points only. The strata preserved under the lava are of Triassic age; the bed which constitutes the surface of the plain is the upper member of the Carboniferous formation. So the mountain is an insular table of Triassic sandstone, standing on a Carboniferous floor, and capped by a volcanic cone. Hence the removal of the Triassic strata by erosion have opened in the plain, and basaltic lava has flowed out, spreading over the surface in broad black sheets and shrouding up hundreds of low cones. From the summit of San Francisco one can look down into the throats of more than a hundred volcanoes. O. K. GILNEY.

Sangallo (It. *Giovanni*), the architect; b. in Florence, Italy, in 1444. He studied engraving, and then became an engraver. His first work as architect was the cloister of the Carminites of Santa Maddalena dei Pazzi in Florence. He built the palace of Poggio Imperiale for Lorenzo the Magnificent, and the Church of the Madonna delle Carceri, of which Lorenzo laid the first stone in 1495. He restored the fortifications of the city of Ostia by order of Cardinal Giuliano della Rovere. On his return to his native place in Florence, he built a monastery for the hermit monks outside the Porta Sangallo, and received the surname of *la Sangallo* from this work. At Milan he began the splendid palace for the Duke Moro which was interrupted, and at Lucca the cupola of the Church of the Madonna. He restored the roof of Santa Maria Maggiore at Rome, under Alexander VI.; this he is said to have gilded with the first gold from America. He constructed the cloister of the Santi Apostoli in Rome, and designed the beautiful facade of the Church of the Florentines. The Gonfaloniere of Florence, Pietro Soderini, made use of Sangallo at the siege of Milan, where he constructed an ingenious bridge and the fortress and the gate of St. Mark. He was called again to Rome by Leo X., who asked him to undertake the direction of the building of St. Peter's, but, being ill, he returned to his own city. D. in 1517. His brother was a remarkable architect, as was Antonio Sangallo, a son of his sister. W. J. STILLMAN.

Sangha, or **Samgha** [Sanskrit, *saṃgha*, assembly or congregation]: the monastic brotherhood, community, or order founded by the Buddha. It consists of men who have renounced all family ties and all worldly desires, and are pledged to devote themselves to meditation, the recital of the law, self-restraint, and the accumulation of merit in order that they may find deliverance from the round of birth and death. The order is open to men of all ranks, provided they are over twenty, have the consent of their parents, are free from disease or bodily defect, are not soldiers or in the service of the state, and are not debtors, slaves, or criminals. They are pledged to celibacy and mendicancy, and depend for support on unsolicited alms. The term *sangha* is sometimes rendered "church" and sometimes "priesthood," but erroneously in both cases, as, except in Tibet, Buddhism has no ecclesiastical organization and no religious rites or ceremonial observances. The *sangha* is also the third member of the *Triratna*, or Buddhist Trinity. See **TRIRATNA**.

San Gil: See **SAN JIL**.

Sangir, or **Sangir Islands:** a chain of islands connecting Celebes and the Philippine Islands, lying between the Sea of Celebes and the Pacific Ocean, belonging to the Netherlands. Area, 823 sq. miles. The largest island is Great Sangir, on which is the celebrated Gunung (or volcano) Abu, a superb pyramid, subject to frequent eruptions. That of 1856 caused the death of 2,500 people; another eruption was contemporaneous with that of Krakatau. The islands produce woods, coconuts, sugar, rice, trepang, and turtles. The inhabitants are Alfurans, pacific, industrious, in part Christian and Mohammedans, in part pagans. Pop. (1888) 76,387. The Taluat Islands to the N. E. are sometimes included in the Sangir group. They have a somewhat greater area, and a population estimated at 5,000. MARK W. HARRINGTON.

Sangkoi: chief river of Tonquin. See **SOUKOU**.

San'greal, Sangraal, or Holy Grail [*Saugreal* is from O. Fr. *saīnt*, holy + *grail*, O. Span. *grail*: Portug. *grail* < Lat. **crataelis*, deriv. of *cratus*, crater, bowl]; according to medieval legends, the cup of emerald which held the wine at the first celebration of the Lord's Supper. St. Joseph of Arimathea, it is related, received some of the blood of the Lord in this cup at the crucifixion. In the earliest form of the legend, *Le petit Saint Graal*, composed about 1160 and ascribed to Robert de Boron, the brother-in-law of Joseph of Arimathea carries this communion chalice to the West. In *Le grand Saint Graal* and *La Queste del Saint Graal*, ascribed to Walter Map, a gentleman of the court of the English Henry II., it is Joseph himself who brings the Grail to England. These romances connect the legend with the stories of King Arthur, several of whose knights undertake its quest, an adventure finally achieved by the maiden knight Galahad. Galahad takes it back to the East, and on his death it ascends to heaven. In the *Conte del Graal* of Gersten de Troyes (about 1190), and the *Parzival* of his German continuator Wolfram von Eschenbach, Percival is substituted for Galahad as the hero of the Grail legend.

The fragment of a Graal romance, *Joseph of Arimathea*, exists in English alliterative verse of the fourteenth century, and has been edited for the Early English Text Society by Rev. W. W. Skeat (1871). H. A. BEERS.

Sangster, CHARLES: poet; b. near Kingston, Ontario, Canada, July 16, 1822, and educated there; was editor of the *Amherstburg Courier* and Kingston newspapers for fifteen years, and in 1868 became attached to the Post-office Department, Ottawa, from which he was retired in 1886. He published *The St. Lawrence, The Saguenay, and other Poems* (1856), *Hesperus and other Poems and Lyrics* (1860).

'Sanguina'ria: a genus of plants containing one species, *S. canadensis*. See BLOOD-ROOT.

San'hedrin, incorrectly but commonly **Sanhedrim** [from Heb. *san'hedh'rin*, from Gr. *συνέδριον*, assembly; *σίν*, with, together + *ἔδρα*, seat]: either of two councils of the ancient Hebrews.

A. *The Great Sanhedrin*.—The Jewish tradition traces its origin to the seventy councilors appointed by Moses (Num. xi. 16-25; comp. Ex. xviii. 13-26), and asserts, without proof, its existence at all periods of the nation's history until after the destruction of Jerusalem by the Romans. The earliest reliable trace of its existence is under the Maccabees (2 Macc. i. 10; iv. 44; xi. 27; 1 Macc. xii. 6). It was in full activity at the time of Herod (Joseph., *Ant.*, xiv. 9-4), and we find constant mention of it in the New Testament (Matt. xxvi. 59; Mark xiv. 5, xv. 1; Luke xxii. 66; John xi. 47; Acts iv. 15, v. 21, 27, 34, vi. 12, 15, xxii. 30, xxiii. 1, 6, 15, 20, 28). It was the supreme "privy council" of the Jews; not only their court of final appeal and last resort, but also an executive and legislative assembly, shaping the general polity of the nation. Its power in matters civil and religious was practically unlimited. It decided all cases brought upon appeal from the lower courts; it had authority over kings and high priests; in it was vested the trial of heresy, idolatry, false prophecy (hence the active part it took against our Lord); and it alone had power to pronounce sentence of death. Its active jurisdiction was confined to Judæa, but the Jews in all parts of the world seem in some degree to have recognized its authority. Owing to the inability to check the constant disorders during the last years of the Jewish commonwealth, its power was greatly curtailed by the Romans, and three years before the death of Christ the right of executing sentence of death was denied, save when confirmed by the Roman authorities (John xviii. 34). In the unsettled condition of affairs attending the fall of Jerusalem it found itself unable to execute civil authority, and from that time until its extinction in the third century its power was merely nominal.

It had seventy-one members chosen from those who were distinguished in birth, learning, or position. In the New Testament are mentioned (1) priests (*ἀρχιερεῖς*), chiefs of different orders of priests; (2) elders (*πρεσβύτεροι*), those venerable from age or position; (3) scribes (*γραμματεῖς*), those learned in the law and tradition. Its officers were president (*Nasi*, chief); first vice-president (*Ab-beth-din*, father of the court); second vice-president (*Ilhakam*, judge); besides a force of secretaries and court officers (Luke xxii. 52). The members sat in a semicircle in a room immediately adjoining the temple, called *הבית החדר* (hall of squares).

Their meeting in the house of the high priest for the trial of our Lord does not seem to have been legal. After the fall of Jerusalem they removed to Tabneh, and finally to Tiberias, where the Sanhedrin became extinct A. D. 425.

B. *The Lesser Sanhedrin*.—A court of twenty-three members appointed by the Great Sanhedrin, sitting in all towns of over 120 households, with jurisdiction over local, civil, and criminal matters. See Matt. v. 22, x. 17; Mark xiii. 9.

LITERATURE.—Selden, *De Synedriis et Præfecturis Juridicis Veterum Ebraeorum* (1650), a mine of learning and the great source from which all knowledge of this subject is drawn, but containing a mass of irrelevant matter; Ugolini, *Thesaurus*, vol. xxv.; Lightfoot gives much valuable information, derived from the Talmud and Mishna (see *Works*); cf. Schürer, *The Jewish People in the Time of Christ*, Eng. trans., second division, i., pp. 163-195.

Revised by S. M. JACKSON.

Sanitary Commission, The United States: an organization formed during the civil war for the purpose of distributing relief to the soldiers of the Union army. On Apr. 15, 1861, the day of President Lincoln's call for 75,000 men,

the women of Bridgeport, Conn., organized a society with the somewhat vague idea of affording relief and comfort to the volunteers. In Charlestown, Mass., on the same day, and at Lowell a few days after, the women of those cities formed similar societies. On Apr. 19 the ladies of Cleveland, O., organized an association for the care of the families of volunteers. The Women's Central Relief Association (founded at a public meeting in the Cooper Union, New York, Apr. 29, 1861) sent a committee to Washington to confer with the medical bureau and the War Department in order to learn more definitely in what way, with least embarrassment to the Government and most help to the army, the women could serve the volunteers. They presented to the Government their plan, based very much on the sanitary commission of Great Britain, asking for the appointment of a scientific board, to be commissioned with ample powers for visiting all camps and hospitals, advising, recommending, and, if need be, enforcing, the best-known and most approved sanitary regulations in the army.

The Government not unnaturally dreaded the possible collision of such a body with the medical and military authorities, and required that the consent of the medical bureau should be obtained before such a commission was appointed. This consent was denied. The best that could be secured was the appointment of a doubtful semi-official commission, with the privilege of advising with the medical bureau, of visiting the army in the field, and of recommending to the War Department sanitary regulations and reforms. A few things soon became obvious, and guided their course:

1. The great object of such a commission must be to develop, strengthen, and support the regular medical and military authorities and methods—to stimulate the departments having the supply of food, transportation, camp equipment, drainage, and incite them by kind and wholesome criticism and counsel, and by the force of public opinion, to do their utmost to prevent pestilence and the spread of scurvy, and the lessening of needless exposures of every kind.

2. The Sanitary Commission became very early in its history thoroughly convinced that to prevent evils to the health of the army was greatly more important and serviceable than to attempt to cure them after they appeared. It accordingly gave its attention chiefly to prevention, by a system of camp-inspection and the promulgation of counsels touching the choice of camp-sites, the importance of drainage and police, and the character and cooking of food. By the appointment of skilled medical inspectors it established at once an advisory and tolerably friendly relation with the surgeons in the field.

Among the policies of the Sanitary Commission was the prevention of incompetency, inefficiency, and contracted ideas in the medical bureau. Another preventive measure which it inaugurated was the erection from its own models of pavilion hospitals, designed to make contagion and pestilence less easy and fatal. Its plans became the type of the great general hospitals which were erected at the base of the Union armies.

One of the earliest services of the Commission was the establishment of soldiers' homes at the chief places where new regiments were concentrating, to take care of the sick and supply the defects in the unperfected arrangements of the quartermaster's bureau for receiving them.

As soon as the capture of Fort Donelson the Commission, finding the Government transportation of the sick to hospitals very rude and inadequate, began to organize a system of hospital steamers. These boats, supplied with every comfort, with surgeons and nurses, plied between the ports nearest to the seats of war and the nearest general hospitals, and transported in comparative comfort tens of thousands of sick and wounded men. The cars in which the largest portion were transported were places of torture to wounded men. The Commission devised a sort of hospital-car, in which the common stretcher upon which the wounded man was carried from the field could be converted into a hanging bed in the car. The car was so hung on gutta-percha springs as to obviate jolting.

The wants of the hospitals and camps very early in 1861 had exhausted 60,000 articles which had been forwarded to the Commission. By September of that year it became plain that a demand for extra food and extra clothing was going to exceed anything that the unorganized and intermittent beneficence of the people would furnish. The organization of over 7,000 aid societies, which offered opportunities to millions of women to take some active share in the war, was one of the Commission's best services. On Sept. 5, 1861,

depot of supplies were established at New York, Boston, Philadelphia, Washington, Cincinnati, and Wheeling. General and associations were in evidence at Boston for New England, at New York for the state and part of New Jersey, at Philadelphia for Pennsylvania, Delaware, and Western New Jersey, at Cincinnati, Columbus, Cleveland, in Chicago, at Iowa, and Wisconsin, for the great Western States, which throughout the war were admitted to the greatest aid and sympathy. Types and other customs had made hundreds of cities and villages comfortable.

Medical Care Relief.—The medical department, having no independent organization, often suffered from the inevitable preoccupation of the quartermaster's department with the more urgent duty of forwarding military stores. The Sanitary Commission, aware of the chief means of sustenance, had money and horses of its own—often forty-four horse teams at a time—and this enabled it at periods when transportation of medical stores was most embarrassed to forward hospital and sanitary supplies to thousands of immediate battle lines in advance of the medical department. After Antietam (Sept. 17, 1862) nearly 10,000 wounded Union soldiers, besides many Confederate soldiers, were left an immense proportion of the whole population in the woods and fields, without any adequate supply of surgeons, and with not a tenth part of needed medical stores, which were locked up in the block of the railway between Baltimore, the base of supply, and the battlefield. A wagon-train loaded with medical stores had, however, been sent forward from the Sanitary Commission only for some time to meet this anticipated difficulty. For three days the medical director received no Government supplies, and the wounded were mostly dependent meanwhile on the stores of the Commission.

General Relief Services.—Early in the war new regiments, fresh from recruitment offices, arrived at Washington and other centers with sick men and exhausted soldiers, compelled to walk many miles to their camps, with no Government provision of food for them at the depots. The Sanitary Commission at once established near the principal army soldiers' homes, where weak and sick men could be recuperated, received, restored to health, and forwarded to duty. Forty soldiers' homes and lodges, in short, were maintained by the Sanitary Commission in its broad field, reaching from Washington to Brownsville, Tex., and from Louisville, Ky., to Port Royal, S. C.

The Hospital Directory.—This was an organized effort to identify and keep the run of the names of all private soldiers who passed through the general hospitals, so that a soldier's friends could follow him, know where he lay, if he lived or died, and what became of him when out of hospital. The central office at Washington was opened to the public Nov. 27, 1864; branches were soon established at Philadelphia, Louisville, and New York.

Quarantine Bureau and Warehousing Agency.—This agency, free of all cost to soldiers, was designed to obviate the accumulations of malleability, or want of strength to win their own way as to secure correct papers, among soldiers passing through the homes and depots of the Commission.

Special Examination of Hospitals.—This was one of the duties undertaken by the Sanitary Commission. It organized a corps of army physicians and surgeons of assumed position, under Dr. Henry W. Clark, of Boston, as inspector-in-chief, who visited all the general hospitals in the country, and reported in a thorough and exhaustive manner (in 2,500 folio pages) to the medical committee of the Sanitary Commission. The object was to attain such information in regard to the practical management of the hospitals as might furnish suggestions to the surgeon-general for improvements in the system.

History of Field Hospitals.—The most scientific and permanently valuable part of the work of the Sanitary Commission was its effort to collect, tabulate, and turn to account such returns as a system of careful inspection could supply touching the effects of applied or neglected hygiene, of diet, of long marching and heavy equipment, of tent and fixed hospitals, the mortality of young recruits, the influence of climate, age, drill, nationality, of previous occupations, or of other connection upon soldiers; the height, weight, strength, and force of the enlisted men.

Account of History of the Commission.—The earliest call for aid published by the Commission was June 21, 1861. In two week papers were addressed to the people at large, the names of the managers and companies. In Mar., 1862, it looked to the Sanitary Commission must disband for want of funds, but its funds were determined not to abandon the enterprise. The first large contribution received was \$100,

000, by telegram dated San Francisco Sept. 10, 1862. Supplies had been running in out of all proportion to the money necessary to move and distribute them. This splendid gift from distant California awoke a general enthusiasm. From that date, after every great battle, money and supplies came pouring in from other quarters, but with each of them came a still greater drain on the stores and the treasury. In the beginning of 1864 a series of great fairs was inaugurated, either by officers of the Commission, or by the friends, in aid of its treasury or of the independent treasury of its branches. They occurred at Chicago, Cincinnati, Cleveland, Philadelphia, Albany, Baltimore, Boston, Brooklyn, New York, Philadelphia, and many other towns and cities. The net product reached \$2,736,929.84. The total amount of money received from the people by the Sanitary Commission up to May 1, 1866, was \$4,082,014.26; but at least \$9,000,000 more was raised and expended in its interest by its branches. Free transportation by railway and express companies and communication by telegraph lines saved the Commission at least two-thirds of the cost in these departments of its work. The aggregate value of the services rendered by the public to the Commission has been estimated at \$23,000,000.

Internal Organization.—The original board consisted of nine persons, with power to add as many more associates as they deemed necessary. The order of the Secretary of War creating the Commission was dated June 9, 1861. The board had a general supervision of the work, the defining of its policy and measures, which were committed to secretaries, heads of bureaus, and agents for execution. To them was presented by the general secretary a sketch of the work founded on the reports of the heads of the various bureaus. The pressure and complexity of the business compelled the board to appoint from its members a standing committee charged with all the responsibility of the Commission during the intervals between its sessions. This committee consisted of Rev. Dr. Hallows, Dr. W. H. Van Buren, Prof. William Gilks, E. T. Strong, and Dr. C. H. Agnew, and C. J. Stillé was afterward added. It was necessary that this standing committee should be constituted of gentlemen living near each other, as their meetings were held necessarily daily, and New York thus became their headquarters. For further details see Moss's *History and Work of the Sanitary Commission*.

Abridged by C. H. Adams.

Sanitary Engineering: See DRAINAGE, PLOWING, and SEWERAGE.

San Jacinto: a river of Texas, which rises in Walker's, and flows S. E. 120 miles to San Jacinto Bay, an arm of Galveston Bay; navigable 45 miles. On its banks, 2 miles S. W. of the junction of the river and Buffalo bayou, the closing battle of the war of Texan independence was fought Apr. 21, 1836. Gen. Houston, in command of the Texan forces, had been gradually falling back eastward, toward San Jacinto river and bay, before the advance of the Mexican army under Gen. Antonio Lopez de Santa Anna from the W. The armies were marching on parallel lines, Houston's object being to reach the river and hold the ferry at its mouth; Santa Anna's to cut off his retreat and capture him. They reached the bay boundary almost simultaneously, and took position within a mile of each other. On the 26th some skirmishing took place, with but little result. On the 28th, with the cry, "Remember the Alamo!" the Texans made a sudden charge, and at the expiration of an hour Santa Anna had fled, and the whole of his army not slaughtered in the action had surrendered. The force of the Mexicans was 1,536; that of the Texans about 700. The latter had 6 men killed and 26 wounded.

San Jil, Sanjil, or San Gil.—(heef): a town of the department of Santander, Colombia; 20 miles S. S. W. of Bucaramanga, in a narrow valley, 2,600 feet above the sea. It is the center of an agricultural district (sugar-cane, cotton, and tobacco), and manufactures Panama hats. Pop. about 10,000.

H. H. S.

San Joaquin (wā-keen) River: a stream which rises at the foot of a small glacier near the summit of Mt. Lyell, on the eastern border of the Sierra Nevada, California, flows S. W. for nearly 100 miles, then turns N. W. and traverses the magnificent valley of the same name, and at last, joining with the Sacramento, enters Suisun Bay. The discharge to the sea is through the Golden Gate. At high water the outflow of the Tulare system of lakes is discharged by the San Joaquin, which is navigable to Stockton for large steamers for a good part of the year. The river is some 350 miles long.

Revised by J. C. Russell.

San'jo Saneyosh'i: statesman; b. at Kioto, Japan, in 1836, of an old princely family. He early began to take a prominent position in state matters. His efforts were directed to the restoration of the imperial power, and his co-operation at court was invaluable to Saigo and the other leaders of the malcontents in the provinces. After the restoration in 1868 he became vice-premier, and in July, 1871, premier, a position which he held until 1886, when he became chancellor. D. Feb., 1891. J. M. D.

San José, -hō-sā': capital of Costa Rica (since 1823) and of the province of San José; in a valley at the foot of a chain of volcanic mountains; 95 miles by rail from the port of Limon on the Caribbean Sea, and 60 miles by mixed route from Puntarenas (see map of Central America, ref. 8-J). It is the commercial center of the republic, and lies in one of the richest agricultural districts; has a cathedral, national library, university, various Government buildings, and two fine parks. San José is about 4,000 feet above the sea, and consequently has a temperate climate; the water-supply is good, but there is no drainage. Owing to the frequency of earthquakes, all the buildings are low, and the churches are without towers. San José was founded about 1750. Pop. 25,000. H. H. S.

San José: city; capital of Santa Clara co., Cal.; on the Southern Pacific Railroad; 8 miles S. E. of San Francisco Bay, 47 miles S. of San Francisco (for location, see map of California, ref. 8-C). It is in the heart of the beautiful Santa Clara valley, and is connected with San Francisco by three lines of railway and a waterway through the bay, and with the Pacific Ocean at Santa Cruz and Monterey by rail. The city is laid out in the form of a parallelogram, with streets ranging from 60 to 100 feet in width. There are four public parks—Washington Square, 28 acres, containing the State Normal School (cost \$200,000); the Plaza, 4 acres, containing the new city-hall (cost \$150,000); St. James's Park, 2 blocks in the center of the city, opposite the court-house and Hall of Records (cost \$500,000); and Alum Rock Park, 7 miles E. of the city, 400 acres, containing numerous mineral springs, and connected with the city by a beautiful boulevard and by railway. The city contains a U. S. Government building that cost \$200,000.

Churches and Schools.—San José contains a Roman Catholic Cathedral and 2 other Roman Catholic churches, 7 Methodist Episcopal, 4 Presbyterian, 4 Baptist, 3 Lutheran, 2 Protestant Episcopal, 2 Christian, and one each Congregational, Friends, Jew, Seventh-day Adventist, and Unitarian. There are also a Young Men's Christian Association, Young Men's Institute, Union Chapel, Spiritual Union, Salvation Army barracks, Theosophical Society, Christ's Rescue Mission, and Florence Night Mission. The public-school system comprises a high school, 6 grammar schools, and 6 kindergartens, with an enrollment of 4,000 pupils and an annual cost of maintenance of over \$90,000. The Roman Catholic Church maintains Notre Dame College, St. Joseph's College, Notre Dame Academy, and St. Aloysius's School, and the Methodist Episcopal Church the University of the Pacific, half a mile N. of the city. There are 2 commercial colleges, 4 private schools, a public library, and 4 daily, 9 weekly, and 5 monthly periodicals. The charity institutions include the O'Connor Sanitarium (Roman Catholic), the Pratt Home for Old Ladies, and the Home of Benevolence, maintained by the Ladies' Benevolent Association.

Finances and Banking.—The city has annual receipts and expenditures of about \$275,000, net debt of \$300,000, and a property valuation of \$17,800,000. Unassessed realty belonging to the city, parks, reservations, etc., estimated, \$1,000,000. In 1894 there were 6 State banks with combined capital of \$1,590,000, and a national bank with capital of \$500,000.

Business Interests.—Lying in the center of a great fruit-growing region, the dominant industry is the preparation and handling of the fruit product. There are three large canneries, one the largest in the world, numerous packing-houses and shipping firms, a large woolen-mill, and an extensive yard for granite-polishing and marble-cutting.

History.—The pueblo of San José was established in 1782 by the Spaniards. Under the first constitution of California the State capital was located here. The completion of the overland railway in 1869 greatly promoted the prosperity of the city, and since 1880 its growth has been rapid. Pop. (1880) 12,567; (1890) 18,060; (1894) with suburbs, estimated, 30,000. CHARLES H. ALLEN.

San José de Cucuta: See CUCUTA.

San Juan, -hōo-aan': a western province of the Argentine Republic, between Chili, Rioja, San Luis, and Mendoza. Area, 29,700 sq. miles. A great part of the surface is covered with mountain-chains, parallel to the Andes, and 7,000 to 13,000 feet high. In the west there are arid tablelands, and in the east extensive *travesías* or dry deserts, which could be reclaimed by irrigation. Most of the inhabitants are gathered in the three fertile valleys of Tulán, Jacal, and Fertil. Cattle and sheep are raised and exported to Chili, but agriculture is the principal occupation. There are extensive vineyards, and the wines of San Juan, resembling Malaga, are noted. Until 1884 the province was frequently devastated by civil wars. Pop. (estimated, 1893) about 150,000. San Juan, the capital, on the San Juan river, was founded in 1561, and has a population of about 15,000. On Oct. 27, 1894, it was partly destroyed by an earthquake. HERBERT H. SMITH.

San Juan Bautista, -bow-tees'tā': capital of the state of Tabasco, Mexico; on the west or left bank of the river Grijalva, which is navigated by small steamers to this point (see map of Mexico, ref. 8-J). It is built on flat land, has few public or private buildings of any pretension, and is hot and somewhat unhealthful. It controls the trade of the upper Grijalva and portions of Chiapas. Pop. 11,000. H. H. S.

San Juan de Fuca, Strait of: the entrance to Puget Sound and the Gulf of Georgia; lies S. of Vancouver's Island and N. of the State of Washington. Its entrance is in lat. 48° 23' 30" N., lon. 124° 43' 48" W.

San Juan del Norte: See GREYTOWN.

San Juan del Río: a town of the state of Querétaro, Mexico; 28 miles E. S. E. of Querétaro; 6,500 feet above the sea (see map of Mexico, ref. 7-G). It owes its importance principally to rich silver mines in the vicinity. The place is beautifully situated and surrounded by gardens. Pop. about 10,000. H. H. S.

San Juan del Sur: a port of Nicaragua; on a bay of the Pacific, where the coast is nearest to Lake Nicaragua (see map of Central America, ref. 7-H). The harbor is good and safe. This was the Pacific terminus of the Central American transit route, now abandoned; it is the only cable-station on the Pacific side, and the commercial port of Southwestern Nicaragua. The proposed interoceanic ship-canal will terminate just N. of this place. H. H. S.

San Juan de Nicaragua: See GREYTOWN.

San Juan de Puerto Rico: capital and most important city and port of the island of Puerto Rico, Spanish West Indies; on a bay of the northern coast (see map of West Indies, ref. 5-J). The city is built on the western extremity of a low coral island which shelters the bay; the latter forms one of the safest and most commodious harbors in the West Indies, but the entrance is somewhat difficult, requiring a pilot. San Juan was founded by Ponce de Leon in 1511; subsequently it was strongly fortified and repulsed several attacks by English fleets. The most important exports are coffee and sugar. Pop. (1887) 26,387. H. H. S.

San Juan River, Nicaragua: See NICARAGUA.

Sankey, IRA DAVID: evangelist; b. at Edinburgh, Lawrence co., Pa., Aug. 28, 1840; in business at New Castle, Pa., 1855-70, when he joined Dwight L. Moody in evangelistic work in Chicago, Ill. They labored together in Great Britain 1873-75, and again in 1883. Mr. Sankey is the author of several popular sacred tunes, and has published a compilation entitled *Sacred Songs and Solos*.

Sāṅkhya [Sansk. *sāṅkhya*, enumerative (see below), from *sāṅkhyā*, number] is the name of the oldest one among the products of Indic speculation that was elaborated into a complete system. For the names of the other five systems, see SANSKRIT LITERATURE. Native tradition makes the Sāṅkhya system older than Buddha (older, say, than 500 B. C.), and maintains that Buddha in the establishment of his doctrines was greatly influenced by it; and this tradition is supported by many correspondences between the two systems. The origin of the rationalistic Sāṅkhya is to be sought in the reaction from the idealistic monism of the Upanishads (see VEDĀNTA), and is to be localized in the same region that brought forth also Buddhism. Originally the system must have maintained an open hostility to the Brahmanical system, as appears indeed from its polemics against Brahmanical ceremonialism. But in the first pre-

Christianity elsewhere, the Brahmins began to make friends with the Sāṅkhyas and to treat their doctrine as not irreconcilable with those of the Vedānta. Later, the Sāṅkhyas appeared as a conscious recognition of the infallibility of the sacred Brahminical literature; and their system, in turn, was received into the number of the six "orthodox" systems. Indeed, Sāṅkhyan doctrine pervades the whole classical Sanskrit literature so far as it concerns itself with a philosophical idea from Manu's law-book and the *Yogasūtra* down to the Purāṇas.

The accuracy of Kapila, the founder of the system, and of his alleged pupil Asuri, are wholly unknown. It is not even probable that the first Sāṅkhyas taught composed any works. The oldest authority of whom we can speak with any certainty is Paninīyasa, who flourished a little after the beginning of our era, but of whose writings only scanty fragments are left. The full bloom of the system belongs in the first centuries after Christ, a time when commerce between Alexandria and India was active; so that the Indian system was, and without influence upon the Hellenic system and Neoplatonism. The oldest extant complete treatise on the system, however, is probably of an late date as the fifth century; this is Jayarāśikha's *Sāṅkhyasūtra*. The two most important treatises are the *Sāṅkhyasūtra* of Uśanaka (about 700 A. D.) and Vāchāspadīyā's *Monist* of Sāṅkhyas *Doctrines of Sāṅkhyasūtra-kāṇḍa* (about 1100 A. D.). Later than this, but before the sixteenth century, is the *Tattva-saṁśā*, a brief compendium of the system, and the basis of many commentaries and supercommentaries. Next in the *Sūtra* in importance is the *Sāṅkhyasūtra*, ascribed to Kapila, but most probably dating from about 1400 A. D. The important commentaries upon it are by Aniruddha (1500), Yāgyavalkya (after 1500), and Vāṇikān Mahādēva (about 1500). The *Sāṅkhyasūtra* was translated by Colebrook (1820), Tasson (1820), Panthier (1830), Windischmann (1841), and with elaborate explanations by Bartholomew Sahibān (1850), and John Davies (1851); and with Gāṇḍapādīyā's comment by Wilson (1847). The *Tattva-saṁśā*, with a comment, was translated by Ballantyne (1850), and the *Sāṅkhyasūtra*, with extracts from the comment, also by Ballantyne, by Pitardward Hall, 1855. Dr. Hall treats of the history of the Sāṅkhyas literature with acuteness and good learning in his introduction to the *Sāṅkhyasūtra* (London, 1863). Recently complete translations of the *Sāṅkhyasūtra-kāṇḍa* and of the commentaries to the *Sāṅkhyasūtra* have been published by the present writer under whose edition of the text of the *Sūtra* and of Yāgyavalkya's commentary appears in Leaman's *Harvard Oriental Series* (Cambridge, 1903). By Garbe also, lately, *Die Sāṅkhyas-Philosophie*, an exhaustive treatise upon the system, its literature, history, and contents, was published at Leipzig in 1894.

The designation "enumerative philosophy" was applied to the system because of the great importance attached by the Sāṅkhyas to the establishment of their twenty-five *guṇas* and to their numerous classifications in general. The system has reference accordingly to externals and not to the essence of the system. Its fundamental doctrine is constant pessimism. Conscious life is suffering. Pleasure, the lot of comparatively few, is mixed with pain, and leads only to sorrow. This is all closely connected with the wheel of birth in the transmigration, with its horrible sequence of death after death. The cycle of birth, life, and death (*Samsāra*) has no beginning; and, for those beings who hang upon the things of this world, it has also no end. In only one way—on this point all the Indian systems are agreed—can one escape the necessity of rebirth: namely, by the recognition of the highest truth. One of the preliminaries to this recognition is a life of complete renunciation. In one other point the Sāṅkhyas agree with the general Indian view: namely, in not attempting to subvert the superstitions of the popular religion, the gods, demigods, and demons, the heavens and the hells. All these supernatural beings, however, stand, as do we, within the *Samsāra*; none they attain to the recognition of the highest truth and thereby to release from existence, they too are still under the power of death, and must keep changing their bodies; but are that on a lower plane even than the man who has attained the highest aim. There is no place in the Sāṅkhyas for an actual god (*īśvara*), who, as others suppose, created the world and sustains and governs it. The deism with which the system of such a god is denied is one of the characteristic features of the genuine early Sāṅkhyas; which accordingly, properly called atheistic (*akīrtana*).

The Sāṅkhyas recognize two eternal entities, matter and soul. The world of matter is, for the Sāṅkhyas system, in contrast with the Vedānta, real; and is derived from a final cause by a gradually philosophical method. The Sāṅkhyas doctrine proceeds from the principle that the effect is nothing else than the cause in a certain phase of development; that from the phase which is physically perceived by us the preceding phases are each to be inferred, one after another, until we arrive at a principle which has only the character of cause, and not also that of effect. The last inferable principle is the primeval material (*pralaya*), often inappropriately translated by "nature", out of which, in accordance with law, the world is evolved. The originator of the Sāṅkhyas doctrine believed that he recognized in the world of matter three substances of constituents (*guṇas*), usually and very erroneously rendered by "qualities", unequal and mingled in varying proportions; of which the first exhibits the characteristics of lightness, of light, and of delighting; the second, those of mobility, of exaltation, and of pain-causing; the third, those of heaviness, of destruction, and of stupefaction; and to which respectively he gave the names of *saṁskṛta*, *rajas*, and *tamas*. And he set up the theory that the primeval matter consisted of these three constituent substances. The undeveloped primeval matter is accordingly the condition of equilibrium of the three *guṇas*.

It is in consequence of a disturbance of this equilibrium that the world enters upon a course of development. First arises the *buddhi*, the fine substance of that internal organ to which belong the functions of determining, discriminating, and judging. From the *buddhi* proceeds the *aśubhāra*, the fine substance of that internal organ whose function it is to put things into relation to the ego or soul. Since these internal organs correspond to what we mean by the nervous system, we should say in modern phrase that the Sāṅkhyas look upon the nerve-substance as the first and finest development of the primeval matter. The *aśubhāra* produces the organs of sense and the subtle elements; from which proceed in turn the five gross elements (ether, air, fire, water, earth), that is, the visible world in all its manifoldness.

When the time of its persistence is at an end, the universe is dissolved; and in such case that each product or set of products, beginning with the gross elements and proceeding in the reverse order, resolves itself into the material cause from which it was developed. By this process of reabsorption, finally, the three *guṇas* at last attain again their original condition of equilibrium. The primeval matter is again precisely the same and in the same state as it was in the time before its evolution; and so it persists until the dawn of a new period of a new world-evolution. This cycle of becoming, existing, and passing away never had any beginning and will never have any end.

As for the physiological side of the system, it is to be observed that the higher and lower corporeal organisms—whether of supernatural beings, of men, or of beasts—are composed of like constituents and do not differ in principle. Besides the gross-material perishable body, each organic being possesses a fine or inner body (*liṅga-parika*), which, with the soul, passes from one gross body into another. The fine body is composed of the inner organs (*buddhi* and *aśubhāra*), the internal sense (*manas*), and the external senses (*indriyas*), and the five fine elements; it is not only the basis of the metempsychosis, but also the bearer of the personality, since it alone is concerned with all those conditions and processes which we term psychic. The functions of the senses and of the inner organs, perception, feeling, thinking, willing, are in the first instance, according to the Sāṅkhyas system, purely corporeal mechanical processes, and would remain unknown did not the soul (*ātman* or *parusha*), which is of purely spiritual nature, make them known by its "illuminating" power. This is the sole function of the *ātman*.

The Sāṅkhyas system—again in sharp contrast with the Vedānta—teaches that there is an endless plurality of souls, which have existed from all eternity, are individual, and yet wholly like each other. Each one of these souls by itself is all-pervasive and infinitely great, like matter; but, for the rest, essentially different from all material principles. The souls are unchangeable; are unconcerned spectators of the processes that go on whether within or without the body; are unaffected by pleasure or pain; and, albeit incapable of any activity, willing, or wishing, they yet exert by their mere presence an existent influence upon the dispensation of nature. Matter—that is, not only external

things, but also our inner organs—is likened to a dancer that executes a dance before the soul as spectator.

The purpose of the Sāṅkhya is to bring us to understand the absolute difference of the soul from matter; and, especially, even from the finest modifications of matter as exemplified in the inner organs: forasmuch as the intelligent recognition of this difference releases the soul from the bonds of matter and puts an end to the series of rebirths. And hereby is attained that absolute deliverance from sorrow which every wise man is to strive for. All other means for doing away with sorrow—because their effect is only transitory—are worthless. An offshoot of the Sāṅkhya system is the Yoga philosophy. See YOGA. R. GARBE.

Translated by C. R. LANMAN.

San Laz'zaro: a small island of the Venetian lagoons, first mentioned in the twelfth century, when a hospital for lepers was established there. After the disappearance of leprosy it was used for other hospital purposes, until the Venetian republic ceded it to Peter Mechitar and his Armenian followers who had fled before the Turks. The Armenian church and convent contain many objects of interest.

San Leandro, -lā-aan'drō: town; Alameda co., Cal.; on the S. Pac. Railroad; 9 miles S. E. of Oakland, the county-seat; 15 miles E. of San Francisco (for location, see map of California, ref. 7-C). It is in an agricultural and fruit-growing region, and has manufactories of agricultural implements and hardware, a State bank with capital of \$25,000, and two weekly newspapers. Pop. (1894) estimated, 2,800.

San Lucar de Barrameda (anc. *Ebora*): fortified port and town of Spain, in the province of Cadiz; on the Guadalquivir, near its mouth; 15 miles N. by W. of Cadiz (see map of Spain, ref. 19-C). It exports large quantities of wines and fruit. It is a popular summer resort for sea-bathing. Pop. (1887) 22,667.

San Lucas, Cape: See CAPE SAN LUCAS.

San Luis, -lōo-ees': an interior province of the Argentine Republic; surrounded by Mendoza, San Juan, La Rioja, Córdoba, and the territory of La Pampa. Area, about 18,000 sq. miles. In the north much of the surface is mountainous; the Salinas desert separates the province from La Rioja. The southern part is a plain included in the Pampas, but partly taken up by arid salines. Owing to the dryness of the climate little of the land is available for agriculture without irrigation, but cattle and sheep are raised in large numbers and exported both to Buenos Ayres and to Chili. The mountain region is rich in gold, silver, copper, graphite, etc. The inhabitants suffered greatly during the civil wars. Pop. (1892) about 100,000. San Luis, the capital, is a town of 8,000 inhabitants, on a plateau 2,502 feet above sea-level; from this point nearly the whole province and the distant Andes can be seen. It is an important station on the railway from Buenos Ayres to Chili. HERBERT H. SMITH.

San Luis Obis'po: city (incorporated in 1874); capital of San Luis Obispo co., Cal.; on the Southern Pacific Railroad; 9 miles N. of San Luis Obispo Bay, with which it is connected by railway to Port Harford, and 90 miles N. W. of Santa Barbara (for location, see map of California, ref. 10-D). It is in an agricultural, dairying, and stock-raising region, and contains 5 State banks with combined capital of \$720,000, the Academy of the Immaculate Heart of Mary (Roman Catholic), and a daily and 2 weekly newspapers. Pop. (1880) 2,243; (1890) 2,995. EDITOR OF "TRIBUNE."

San Luis Potosí: an interior state of Mexico; bounded by Coahuila, Nuevo Leon, Tamaulipas, Vera Cruz, Hidalgo, Querétaro, Guanajuato, and Zacatecas. Area, 24,446 sq. miles. In the central and northern parts there are extensive high plains included in the Mexican plateau; these are varied by mountains and hills. The eastern and southern portions are on the mountainous border of the table-land, and are exceedingly varied in scenery and climate. Agriculture is the most important industry, the principal crops being maize and wheat on the plateau, sugar-cane, cotton, and coffee in the warm valleys, and maguey, used for the manufacture of pulque and the spirituous liquor called mezcal. The mines (of silver, gold, lead, etc.) are among the most valuable in Mexico; salt is obtained from salines on the plateau. In the western part the grazing industry occupies much of the land. The manufactures are increasing in importance, and altogether this is one of the richest and most progressive of the Mexican states. Pop. (1893) estimated, 550,670; a large proportion are of Indian or mixed race. HERBERT H. SMITH.

San Luis Potosí: capital of the state of the same name; in a valley on the mountainous border of the plateau, 6,200 feet above the sea; 362 miles by railway N. N. W. of Mexico (see map of Mexico, ref. 6-G). It is regularly laid out with wide streets and numerous small squares ornamented by trees; the outskirts have so many gardens and trees that, from a distance, only the higher towers can be seen. The cathedral and many churches are richly ornamented. San Luis has a university, school of engineering, mint, etc., with considerable manufactures; it is an important railway center and has a large and increasing trade. The silver mines (discovered in 1583), which first gave importance to the place, are nearly abandoned. The climate is dry and temperate. Pop. (1892) 62,573; this includes numerous suburban villages, the city having about 40,000. HERBERT H. SMITH.

San Marcos: town; capital of Hays co., Tex.; on the San Marcos river, and the International and Gt. Northern, and the Mo., Kan. and Tex. railways; 31 miles S. of Austin, the State capital (for location, see map of Texas, ref. 5-H). It is in an agricultural region, and contains 2 national banks with combined capital of \$130,000, Coronal Institute (Methodist Episcopal, South, chartered in 1879), public-school building (erected in 1890, cost \$10,000), a U. S. fish-culture station, grounds of the Texas Chautauqua Association, water-works, electric lights, several steam-gineries and cottonseed-oil mills, an interesting group of boiling springs, and 3 weekly newspapers. Pop. (1880) 1,232; (1890) 2,335.

ISAAC H. JULIAN, EDITOR OF "PEOPLE'S ERA."

San Mar'i'no: the oldest and smallest independent republic in the world, situated in eastern Central Italy (see map of Italy, ref. 4-E). It is governed by a legislative senate of sixty members elected for life, an executive council of twelve, two-thirds of whom go out every year, and two presidents elected for six months. This has been the form of government since 1847, when the constitution was considerably changed. Area, 32 sq. miles, embracing five small villages, with a population of about 8,200. The capital, of the same name, is perched on the crest of a mountain 2,635 feet above the sea. It is said to have been founded early in the fourth century by St. Marinus, a converted stone-mason, who fled from Rimini (12 miles N.) during the Diocletian persecution. Borgo, 500 feet lower down, is the residence of the principal inhabitants. The other three villages are Serravalle, Faetano, and Monte Giardino. There is a standing army of thirty-eight officers and 950 men, and an annual revenue of about 227,000 lire. The principal products are fruit, silkworms, and wine, and there is some good pasturage. Gunpowder is manufactured. See histories of the republic by Melchiorre Delfico (Milan, 1804) and Cazeneuve (Paris, 1887).

San Martín, saan'määr-teen', José, de: general; b. at Yapeyú, Misiones (now in the Argentine Republic), Feb. 25, 1778. His father was governor of Misiones, but returned in 1785 to Spain, where young San Martín early entered the army as a cadet. He distinguished himself in the wars with France, attaining the rank of lieutenant-colonel. Meanwhile he had adopted republican ideas; in 1811 he resigned and went to London, where he was associated with Miranda and other noted Spanish-American republicans. In 1812 he and other young officers sailed for Buenos Ayres with the object of offering their services to the patriot junta of that colony. On his arrival San Martín was commissioned to organize a regiment of cavalry. This force, the Mounted Grenadiers, was distinguished throughout the war for independence. About Aug., 1812, San Martín and his friends organized the secret society called the Lautaro Lodge; this speedily became the most important political influence in the country, and most of the subsequent successes were directly or indirectly due to it. At the end of 1813 San Martín succeeded Belgrano as commander of the patriot forces in Upper Peru or Bolivia. By the reverses of 1814 the patriots were practically driven out of all the South American colonies except those in the basin of the Plata. The patriots of the Plata basin had repeatedly attempted to attack the central Spanish power in Peru by way of La Paz and Lake Titicaca, but they had always been driven back, the mountain region being unfavorable for cavalry. San Martín conceived the idea of opening a new line of attack by crossing the Andes into Chili; this scheme he was able to carry out through the support of Pueyrredon, director of Buenos Ayres, and the secret influence of the Lautaro Lodge. He drilled and organized his army during two years, and on Jan. 17, 1817, began his march with 4,000 men.

—**San Miguel**: *San Miguel*, which is 12,000 feet above sea-level, or 4,000 feet higher than St. Bernard where Napoleon made his celebrated passage. The Spaniards were defeated at Cambrón, Feb. 12, and San Miguel was occupied three days after. San Martín was immediately nominated supreme director of Chile, but declined. And the office was given to O'Higgins. On Feb. 12, 1818, the independence of Chile was proclaimed. The Spaniards, strongly reinforced from Peru, won the battle of Cancha Rayada, Feb. 19; but were again completely defeated by San Martín at Maipo, Apr. 5, 1818, their power in Chile being essentially ended. Meanwhile San Martín had been busily engaged in the second part of his great plan—the invasion of Peru by sea. A fleet was organized and placed under command of Lord Cochrane, and, after several brilliant naval exploits, San Martín's army of 4,500 men was transported to the Peruvian coast in Aug., 1820. By skilful maneuvering the Spaniards were forced to evacuate Lima, which was occupied by San Martín July 9, 1821; three weeks later the independence of Peru was proclaimed, and San Martín was chosen supreme protector. At this time another patriot army under Bolívar was approaching from the north, and Peru was threatened with a country between the two patriot leaders. San Martín generously sacrificed his own ambition to the cause. After an interview with Bolívar at Guayaquil, July, 1822, he resigned his office to the Peruvian congress (Aug. 22, 1822), and in September sailed for France; there he passed the remainder of his life in companionable poverty. D. at Boulogne, Aug. 17, 1850. The final triumph of the war was achieved by Bolívar and his generals, but the independence of South America was largely due to San Martín. See Mitre, *Vida de San Martín*; an English abridged translation by Filling, entitled *The Emancipation of South America* (1899); and *Memories of Gen. Miller* (1926). See also *La Sena e Hvos*—HARRIS H. SMITH.

San Miguel: *San Miguel*, a town of Salvador; capital of a department of the same name; in the eastern part of the republic; on the river San Miguel (see map of Central America, ref. 6-F). It is the center of a rich agricultural region (sugar, etc.). The climate is warm and insubrious. Pop. about 12,000. The San Miguel volcano, 10 miles to the S. W. of the town, is 6,000 feet high, and one of the most active in Salvador. H. H. S.

San Miguel de Allende: See ALLÉNDE.

Sanmukha, *Sanmukha*; poet; b. in Naples, Italy, July 28, 1808; educated at the academy of Pontano; traveled much, and early received great favor from King Frederick III. of Naples and secured for his poems; followed the king into exile in 1821, when he was driven from the throne by the Spaniards, and did not return until after his death. D. in Naples, Apr. 27, 1859. A collected edition of his Italian poems appeared at Padua in 1784. The last known is *Aradia Veneta*, 1802; Turin, 1896, which is a series of 515, partly in prose, partly in verse, and hence one of the earliest of prose pastiches. His Latin poems comprise *De Porta Virgilio* (1829); also *Epitheta*, 1826, *Epitheta*, and epigrams, among which is the famous poem in praise of Venice, which gained a reward of 600 ducats from the senate.

San Nicolás de los Arroyos: a town of the province of Buenos Ayres, Argentine Republic; on the river Paraná, close to the boundary of Santa Fé. It is built on a high bluff overlooking the river; is the center of a rich grazing district (cattle and sheep); and of agricultural colonies settled by Italians. There are many flouring-mills; a meat-freezing establishment, etc. San Nicolás is a port of call for ocean steamers, and is an important railway center. Pop. (1892) 25,000, and growing rapidly. H. H. S.

San Pier d'Arena, or Sampierdarena, *San-pi-er-dà-rena*; town; in the province of Genoa, Italy; occupying a narrow band about 9 miles W. of Genoa (see map of Italy, ref. 3-C). Though it is a suburb of Genoa, it has a distinct organization. The churches contain some valuable works of art, and there are some noticeable public buildings as well as private palaces. There is much commercial and manufacturing activity. Pop. (1890) 22,000.

San Rafael: town; capital of Marin co., Cal.; on the coast of San Pablo, and the N. Pac. Coast and the San Fran. and N. Pac. railways; 15 miles N. of San Francisco (for location, see map of California, ref. 7-B). It is in an agricultural, sheep, and stock-raising region at the base of Mt. Tamalpais; is a widely known resort for invalids; has hourly communication with San Francisco by two railways and by fer-

ries, and contains six churches, a public high school, San Rafael Institute (opened in 1881), St. Vincent's Male Orphan Asylum, a library, a private bank, and two weekly newspapers. Pop. (1880) 2,276; (1890) 3,290.

EDITOR OF "MARIN COUNTY JOURNAL."

San Remo: town; in the province of Porto Maurizio, Italy; 26 miles by rail E. N. E. of Nice; railway station on the line from Genoa to Nice (see map of Italy, ref. 4-B). It is picturesquely situated on a slope descending to the sea, with rich olives behind it, and surrounded by luxuriant orchards of lemons and oranges. There was an old town with steep and narrow streets. The new town is a favorite resort of invalids, for whom ample accommodation is provided, and is preferred by many to either Nice or Mentone, as being more sheltered than the former and less confined than the latter. Pop. 16,330.

San Roque, *San Roque*; town; in the province of Cadix, Spain; on the Bay of Gibraltar; 8 miles S. by W. of Gibraltar (see map of Spain, ref. 96-D). It was built by the Spaniards after the loss of Gibraltar. It produces great quantities of fruit and vegetables, in which it carries on a considerable trade with Gibraltar. Pop. (1887) 5,730.

San Salvador, or **Banza Congo**: town of the province of Luanda, Portuguese colony of Angola, Western Africa; in the basin of the Congo river; lat. 6° 29' S., lon. 14° 47' E. (see map of Africa, ref. 6-D). It is the ancient *Ambaca*, capital of an indigenous kingdom, but destroyed about 1550. In the seventeenth century it revived under Portuguese influence, and became an important center of trade and religion, but it has again fallen into decay. It is of importance only as a center for mission-work. Pop. 700, with a thinnest sort of whites. M. W. H.

San Salvador: capital and largest city of the republic of Salvador, Central America; on a branch of the river Lempa, and at the southeastern base of the national volcano of San Salvador; 2,270 feet above sea-level (see map of Central America, ref. 4-E). It was founded in 1538 and removed to its present site in 1553. This locality seems peculiarly subject to earthquakes; over sixty have been recorded in a single year, and occasionally they are very destructive. The city was more or less completely overturned in 1575, 1593, 1625, 1636, 1708, and 1809. On Apr. 16, 1854, it was reduced to a heap of ruins by a succession of severe shocks. An attempt was then made to found a new capital at Nueva San Salvador, 9 miles distant; but the old city, having been rebuilt, regained its supremacy, and was again destroyed, with the neighboring villages, Mar. 19, 1878. As rebuilt, all the houses and public edifices are low and surrounded by wide grounds; the cathedral and many other buildings are of wood. San Salvador has a university, national palace, normal college, national theater, etc. It is the center of a rich agricultural district, and has a thriving trade. Pop. with the suburbs, about 35,000; of the city proper, about 25,000. Its port is La Libertad, connected with it by a road which is possible for carts only during a part of the year; a railway is projected. HARRIS H. SMITH.

San Salvador Island: See BAHAMA ISLANDS.

Sans-Culottes, *san k'ul'ot* [=Fr., *liter.*, without breeches; *sans*, without + *culotte*, breeches]: a name bestowed early in the first French Revolution upon the lower classes of the populace from the fact that they wore pantaloons instead of knee-breeches, the latter garment distinguishing the dress of the bourgeoisie and nobility.

San Sebastián: capital of the province of Guipuzcoa, Spain; on a peninsula in the Bay of Biscay, surrounded with strong walls and defended by a citadel (see map of Spain, ref. 12-G). Its harbor, though not safe, is frequented by large vessels. A large import trade in French and English goods is carried on, and during the summer the town is much resorted to as a watering-place. Pop. (1887) 29,047.

San Severo: town; in the province of Foggia, Italy; 18 miles by rail N. W. of Foggia and 141 N. E. of Naples (see map of Italy, ref. 6-F). The district is fertile in grain and fruit, and not lacking in pasturage. The town, of mediæval origin, has suffered severely from earthquakes on several occasions. Pop. 20,880.

Sanskrit Language: the literary language of the Aryan inhabitants of India. Two principal reasons have led to its study: the intrinsic interest attaching to the very extensive Sanskrit literature, which reveals the thought and life of a large and highly endowed part of the human race; and,

second, the fact that, of all the Indo-European languages, the Sanskrit has, on the whole, best conserved the pristine features of their common parent-speech—a consideration appealing with especial force to most of the cultivated European races, inasmuch as their languages are descended from this parent-speech. The application of the comparative method to the study of genetically related tongues is due in largest measure to the study of Sanskrit, which has thus proved to be the most important factor in the revolutionizing of some parts of classical philology and in the creation of Germanic philology. Moreover, with the broadening of the conception of philology, the conception of comparative philology has also grown broader; instead of being confined to phonology and to the morphology of word and of sentence (comparative grammar), it includes the whole intellectual life of a people, as that life is manifested not only in its language, but also in its literature, its antiquities, its customs and laws, its religion, its philosophy. These subjects when treated comparatively form chapters of comparative philology; and these are the very subjects which receive and are yet to receive especial illumination from ancient India.

The languages of India may be divided primarily into Aryan and non-Aryan (see *Ethnology* under INDIA, and especially DRAVIDIAN LANGUAGES, and Constable's *Hand Atlas of India*, plate 10); the Aryan constitute, with the IRANIAN LANGUAGES (q. v.), the Indo-Iranian group of the Indo-European family of languages. For the relation of this group to the others, see INDO-EUROPEAN LANGUAGES. The Aryan languages of India show three principal stages of development: (1) Old Indic or Sanskrit; (2) Middle Indic or Prākṛit (see PRĀKRIT LANGUAGES); and (3) New Indic or Bhāṣā. The old Indic belongs locally to the Punjab and the Indo-Gangetic plain. The name Sanskrit is applied to the ancient and sacred language of India, the tongue in which the Vedas, Brahmanas, Upanishads, epics, etc., are written. It is difficult to say just how long it was a true vernacular; but, under the influence of learned writers and grammarians, it has maintained for 2,000 years a more or less artificial existence as a means of communication, spoken and written, for the learned of India. The word Sanskrit is a Sanskrit word meaning "elaborate," and it doubtless connotes a certain antithesis to Prākṛit, which means the "ordinary" or "vulgar" (idioms). It is in its broader sense that the term Sanskrit is applied to the language of the widely different periods of Sanskrit literature; in a narrower sense, it is often used as the equivalent of "classical Sanskrit," the language of the later classical works as distinguished from the archaic dialects of the Veda and Brahmanas.

There is, properly speaking, no Sanskrit alphabet. The Hindus of the different parts of India write the language usually each in his own vernacular alphabet. The alphabet which prevails in Hindustan proper is the one called *Nāgarī*, or *Devanāgarī*; and this, of all the Indic alphabets, is the one adopted by Occidental editors of Sanskrit works. It is written from left to right. Alberuni (in his *India*, written about 1030 A. D., chap. xvi.) mentions among the principal alphabets the *Nāgarā* of Malwa. *Nāgarā* means "of the city," and refers perhaps to the very famous city of Ujjain, once the capital of Malwa. The alphabet is probably derived from a Semitic source. By far the most important discussion of this subject is that of G. Bühler, *Indian Studies*, No. 3 (Vienna, 1895).

The system of sounds, in the native order of arrangement, is as follows: Vocalic: *a, ā, i, ī, u, ū, ṛ, ṝ, l, e, ai, o, au*; the breathing *h* and nasalization *ṁ*; consonantal:

Mutes.	Surd.	Surd asp.	Sonant.	Son. asp.	Nasal.	Semi-vowels.	Sibilants.
Guttural	<i>k</i>	<i>kh</i>	<i>g</i>	<i>gh</i>	<i>ṅ</i>	..	..
Palatal	<i>c</i>	<i>ch</i>	<i>j</i>	<i>jh</i>	<i>ñ</i>	<i>y</i>	<i>ç</i>
Lingual	<i>t</i>	<i>th</i>	<i>d</i>	<i>dh</i>	<i>n</i>	<i>r</i>	<i>ṣ</i>
Dental	<i>t</i>	<i>th</i>	<i>d</i>	<i>dh</i>	<i>n</i>	<i>l</i>	<i>s</i>
Labial	<i>p</i>	<i>ph</i>	<i>b</i>	<i>bh</i>	<i>m</i>	<i>v</i>	..

and the sonant guttural aspirate *h*. The vowels are written with different characters according as they are long or short. The *a, i, and u* vowels are pronounced as in Italian, save that the short *a* has the value of the neutral vowel in *but*. The *ṛ* is like the common English *l*-vowel in *ankle*, and the *r*-vowels are simply untrilled *r*-sounds with vocalic value in syllable-making. Of the mutes, the unspirated surds and sonants and the nasals of the guttural, dental, and labial series are familiar: the surd aspirates *kh, th,*

ph are like the simple surd with following breathing, as in *blockhead, pot-hook, uphill*; and the sonant aspirates are rendered in practice as in *abhor*, etc., though their strict value is matter of question. The whole palatal series is secondary, and derived by modification of original gutturals (see PALATALIZATION: pronounce *c* and *j* as in *dolce, jar*). The linguals are pronounced with the tip of the tongue reverted upward to the dome of the palate. A most striking peculiarity is the prevalence of the *a*-sounds, which make up over one-quarter (28 per cent.) of all the sounds of any ordinary piece of text. And since original *e, o, and a* (cf. *ददार्का = dadārka*), often also vocalic *n* and *m*, have all been leveled in Sanskrit to one uniform *a*, it is not strange that short *a* aggregates about one-fifth of all Sanskrit sounds. The word-accent is a pitch-accent, not a stress-accent. For the phonetic relations of Sanskrit to the parent-language, see Brugmann's *Comparative Grammar of the Indo-Germanic Languages*.

For the phonetic changes of the language, reference must be made to the grammars. Several general statements may be made, however: hiatus is avoided; when a surd is concurrent with a sonant, either the surd is changed to a sonant or else the sonant to a surd (assimilation, regressive or progressive); consonant groups are abbreviated. The laws of phonetic combination (*samdhī*) wear indeed an artificial aspect in the classical period; yet even there the *rationale* of many or most of them is discernible; and in the Vedas the case is quite otherwise, and the *samdhī* quite simple.

As for morphology, the Sanskrit surpasses, on the whole, all the cognate tongues in transparency of structure, thus contrasting sharply with the Latin, which has been likened, morphologically, to "a venerable ruin." Its words invite analysis and are, for the most part, easily analyzable into roots, suffixes of derivation, and inflectional endings. This feature of the language is exhibited incidentally with wonderful clearness and completeness by Whitney in his *Roots, Verb-forms, and Primary Derivatives of the Sanskrit Language* (Boston, 1885). The Sanskrit roots come nearer in form and meaning to their Indo-European prototypes than do the roots of any other of the related languages. It was this conservation of old material, coupled with its surpassing transparency of structure, that made the study of Sanskrit so fruitful in results and so suggestive of new and rigorous methods to be pursued in etymologizing and in the science of language generally.

In the noun three numbers, singular, dual, and plural, are distinguished; and the dual is actually used probably to a larger extent than in any other Indo-European language. There are the usual three genders, the feminine themes ending prevalently in a long vowel. The cases are eight: nominative, accusative, instrumental, dative, ablative, genitive, locative, and vocative; and their proper uses are so precisely like those of the Indo-European case-system that it suffices, in lieu of a general description of them, to refer to INDO-EUROPEAN LANGUAGES. The declension of adjectives is essentially the same as that of substantives. The pronouns are of course of three persons, and except in the first and second persons show three genders. Their inflection is peculiar, but offers striking parallels to the facts of the cognate tongues (with *sa-s, ā, ta-d*, cf. *ṣ, ṛ, rō*, Ang.-Sax. *se, seō, dæ-t*; with *i-d*, cf. Lat. *i-d*, Eng. *i-t*). The numerals agree well with those of the parent-speech (thus *tri* = three; *nava* = nine). See INDO-EUROPEAN LANGUAGES.

The verb shows, as in Greek, etc., the distinctions of voice, tense, mode, number, and person. The voices are active and middle. In the present system there is a special passive inflection; elsewhere the middle serves also as passive. There are four tense-systems, present, perfect, aorist, and future. The modes are indicative, subjunctive (mostly Vedic), optative, and imperative. There are three numbers and three persons. There are also secondary conjugations, passive, intensive, desiderative, and causative. Most important is the distinction between verbs without the thematic *a*-vowel and verbs with it (*-mu* verbs and *-va* verbs). The retention of ancient accentual conditions is very remarkable, and in general the whole system of conjugation casts floods of light upon innumerable inflectional forms of the related languages.

The syntax is very bald and simple: partly because of the ample number of case-forms for the expression of all the most important logical relations; and partly because, in the case of the verb, although there is an abundant wealth of mode and tense forms, the Hindus never came to turn them to account, as did the Greeks, for the nice expression of modal and temporal relations.

The most comprehensive historical grammar is W. D. Whitney's *Sanskrit Grammar, including both the Classical Language, and the Older Dialects, of Veda and Brāhmaṇa* (2d ed. Boston, 1896). The Vedic prose-inflections have been fully treated by Lammann, *Journal of the American Oriental Society*, x, 225-501. The verbs are treated with great completeness in Whitney's *Roots, Verb-forms, etc.* For the nouns, see J. H. Speyer's *Sanskrit Nouns* (Leyden, 1890). The best dictionary is the great Sanskrit-German *Wörterbuch* of Böhtlingk and Roth (2 vols., St. Petersburg, 1852-75). Of more moderate size and cost, and yet comprehensive, are the Sanskrit-English dictionaries of A. A. Macdonell (New York, 1900), and Carl Cappeller (Köten, 1901). There is a *Sanskrit Grammar for Beginners*, by Max Müller, abridged by Macdonell (New York, 1896). Lammann's *Sanskrit Reader with Vocabulary and Index* (Boston, 1895) is a companion volume to Whitney's grammar, and is made with especial regard for the needs of such as study the language without a teacher. For comparative study may be recommended Victor Henry's *Short Comparative Grammar of Greek and Latin* (New York, 1890). An English manual in which Sanskrit is made the primary subject, to be illuminated by the related tongues, is a desideratum; such a work has appeared in Dutch, C. C. Uhlenbruch's *Handboek der Indische Kerkleer, in vergelijking met de der Latijnsche Kerkleer* (Leyden, 1894).

CHARLES R. LAMMANN.

Sanskrit Literature: one of the several bodies of literary products of ancient India. (Compare PILA and PRAKARTI.) In its broader sense, the term Sanskrit literature includes the Vedas (which are the oldest literary monuments of any part of the human race, the Indo-European family) and the post-Vedic literature. In its narrower sense, it means post-Vedic literature only. The latter terminus of the post-Vedic period is not clearly definable; indeed, literary works were written in Sanskrit all through the Middle Ages, and are still so written even to-day. Aufrecht's *Katalogus Catalogorum*, an orderly assembling of the contents of the various catalogues of Sanskrit manuscripts, enumerates more than 20,000 titles of Sanskrit works. This great quantity is of measurable variety in style and contents. In quality it is, upon the whole, distinctly inferior to the Greek. Nevertheless, the Vedas have a very high degree of importance from the light they shed on the history of religions; the *Itihāsa-sūtras* are of great interest to the student of ancient antiquities; the *Dharma-sūtras*, to the student of the history of law; the *Upanishads* and their sequels, to the student of the history of philosophic speculation; the *śaśtras*, to the student of popular tales; the critical history of the epics illuminates many aspects of the problems concerning the genesis of popular epics; the Hindu dramas are interesting both in themselves and often on account of their relations to the legendary material on which they are based; and the grammar, rhetoric, music, medicine, mathematics, and astronomy of the Hindus, like their philosophic speculations, may no longer be ignored by writers upon the history of the several sciences.

The history of Sanskrit literature is divided into two periods, the Vedic period and the classical period. These names, as is elsewhere often the case. But in all this history there is very little like a fixed chronology. The Hindus are the antipodes of the record-loving Egyptians, as indeed we might expect from the Indic views of life that go with the popular belief in transmigration and with pessimism. On the other hand, it is possible to determine the relative age of very many works, and this relative chronology offers many interesting and not insoluble problems.

3. **THE VEDIC PERIOD.** 1. *Mantra*.—The Sanskrit word *mantra* means "knowledge," and especially the "sacred knowledge," handed down in the triple form of *ṛc*, *sāman*, and *yajus*, and including the well-known collections called *Rig-veda*, *Sāmaveda*, and *Yajurveda*, which bodies of text are often ascribed to be the triple *vidyā*, or "triple knowledge." *ṛc* is a hymn of praise, and especially a stanza of praise that is spoken as distinguished from one that is sung (*sāman*), or from a sacrificial formula (*yajus*). The Hindus hold that the Vedas have existed from all eternity and survive the mortal fluctuations of the universe, and that they have no human authors, but are "seen" by the Rishis or "seers," to whom they are from age to age "revealed." The *Ātharvaveda* is of later date and randomness than the others. These four collections, called *śaśtras*, consist of sacred texts, mostly poetical, called *mantras*. They embody only a part of the great mass of Mantra material which originated and

was handed down by memorial tradition, orally from generation to generation long before the existence of the collections. Of the Mantras not now extant in any collection we find remnants scattered about in various books. To each of these collections is attached a body of subordinate works called *Brāhmaṇas*, and yet another of works called *Sūtras*. A cross-division is thus involved, so that the oldest Indic books are classed, first, according to the Veda to which they belong, and, second, according to their character as Mantra, Brāhmaṇa, or Sūtra.

2. *Brāhmaṇas, Upanishads*.—The Brāhmaṇas are the oldest Indo-European monumental prose extant. In the texts of the old Yajus Saṁhitās the sacred formulas are mingled with prose passages, explanatory, prescriptive, and legendary. A single such passage is a *Brāhmaṇa*, "the dictum of a *brāhman* or priest," "a priestly discourse." The separate collections of Mantras naturally suggested a similar treatment of these priestly discourses. Such a collection of discourses is itself also called a Brāhmaṇa, and is practically a compendium of the wisdom of a priestly school. The older Brāhmaṇas contain descriptions of the sacrificial ceremonies, accounts of their origin, and legends to illustrate their efficacy. Conscious philosophic speculation plays a subordinate part. In the later Brāhmaṇas the descriptions of the ritual are relegated to systematic treatises; the theosophic and philosophic passages become, with the growth of asceticism and hermit-life, more lengthy and important, and receive—as containing matter appropriate for the meditations of the forest-hermits—the special name of *Āraṇyaka*, or Forest-treatises, and *Upanishads*. From the hand of O. Böhtlingk are the best editions of the two most important Upanishads: the *Ithāsa-āranyaka-upanishad* (St. Petersburg, 1880); and the *Chāndogya-upanishad* (Leipzig, 1880), both in text and in German translation. Vols. i. and xv. of Max Müller's *Sacred Books of the East* contain versions of the principal Upanishads. W. D. Whitney translated the *Kaṭha-upanishad* (*Transactions of the American Philological Association*, 1890, vol. xxi.).

3. *Sūtras*.—The Brāhmaṇas presuppose a thorough acquaintance with the details of the sacrifices. When the ceremonies had grown to tremendous length and complexity, it became necessary to have systematic treatises for the use of the celebrants. Such works are the "Rules for the Sacrifices" or *Gṛantha-sūtras*, so called because they stand in intimate relation to the Veda or "sacred texts" (*grāṇi*) and continually cite these texts, and serve as rules to them, prescribing the manner and the occasions of their employment with the various ceremonies.

Usage and observance, crystallized into sacred ceremony, invest the whole life of an Aryan Hindu—nay, even his prenatal and post-mortem existence. The books that describe these observances are called *Gṛhya-sūtras*, or "Rules of Domestic Usage." Vols. xxix. and xxx. of the *Sacred Books* contain translations of the most important ones. The proper subjects of these rules are the "sacraments" (*samskāras*—such as name-giving, investiture with the sacred cord, marriage) and the "simple sacrifices" (*pāka-yajñas*) of the householder.

There is a third class of Sūtras, called *Dharma-sūtras*, which prescribe rules for the everyday life of these who would conform to the example of the virtuous, and of which the legitimate subjects are much more varied than those of the *Gṛhya-sūtras*. They embrace all sorts of injunctions and restrictions relating to etiquette, to eating and sleeping, to purification and penance, and to the details of the daily life of the student and householder and hermit, and even extend to the duties of the king and to the beginnings of civil and criminal law. The most important Dharma-sūtras are Englished in vols. ii. and xiv. of the *Sacred Books*. Out of these were developed the *Dharma-pātras* or metrical law-books like those of Manu (q. v.).

These Sūtras embody the *Kalpa* or "ceremonial," and constitute one of the six classes of works which have to do either with the conservation and interpretation of the Vedic texts or else with their practical application; and they are accordingly styled *Vedāṅgas*, "limbs or members of the Veda." Their names are enumerated in the memorial verse,

śikṣā kalpa vyākaraṇaṁ nirukṭhi dhanda jyotiṣam,

that is, "phonetics, ceremonial, grammar, etymology, metrics, astronomy." The above are the principal general divisions of the Vedic literature.

4. The *Rigveda* is, of the several collections, the most im-

portant. It consists of 1,017 hymns, each containing on an average about ten double lines, so that the text is somewhat less than that of the two Homeric poems together. Its more significant division is into books, hymns, and stanzas (*maṇḍala, śukta, ṛc*). There are ten books. Of these, books ii.-viii. are called "Family-books," as containing each the hymns ascribed to a single family or clan in which they doubtless originated and by which they were handed down as a sacred inheritance. Thus book iii. contains the hymns of Viśvāmitra and his tribe; book vii., those of Vasishtha; and so on, the names being those of the most famous sages or eponym heroes of Indic antiquity. The hymns of book ix. are addressed to the deified drink Soma. The tenth comprises hymns ascribed to very different authors, while the first consists of fifteen groups, each attributed to some ancient poet-sage. The soma is the juice of a plant believed to be of the milkweed family, and now classed as *Sarcostemma brevistigma*; and the Soma sacrifice appears to have been an exceedingly important feature of the Vedic religion. Certain principles of arrangement within the books are discernible: thus in books ii.-vii. the hymns to the fire-god Agni (*agnis*) come first; then those to Indra, the Jupiter Pluvius; and so on. The oldest hymns may have originated as early as 1200 or 1500 B. C., but it is not feasible to assign a precise date. Geographically, the early Vedic Aryans may be referred to the land of the Punjab and Indus. Their religion is a worship of the anthropomorphized forces of nature, and is in many ways most instructively primitive. The best works on this subject are E. W. Hopkins's *The Religions of India* (Boston, 1895) and H. Oldenberg's *Die Religion des Veda* (Berlin, 1894).

The Brāhmanas of the Rigveda are the *Āitareya* and the *Çāṅkhāyana* or *Kāṇḍikā*; and each of these is supplemented by an Aranyaka of similar designation; and part of each Aranyaka forms an Upanishad (translated, *Sacred Books*, vol. i.). To this Veda further belong Aṅvalāyana's *Çrāuta-sūtra* and *Çāṅkhāyana's Çrāuta-sūtra*, both edited in the *Bibliotheca Indica* (Calcutta); and also Aṅvalāyana's *Grhya-sūtra* and *Çāṅkhāyana's Grhya-sūtra*, edited and translated, the first by A. F. Stenzler, and the second by H. Oldenberg.

5. *The Sāmaveda* is a Veda of *sāman*. A *Sāman* is properly a tune, not a text; but the word *sāman* came to be used of the text to which a given tune was sung, a stanza of the Rigveda modified for chanting. Of the 1,549 stanzas of the Sāmaveda (edited and translated by T. Benfey, Leipzig, 1848), 1,474 occur also in the Rigveda.

6. *The Black Yajurveda* belongs to the period of the highly developed ritual. At least five schools of the older Yajurveda possessed special Sanhitās, of which four are extant. Of these, the *Taittiriya* has been published by A. Weber (Berlin, 1872) and the *Maitrāyaṇiya*, by I. von Schröder (Leipzig, 1881-86). In all these older texts sacred formulas are confusedly mingled with prose passages. To remedy this confusion a new school, called Vājasaneyins, arranged a Sanhitā of "clear formulas," that is of formulas clear of Brāhmana passages. The word for "clear" (*śukla*) means also "bright" or "white"; and it is perhaps with reference to this double meaning that the older Yajus texts were called "Dark" or "Black." The Brāhmana of the White Yajurveda or *Vājasaneyi-Samhitā* is the *Çatapatha*, much of which has been Englished by J. Eggeling, *Sacred Books*, vols. xii., xxvi., and xli. *Samhitā, Brāhmana*, and *Çrāuta-sūtra* (Kātyāyana's) have all been published by A. Weber (Berlin, 1852-59).

7. *The Atharvaveda* Sanhitā, as compared with that of the *Rigveda*, represents a lower plane of life and thought. It contains magic incantations for the warding off of the most diverse malign influences, and prayers and charms for success in the various affairs of life, as love, gaming, quarrels, journeys, etc. The text was published by Roth and Whitney (Berlin, 1856), and Whitney has left the manuscript of a translation, in course of publication (1895) in Lanman's *Harvard Oriental Series*.

8. *Vedic Bibliography*.—The first complete edition of the *Rigveda* was issued by T. Aufrecht in Roman letters (Berlin, 1861-63; 2d ed. Bonn, 1877). Max Müller's great six-volumed quarto edition, in Nāgarī letters, with native commentary, etc., was begun in 1849 and completed in 1874 (London). A new edition of this in four volumes quarto was issued in 1892 (London). Octavo editions, also in Nāgarī, were issued by Müller in 1873 and 1877. The greatest achievements in Vedic exegesis are those made by Roth, and contained chiefly in the St. Petersburg lexicon. H. Grass-

mann has published a *Wörterbuch zum Rigveda* (Leipzig, 1875), and a complete translation (Leipzig, 1877). For a succinct sketch of the Vedic literature, with numerous references to other sources of information, see A. Kaegi's *Rigveda* (Englished by R. Arrowsmith, Boston, 1886), notes 1-26, or Lanman's *Sanskrit Reader*, pp. 352-59.

B. THE CLASSICAL PERIOD. 1. *Epos*.—The most important works of this period are the great epics. These are treated separately. See MAHĀ-BHĀRATA and RĀMĀYANA.

2. *The Purāṇas*.—These are pseudo-historical works, often in prophetic tone, and in metrical form. Their name means "old," but the extant Purāṇas are held to be not over a thousand years old. The *Bhāgavata-Purāṇa*—or most of it—was published and translated by E. Burnouf (Paris, 1847). Of the *Viṣṇu-Purāṇa*, H. H. Wilson gave an analysis and translation (2d ed., enriched with notes, by Fitzedward Hall, 6 vols., London, 1864-77). Of this and other Purāṇas, as the *Agni-Purāṇa*, the *Mārkaṇḍeya-Purāṇa*, there are cheap Hindu editions. The *Viṣṇu* treats of the evolution and dissolution of the universe, of the *yugas* or ages, of mythical geography, the heavenly bodies, and the origin of the castes; gives many ancient legends, accounts of the Vedic literature, the dynasties of kings, the history of the god Krishna, etc. The Purāṇas are in fact a kind of encyclopædic digest of Indic knowledge, but in many ways quite untrustworthy.

3. *The Artificial Epics*.—These are called *Kāvya*, and the oldest are referred to the fifth or sixth century of our era. They take their material from the great popular epics, but can never themselves have been popular, since only the learned could understand them. In them the epic element gives place more or less to the lyric and descriptive, and they are often not without real poetic merit and genuine feeling. There are six of them that the Hindus call "great Kāvya"; and among the six the most noted are the *Raghuvamśa*, or "The Ancestry and Deeds of Rāma," and the *Kumāra-sambhava*, or "Birth of the War-god," both ascribed to the famous Kālidāsa, and both edited and translated by A. F. Stenzler, the latter translated also by R. T. H. Griffith into English verse. See especially the masterly fifth canto.

4. *The Drama*.—The real beginnings of the drama may be seen in the *Rigveda*, where there are not a few hymns in the form of genuine dramatic dialogue. In the *Mahābhārata*, too, are passages of similar character. And the public recitations of the epics were in fact really dramatic performances. The earliest direct allusion to this subject is made by Pāṇini, probably in the fourth century B. C., who speaks of "rules for actors" (*nāṭa-sūtras*). The word *nāṭa*, with many derivatives, including *nāṭya*, Anglo-Indian *nauteh*, and *nāṭaka*, "drama," comes from the root *nāt* or *nṛ*, "to dance," and perhaps warrants the inference that the Hindu drama originated in pantomime. From the statement of Patanjali (about 143 B. C.), who mentions the slaying of Kansa by Krishna as a subject of dramatic representation, it would seem that the oldest performances were of a kind like to the mediæval mysteries. There has been much debate (A. Weber, E. Windisch) as to whether the Greek drama influenced that of the Hindus. The question is unsettled. The Hindu play is divided into acts, with benediction in place of a prologue, with prelude and with interacts; and it is peculiar in that the women and inferior characters speak not Sanskrit but Prākṛit. The dialogue is in prose, with lyrics interspersed. Lévi enumerates the titles of some 375 dramatic works; of the extant dramas hardly more than fifty are of considerable literary value.

The *Mṛcchakaṭikā*, or "Earthen Toy-cart," is held to be the oldest. It is ascribed to King Çūdraka, and the scene is laid at Ujjain. It is a love-story with political underplot. The Sanskrit work most famous as literature is the *Çakuntalā* of Kālidāsa (about 550 A. D.). For this and his dramas *Vikramorvaç* and *Mālarikā*, see KĀLIDĀSA. To Çri Harshadeva—apparently the King of Kanauj at the time of HUYEN-TSANG (q. v.), about 630 A. D.—are ascribed the *Ratnavali* and the *Nāgānanda*. Bhavabhūti is said to have flourished at this same court of Kanauj about 700 A. D. He was author of the *Mahāvīra-carita*, or "Life of the Great Hero," and *Uttara-rāma-carita*, or "Later Life of Rāma," which together form a dramatized version of the *Rāmāyana*, and of the *Mālatī-mādhava*, a domestic drama. These are held in high esteem by the Hindus, but Bhavabhūti, as compared with Kālidāsa, is more artificial, more unboundage to the rules of the writers on dramatic composition. Bhaṭṭa Nārāyaṇa's *Veṇī-samhāra*, or "The Seizing of the

to him as emperor; but later he went over to the republicans, and by heading a revolt at Vera Cruz Dec. 2, 1822, was the chief instrument of Iturbide's downfall. During the presidency of Guadalupe Victoria, 1824-28, Santa Anna lived in retirement; but the political struggles of 1828 brought him again into prominence. By a pronunciamento in favor of Guerrero he materially aided him to attain the presidency, and was rewarded by high commands in the army. In 1829 he was sent against the Spanish army, which had invaded Mexico under Gen. Barradas; the latter was forced to capitulate at Tampico Sept. 11, and this success added immensely to Santa Anna's popularity. In 1832 he headed the revolt by which Bustamante was overthrown and Gomez Pedraza, the constitutional president, was restored for the remainder of his term. Santa Anna himself became a presidential candidate, and was elected for the term beginning Apr. 1, 1833. He assumed the executive only at intervals and for short periods. At first the chair was occupied by Vice-President Gomez Farias, an enlightened statesman who instituted many reforms. These excited violent opposition in the Church and army, secretly fomented by Santa Anna, who, whenever he acted as president, posed as the champion of religion and order. By such intrigues he obtained the support of the reactionists, had Farias banished in 1835, abolished the federal constitution, and became practically dictator, though commonly acting through vice-presidents who were his subservient tools. Texas seceded in 1836. Santa Anna marched against the rebels, stormed the Alamo, and massacred its garrison Mar. 6, 1836, but was defeated and captured by Houston at the battle of San Jacinto Apr. 21-22. To obtain his release he recognized the independence of Texas in a treaty which was repudiated at Mexico; all his popularity was lost, and when he returned to Jalapa he signified his intention of retiring to private life. The French invasion of Vera Cruz in 1838 brought him out again; he was given command of the army, defeated the French Dec. 5, and, having lost a leg in the engagement, became at once a popular hero and martyr. In 1839 he supported Bustamante against the federalist revolts, and was for a short time acting president. In 1841, partly by intrigue and partly by open rebellion, he deposed Bustamante and caused himself to be chosen president with dictatorial powers, increased by the new constitution of June 12, 1843. This led to fresh revolts. In Dec., 1844, his opponents seized the capital during his absence; he was defeated, captured, and banished, taking up his residence in Havana. Fresh changes brought his party again into power; he was recalled in 1846, and in December of that year was again elected president, but, as usual, only assumed the executive at intervals. During the war with the U. S. he commanded the Mexican army, and was repeatedly defeated by Taylor and Scott (see TAYLOR, ZACHARY, and SCOTT, WINFIELD); after the capture of Mexico he resigned and left the country. In 1853 he was recalled by a conservative revolution, was made acting president, and on Dec. 16, 1853, declared himself perpetual dictator, with the title of supreme highness. But the liberals, under Alvarez and Comonfort, speedily excited a civil war. After a vain attempt at conciliation Santa Anna fled from the capital Aug. 9, 1855, and soon left the country. In his absence he was tried and condemned for treason and his estates were confiscated. He was never again prominent in Mexican affairs, though he kept up a series of intrigues in the U. S. and elsewhere, and vainly offered his services to the French invaders and to Maximilian. In 1867 he made an attempt to enter the country, but was captured and exiled. After the amnesty of 1874 he returned, but lived in obscurity. D. at Mexico, June 20, 1876. HERBERT H. SMITH.

Santa Barbara: city; capital of Santa Barbara co., Cal.; on Santa Barbara channel, and the S. Pac. Railroad; 14 miles E. of Elwood (for location, see map of California, ref. 11-D). There is regular steamer communication with San Francisco, San Diego, and San Pedro. Santa Barbara is in a sheltered nook of the shore, is protected on the N. by the Santa Ynez Mountains, and from its dry, equable climate has become one of the most noted midwinter health resorts on the Pacific coast. The temperature ranges from 50° to 55° in winter, and from 65° to 70° in summer. The city has beautiful surroundings, with luxuriant roses and tropical plants, many attractive residences, a Spanish and a Chinese quarter, and an excellent bathing-beach. There are a public high school, primary and grammar schools, St. Vincent's School, manual-training school, free kindergarten, collegiate school, commer-

cial college, College Hospital, 2 national banks with combined capital of \$200,000, 2 State banks with capital of \$60,000, 3 libraries (Public, Franciscan Mission, and Natural History), and 2 daily and 3 weekly newspapers. The Spanish Mission, founded by Junipero Serra in 1786, is within a mile of the city; it includes a church with two towers, a refectory, a dormitory, and a garden, and is still in charge of Franciscan monks. Other points of interest are the springs containing sulphur, sulphuretted hydrogen, iron, alumina, and potash; the Parra Grande, or great grapevine, which annually yields about 8,000 lb. of fruit, at Montecito, 4 miles distant; and numerous avenues of magnolias, bananas, and date-palms, fields of pampas grass, groves of walnut, orange, prune, olive and loquat trees, and interesting Chinese vegetable gardens. The city is in an agricultural and stock-raising region, and has large wool, olive oil, asphaltum, petroleum oil, and fruit-growing interests. It has received the popular name of the American Mentone. The harbor was first visited by Sebastian Vizcaino in 1603. The presidio established by Gov. Felipe Neve in 1782 was maintained till the arrival of Gen. Frémont. Pop. (1880) 3,460; (1890) 5,864.

G. E. THURMOND.

Santa Catharina: an island of the state of Santa Catharina. It is 34 miles long by 3 to 5 miles wide, and is separated from the mainland by a channel which forms an excellent harbor. The surface is partly hilly. On the western side is the capital of the state, sometimes called Santa Catharina, but properly DESTERRO (q. v.). H. H. S.

Santa Catharina: a maritime state of Brazil, bounded by Paraná, the Atlantic, Rio Grande do Sul, and the Argentine Republic. Area, 28,627 sq. miles. A low coast belt lies between the ocean and the Coast Range, which here rises to 5,000 or in parts to 6,500 feet. This range is succeeded by an irregular plateau which falls gradually westward. The coast belt and mountains are covered with forest, araucaria predominating above 3,000 feet. The plateau is occupied in part by open grass-lands, in part, especially toward the W., by tracts of forest. The principal rivers are the Pelotas or upper Uruguay, on the southern boundary; the Iguassú, a branch of the Paraná, on the northern boundary; and the Itajahy, flowing to the Atlantic. The climate is essentially tropical on the coast, temperate on the plateau. Santa Catharina, though it has a fertile soil and other natural advantages, has developed very slowly. Agriculture and grazing are almost the only occupations. There are considerable agricultural colonies of German and Italian immigrants. A little coal is mined. Pop. (1888) estimated, 236,346. H. H. S.

Santa Clara: town (founded in 1852, received new charter in 1867); Santa Clara co., Cal.; on the S. Pac. Railroad; 3 miles W. by N. of San José, and 48 miles S. E. of San Francisco (for location, see map of California, ref. 8-C). It is in the center of the beautiful and rich agricultural valley from which the town takes its name, and contains a State bank with capital of \$125,000, a public high school, Santa Clara College (Roman Catholic, opened in 1851), Academy of Our Lady of Angels (Roman Catholic), convent school, a library, and two newspapers. The University of the Pacific (Methodist Episcopal, opened in 1852) is about midway between Santa Clara and San José. Pop. (1880) 2,416; (1890) 2,891; (1895) estimated, 3,000. EDITOR OF "JOURNAL."

Santa Cruz, or St. Croix: an island of the Danish West Indies; in the Virgin islands group; 37 miles S. of St. Thomas. Area, 83 sq. miles. The surface is hilly, with considerable plains near the coast; the soil is fertile and well watered. Sugar and rum (known as Santa Cruz rum) are the principal products and exports. The common language is English. Santa Cruz was discovered by Columbus in 1493, was occupied in turn by Spanish, English, and French adventurers, and was sold by the French to a Danish company in 1733. Chief town, CHRISTIANSTED (q. v.). H. H. S.

Santa Cruz: a territory of the Argentine Republic; occupying the southern part of Patagonia S. of lat. 46° S., and bounded S. and W. by Chili. Area, 111,000 sq. miles. The greater part is a terraced plateau, which, especially near the Andes, contains good pasture-land. Some of this has been taken up by sheep-farmers, but the civilized population does not exceed 2,000. There are a few roving Indians, who sell guanaco-skins to the traders. Capital, Gallegos. The Santa Cruz river, from which the territory takes its name, has its sources in several beautiful lakes on the western slope of the Andes; it is navigable for small craft, and its estuary forms the port of Santa Cruz. H. H. S.

Santa Cruz: an eastern department of Bolivia, bordering on Brazil. Area, 196,017 sq. miles. Spurs of the Andean chain rise in various places, occupying a comparatively small area in the western part; all the rest is a plain, level only by a few hills and including in the eastern part portions of the floodplains of the great Paraguay, which flow past beyond the frontier. Most of the drainage, however, is toward the Amazon and Uruguay. The plains have few inhabitants except Indians and are very imperfectly tilled. They include considerable tracts of forest and great areas of open land known as the llanos de Chiquitos, from the Chiriguano Indians. A little-used road crosses in the floodplain frontier. The civilized population is gathered in the mountain region, which has a rich soil and valuable gold mines. Pop. 171,000. Capital, Santa Cruz de la Sierra. HENRI H. SMITH.

Santa Cruz: city, capital of Santa Cruz co., Cal.; on Monterey Bay, at the mouth of the San Lorenzo river, and on the Southern Pacific Railroad; 75 miles S. of San Francisco. The location, see map of California, ref. 8-C. The surface lies gradually from the sea to circling plateaus, covered with handsome cliffs to the mountains, which shelter the city from the N. winds. With an average winter temperature of 52° and summer temperature of 62°, a magnificent bathing beach, attractive drives of 10 miles along the sea-shore, and good roads through mountain scenery to the famous Red Tree grove, 5 miles distant, Santa Cruz is a favorite resort all the year. The San Lorenzo river and its branches are spanned by eight bridges within the city limits, and furnish fresh-water bathing and boating-places. The city has numerous covered streets, a public park of 200 acres overlooking the city and bay, several public plazas, water-works, electric light plant, street railways (operated in part by electricity), and several large hotels. There are 14 schools, 7 public-school buildings with 1,500 pupils, public school property valued at \$190,400, School of the Holy Cross (Roman Catholic), a business college, and a Free Public Library containing 15,000 volumes. The banking interest comprises 6 State banks for savings and loans, with a combined capital of \$300,000; the industrial establishments include sawmills, foundries, soap and glue works, and planing-mills, and the trade reports show large shipments by rail and water of powder, lime, and bituminous rock. There are 2 daily, 11 weekly, and 2 monthly periodicals. In 1905 the city had an assessed property valuation of \$12,200,000. The city is built on the site of the Santa Cruz Mission, founded by the Spaniards in 1791. Pop. (1890) 11,898; (1900) 23,000; (1905) 23,500. LUCY URBANOWICZ McCANN.

Santa Cruz (Span. prop. san-tú-krooth'), ARABIAN: general and politician; b. at La Paz (now in Bolivia) about 1794. He was of mixed white and Indian blood. He entered the Spanish army and attained the rank of colonel; but being opposed by the patriots in Dec., 1820, went over to them, was made general, and led an invasion of Upper Peru in 1825. Under Bolívar he was acting president of Peru from Aug., 1826, to June, 1827. Gen. Sucre, president of Bolivia, having been deposed, Santa Cruz was elected president of the republic for the term of ten years beginning Jan. 1, 1828; at the same time he received the military title of great marshal. His internal policy was progressive and the country was very prosperous; but almost from the first he encountered the idea of uniting the Pacific coast republics, and at this time was assailed by civil wars, and there were several attempts to the presidency. Orbegoso, who had been deposed, appealed for aid to Santa Cruz, who marched into the country (1828), successfully defeated Gamarrá and Orbegoso, and in Oct., 1829, proclaimed the Peruvian-Bolivian confederation. This consisted of the states of North Peru, South Peru, and Bolivia, each with a president, Santa Cruz himself being the chief executive, with the title of proconsul. His execution of slavery excited general horror. A British army invaded Peru, and after many months of fighting Santa Cruz was finally defeated at the battle of Yungay, Jan., 1839. He resigned and left the country, and the confederation was at once dissolved. Santa Cruz subsequently lived a dissipated life in Europe, a political means of keeping him out of the country. D. at St. Nazaire, France, 1860. HERBERT H. SMITH.

Santa Cruz de la Sierra: capital of the department of Santa Cruz, Bolivia, on a tributary of the Orinoco, or upper Amazon. As its name indicates, it was originally founded in the highlands, but was removed to its present location like Laredo in 1590 (or 1575?). As the frontier town

in this direction it has a considerable trade with Brazil and with the half-civilized Indians of the plains. Most of the men are engaged in trading, etc., at distant points; hence the permanent population (about 10,000) is largely composed of women. H. H. S.

Santa Cruz de Santia'go, or de Tenerife: capital of the Canary Islands; on the northeast coast of Tenerife. It has an excellent harbor, making the city the chief commercial port of the islands. Wine, brandy, cochineal, tobacco, and agricultural products are exported. The town and harbor are strongly fortified. Pop. of commune, 10,010.

Santa Cruz Islands: an archipelago of Melanesia, between the Solomon Islands and the New Hebrides, between parallels 8° 41' S. and 11° 40' S., and meridians 162° E. and 165° E.; under British protectorate, but claimed by the French, and very little known. They consist of a dozen volcanic islands and many islets, with a total area of about 300 sq. miles, and an estimated population of 5,000. The largest island is the Santa Cruz or Niteli, with an area of 215 sq. miles. The inhabitants present a mixture of the Melanesian and Polynesian types, the former prevailing, and differ much from island to island. They have uniformly proved hostile to visitors, and even missionaries have as yet got no foothold on the islands. MARK W. HARRINGTON.

Santa Fé, Span. prop. san-tá-fé': a province of the Argentine Republic; on the west side of the river Paraná; between Chaco on the N., Corrientes and Entre Ríos on the E., Buenos Ayres on the S., and Córdoba and Santiago del Estero on the W. Area, 50,969 sq. miles. The surface is level, and the greater part is included in the open pampas, but in the north there are extensive forests. The climate is mild and healthful, and Santa Fé is one of the most favored provinces in being generally free from floods and droughts. Its progress, especially since 1904, has been wonderfully rapid, mainly owing to the influx of immigrants and the establishment of agricultural colonies. The level surface has facilitated the construction of a network of railways, and the Paraná is a safe channel for seagoing vessels. In the construction of public works a heavy provincial debt has been contracted, and the finances are in bad condition. Grazing and wheat-raising are the principal industries; maize, flax, lucerne, and, in the north, sugar-cane are largely cultivated. There are extensive flouring-mills and other manufactures. Pop. about 300,000, over one-third of foreign birth. ROSARIO (p. 20) is the principal city and river-port. Santa Fé, the capital, is on the Santa Fé river, an arm of the Paraná. It was founded in 1573, and has a thriving trade, especially in cattle and lumber. The port does not admit large vessels, except when the river is flooded. Pop. about 20,000. HERBERT H. SMITH.

Santa Fé: city; capital of New Mexico and of Santa Fé County; on the Santa Fé creek, and the Atch. Top. and S. Fé and the S. Fé Southern railways; 30 miles E. of the Rio Grande, 50 miles N. E. of Albuquerque (for location, see map of New Mexico, ref. 10-S). It is the oldest and in many respects the most curious settlement in the U. S. The streets are narrow and crooked, and most of the buildings are of adobe, or sun-dried brick. The principal open space is the plaza, containing a soldiers' memorial monument, and having on one of its sides a long, one-story structure known as the Governor's Palace. The city is the seat of a U. S. military post, Fort Marcy, and of a Roman Catholic archbishopric. It is in an agricultural and stock-raising region, which contains gold, silver, copper, lead, zinc, anthracite coal, marble, a variety of building-stones, and gypsum. The city has a national bank with capital of \$150,000, 3 libraries, and 3 daily and 4 weekly newspapers.

Public Buildings.—The Governor's Palace, built in 1598, with walls 5 feet thick, has been used continuously as the official residence of the chief executive, under whatever title and superior authority he has served. In it Gen. Lew. Wallace wrote *Ben-Hur* while governor of the territory. One end of it contains the quarters and priceless treasures of the New Mexico Historical Society, and the other the post-office. The Capitol is an attractive building of cream-colored sandstone and cost \$200,000. Other buildings of note are the U. S. Government building, county court-house, penitentiary (cost \$150,000), New Mexico School for the Deaf and Dumb (opened 1885), St. Vincent's Hospital, and a Roman Catholic orphan asylum.

Churches and Schools.—The oldest church in the city, also said to be the oldest in the U. S., is San Miguel, built about 1550, destroyed by the Indians, and rebuilt in 1710.

The cathedral of San Francisco, of light brownstone, is built around a former cathedral whose history dates back to 1622. The educational institutions comprise 3 public schools, the University of New Mexico (Congregational, opened 1880), St. Michael's College (Roman Catholic, opened 1859), the Presbyterian Academy (opened 1881), Academy of Our Lady of Light (Roman Catholic), Whitin Hall School (Congregational), the Ramona Industrial School for Indian girls (memorial to Helen Hunt Jackson), and a Roman Catholic school for Indian boys.

History.—As far back as 1541 the place existed as an Indian pueblo or town, with a population estimated at upward of 15,000. About 1605 it was occupied by the Spaniards, who gradually reduced the Indians to slavery and opened and worked the rich mines of gold and silver. In 1680 the Indians revolted, expelled the Spaniards, closed up and obliterated all traces of the mines, and burned all the Spanish archives and church ornaments. The Spaniards under Vargas recaptured the pueblo in 1692, and the territory was held by Spain till 1821, when Mexico declared and perfected its independence. In 1846 U. S. troops under Gen. S. W. Kearny took possession of the city; in 1848 the territory was ceded to the U. S.; and in 1851 Congress created the Territory of New Mexico, with Santa Fé as its capital. Pop. (1880) 6,635; (1890) 6,185. G. J. HAGAR.

Santa Fé de Bogotá: See BOGOTÁ.

Santalaceæ: See SANDALWORTS.

Sant-Aldegondé: See MARNIX, PHILIPP, van.

Santal-wood, Sanders, or Saunders: the heart-wood of a tree, *Pterocarpus santalinus*, found in the East Indies, Ceylon, and Madagascar, and on the coasts of Coromandel and Malabar. It occurs in large billets, compact, hard, and of a dull murky red. Its coloring-matter is supposed to be similar to, if not identical with, that of barwood. It is only developed by age, and, while it is abundant in the trunks, is not found in the young branches. Weidel isolated two peculiar bodies from santal-wood: (1) *Santal* ($2C_6H_5O_2H_2O$), colorless crystals, tasteless, odorless, insoluble in water, bisulphide of carbon, benzene, and chloroform, and slightly soluble in alcohol and ether. Its alkaline solution is yellow, but becomes rapidly red in the air, and gives red precipitates with lime and baryta. Its alcoholic solution assumes a dark red with ferric chloride. He obtained 3 parts from 1,000 of wood. (2) *Santaline* ($C_{11}H_{14}O_4$), which is a magnificent scarlet, with a green metallic iridescence, is insoluble in water, slightly soluble in alcohol and ether, and imparts a reddish purple to alkaline solutions. Santal-wood is used chiefly on the Continent to give a bottom to woolen cloth to be subsequently dyed with indigo, yielding by this combination a fine blue (*bleu de Nemours*), which is purple blue by reflected light. It also imparts a dark red to woolen and cotton goods, which assumes a rich brown on passing through a bath of bichromate of potash; with sumac it gives a dark brown, with fustic a light brown. Revised by IRA REMSEN.

Santa Maria: a name for PUERTO DE SANTA MARIA (q. v.).

Santa Maria: town (settled in 1874); Santa Barbara co., Cal.; on the Santa Maria river, and the Pacific Coast Railway; 13 miles from the ocean, 31 miles S. of San Luis Obispo (for location, see map of California, ref. 10-D). It is in an agricultural, fruit-growing, and stock-raising region, and contains 4 churches, 3 public-school buildings (high school cost \$15,000), 4 hotels, State bank with capital of \$25,000, and 2 weekly newspapers. Pop. (1880) 300; (1890) 900; (1895) estimated, 1,500. EDITOR OF "SANTA MARIA TIMES."

Santa Maria, Domingo: statesman; b. at Santiago, Chili, Aug. 4, 1825. He graduated at the University of Santiago; was admitted to the bar in 1847; held minor Government offices, and early became known as a pronounced liberal. Being involved in the insurrection of 1851-52, he was banished for a year to Peru; was elected to congress on his return, and became widely known for his brilliant oratory; and during the political struggles of 1858-59 was again banished, traveling in Europe. President Perez recalled him, and made him Minister of Finance 1863-64. During the war with Spain he negotiated a treaty of alliance with Peru. In 1868 he was appointed judge of the Supreme Court. He supported the administration of President Pinto, was his Minister of Foreign Affairs and of the Interior, and finally Minister of War during the second year of the contest with Bolivia and Peru. His vigorous measures won him great popularity, and he was elected to succeed Pinto Sept. 18, 1881-Sept. 18, 1886. The war was brought to a successful

end in 1883, and in the same year the Araucanian Indians were finally subdued. Subsequently he was president of the senate. D. at Santiago, 1890. H. H. S.

Santa Maria di Capua: See CAPUA.

Santa Marta: capital and port of the department of Magdalena, Colombia; on a bay of the northern coast; 40 miles E. N. E. of the mouths of the Magdalena (see map of South America, ref. 1-B). It was founded by Rodrigo de Bastidas in 1525, as the capital of the province of the same name, which corresponded in part to the modern department. During the colonial period it was very important as a port and center of conquest; Quesada, marching from this place, conquered the plateau of Bogotá. The town was repeatedly attacked by Indians, and taken and sacked by English and French corsairs; the ruins of the Spanish forts erected for its defense may still be seen. The harbor is one of the best on the coast; a short railway runs to Ciénega, and (1895) projected to Cerro de San Antonio on the Magdalena. Santa Marta is an episcopal see, and has a cathedral, seminary, hospital, etc. Pop. about 6,000. HERBERT H. SMITH.

Santa Marta, Sierra Nevada de: an isolated group of mountains in Northern Colombia (department of Magdalena), near the coast, and immediately S. E. of the town of Santa Marta. Brettes and Nufiez, who first scaled the highest peak in 1891, found it to be 17,018 feet above sea-level; other estimates make it higher. From the sea the snow-crowned summits present a magnificent sight. The group is completely separated from the Andean system, and has a different geological structure. H. H. S.

Santa Maura, saan'taa-mow'raa, or Leuca'dia: one of the Ionian islands; formerly a peninsula, but since the seventh century B. C. separated from Western Greece by a strait about a mile wide. Area, 180 sq. miles. Pop. 25,000. Its history has been mainly that of the other IONIAN ISLANDS (q. v.). Hills traverse it from north to south, terminating in white cliffs, whence its ancient name *Leucas* (Gr. *leukos*, white). One of these cliffs served as a place of execution of criminals. This is still called Rock of Sappho's Leap, from the tradition that the poetess and other unhappy lovers cast themselves hence into the sea. E. A. G.

Santa Monica: city; Los Angeles co., Cal.; on the Pacific Ocean, and the S. Cal. and S. Pac. railways; 17 miles W. of Los Angeles, the county-seat (for location, see map of California, ref. 12-F). It is a popular summer resort, is engaged in ostrich-farming, lumbering, and milling, and contains one of the longest ocean wharves in the world (extending 4,700 feet into Santa Monica Bay), 7 churches, grammar and high school, public library, water-works, electric lights, 2 State banks with combined capital of \$115,000, and a weekly newspaper. The Pacific branch of the National Home for Disabled Volunteer Soldiers is here. Pop. (1880) 417; (1890) 1,580. EDITOR OF "OUTLOOK."

Santa'na, Pedro: general and politician; b. at Hincha, Santo Domingo, June 29, 1801. He was a lawyer and wealthy landowner until 1844, when he headed the revolution by which the eastern part of the island became independent of Haiti; was president of the Dominican Republic, then formed, 1844-48; repulsed the invasion of Souloque 1849; deposed Jimenes, and was president for a short time. He was president by regular election 1853-57, and again defeated Souloque in 1855 and 1856. After the deposition of Baez, Nov., 1858, Santana again assumed the presidency, but despairing of bringing about order, he ceded the republic to Spain in Mar., 1861. He was appointed lieutenant-general in the Spanish army, and quelled an insurrection in Azua. D. at Santo Domingo, June 14, 1864. H. H. S.

Santander: capital of the province of Santander, Spain, on a promontory in an inlet of the Bay of Biscay, where a spacious and perfectly safe harbor is formed by two mountains, and provided with convenient quays and docks (see map of Spain, ref. 12-F). The surrounding hills are beautifully covered with vineyards and forests, and rich in mineral springs and iron and copper ores. The rivers and the sea teem with fine fish. There are several good manufacturing establishments. Wheat and ores are the principal exports. Pop. (1887) 41,829.

Santander: an interior department of Colombia, on the east side of the river Magdalena; surrounded by Magdalena, Venezuela, Boyacá, Antioquia, and Bolívar. Area, 16,291 sq. miles. It is traversed by the Eastern Cordillera of the Andes, and two-thirds of the surface is essentially mountainous. Near the Magdalena and in the eastern part there are extensive plains. The river Sogamoso divides the

mountain region by a deep gorge, flowing to the Magdalena. The drainage of the northern part is to Lake Maracay. The soil, climate, and natural productions embrace everything found in Colombia) but the roads are good mule-tracks, and the difficulty of communication has retarded the development of the department. The principal occupation is agriculture, the most important crops being coffee, cacao, and tobacco. Gold, silver, emeralds, etc., are mined on a small scale. There is a considerable trade with Venezuela. Pop. (1885) estimated, 800,000. Capital, Bucaramanga.

HERBERT H. SMITH.

Santander, FRANCISCO DE PAULA: general and statesman; b. at Barranquilla, Colombia, New Granada, Apr. 2, 1792. He was a student at Bogotá when the war for independence began in 1810; joined the patriots, and served through an arduous campaign; was with Bolívar in the llanos and he commanded an advance division in the invasion of New Granada, and by his opportune aid with the main army, enabled Bolívar to gain the victory of Boyacá Aug. 7, 1819. Santander was promoted general of division on the field, was appointed vice-president, or governor, of Cundinamarca, and on Sept. 7, 1821, was elected vice-president of Colombia under Bolívar. During the latter's campaign to the south and Peru, 1823-27, he governed the republic with wisdom and energy, completely cleared it of hostile forces, obtained the recognition of foreign powers, and sent more than 8,000 men to re-enforce the liberator. He was elected vice-president in 1827. After Bolívar's return in that year he led the federalist opposition to him, though he did not openly revolt; and when Bolívar assumed absolute power in 1828 Santander was deposed. Soon after he was arrested and sentenced to death in a charge which proved of emptying at an attempt to assassinate Bolívar. The sentence was commuted to banishment and loss of rank, and he went to Europe. In 1834, after the dissolution of the republic of Colombia, Santander's honors were restored, and he was invited to return. Before his arrival he was elected president of New Granada Mar. 9, 1832, and held the post until the beginning of 1837. Subsequently he was an active member of congress. D. at Bogotá, May 4, 1864. Santander was one of the ablest statesmen of his country and time, and he is properly regarded as the founder of New Granada, the modern Colombia. H. H. S.

Santa Paula, *span'lah;* town; Ventura co., Cal.; on the S. Pac. railroad; 16 miles N. E. of San Buena Ventura, the county seat, and 65 miles N. W. of Los Angeles (for location, see map of California, ref. 14-B). It is the center of a rich agricultural region, the place of residence of many of the wealthiest farmers in the Santa Clara valley, and a noted health resort. The valley is surrounded by mountains ascending in excellent water, petroleum, asphaltum, and valuable building stone and timber. It has the largest bean-crop in the country (yielding an average of a ton per acre), peach orchards and lemon groves, and a great honey industry. The town contains 11 churches, 3 public-school buildings, a national bank with capital of \$75,000, and 3 weekly newspapers. The principal industries are the refining of petroleum, and the manufacture from it of over fifty articles of commerce, the manufacture of printing-inks, the cement of building-stone and asphaltum, and the drying of fruit and beans. Pop. (1890) 188; (1890) 1,047; (1894) estimated, 1,200.

ERROR in "CROCHER."

Santarem, sãnt'cãr'ã; a town of the state of Pará, Brazil, on the river Tapajós, 3 miles above its junction with the Amazon (see map of South America, ref. 3-F). It is the most important river-port between Manaus and Pará; is the center of an agricultural and grazing district; and one of the entrepôts of the Tapajós. Near it is an agricultural colony, partly composed of immigrants from the Southern U. S. Pop. about 9,000. H. H. S.

SANTERRE, MANUEL FRANCISCO DE BARROS E SOUZA, Viscount of; politician and historian; b. at Lisbon, Portugal, Dec. 18, 1791. His father was a courier. He accompanied the royal family to Brazil in 1807, held diplomatic positions in Europe from 1814, and was minister of Portugal to Denmark 1819-20. From 1823 to 1827 he was director of the archives of Portugal. Under the regency and Dom Miguel he was Minister of State 1827-33. After the fall of Miguel he returned to Paris, where the remainder of his life was spent. His numerous works in French and Portuguese are rather collections of historical material than well-arranged histories, but they are very valuable. Among them are *Revue des Annales Portugaises* (1842); *Essai sur l'histoire*

de la cosmographie et de la cartographie pendant le moyen âge (8 vols., 1840-52; continued by Mendes Leal); and *Quatro elementos das relações políticas e diplomáticas do Portugal* (10 vols., by Santarém; continued by Ribeiro da Silva, D. in Paris, Jan. 18, 1854. H. H. S.

Santa Rita Durão, rit'ã-dô-crown; José, da; poet; b. near Marianna, Minas Geraes, Brazil, 1767. He studied in Rio de Janeiro and at Coimbra, and became Doctor of Theology at the University of Coimbra, Dec. 24, 1796. After a sojourn in Rome, where he made the acquaintance of his compatriot, Basílio da Gama, and felt powerfully the influence of the Italian poets, he became professor at Coimbra (before 1778). Here he pronounced an elegant and truly interesting Latin oration (*Josephi Durani, Theologi, Conimbricensis O. E. S. A. pro omnia studiosorum institutione oratio* (Coimbra, 1778). Here also he wrote his epic, *Caracorum* (Lisbon, 1783), an account of the discovery and settlement of Bahia, by Diego Álvares (called *Caracorum* by the aborigines). The poem has been several times printed, but the best edition is in Varnhagen, *Epica brasiliensis* (Lisbon, 1845). D. in Lisbon, Jan. 34, 1784. A. R. MASON.

Santa Rosa: city (located in 1854); capital of Sonoma co., Cal.; on the San Fran. and N. Pac. and the S. Pac. railways; 61 miles N. of San Francisco (for location, see map of California, ref. 6-B). It is widely known for its roses, which bloom all the year in the open air, and is the center of a region peculiarly adapted to fruit-culture, hop and grain growing, hay-making, and dairying. The city is laid out on a site nearly level, with wide streets and broad sidewalks bordered with trees. There are nine churches; one, the Baptist, was built entirely from a single tree, a giant redwood from the Guerneville forest. The educational institutions comprise the public schools with 1,500 pupils, the Santa Rosa Seminary and the Ursuline Academy (Roman Catholic), the Santa Rosa Ladies' College (non-sectarian), and the Pacific Methodist College (Methodist Episcopal South, opened in 1861). The court-house is an imposing structure, and, with adjacent county buildings, cost \$200,000. The city has an excellent gravity water-supply, gas-works, two electric-light plants, several flour-mills, and extensive fruit-drying and canning works. There are a national bank with capital of \$150,000, 3 State banks with combined capital of \$620,000, and 2 daily and 3 weekly newspapers. In 1894 the city had receipts of \$40,318, and an assessed property valuation of \$3,822,652. Pop. (1880) 3,516; (1890) 5,220; (1894) 7,250. JAMES W. OATKES.

Santa Rosa de los Osos: a town of the department of Antioquia, Colombia; 26 miles N. E. of Medellín; on a plateau of the Andes; 3,500 feet above sea-level. It owes its importance to rich gold-deposits in the vicinity; there are over forty regular works, but the methods of working are antiquated. The climate is cold for Colombia (mean, 57° F.), and very salubrious. Pop. (1892) 10,052. H. H. S.

Santa Rosalia: city of Southern Chihuahua, Mexico; on the Mexican Central Railway; 335 miles S. of El Paso (see map of Mexico, ref. 3-E). It is celebrated for its hot sulphur springs, long known to be curative by the natives and much resorted to by invalids. They are especially useful in inflammatory rheumatism. Pop. estimated at 8,000. M. W. H.

Santa Tecla, or Nueva (nôô'vã) San Salvador: a town of Salvador; 8 miles S. W. of San Salvador; beautifully situated in a valley on the south side of the San Salvador volcano. After the destruction of San Salvador by the earthquake of 1854 an attempt was made to remove the population to this place, which was officially declared to be the capital in 1855. The latter arrangement was never carried out, but the newly founded city has prospered. Pop. (1890) 13,715. H. H. S.

Santee Indians: See SIOUAN INDIANS.

Santee River: a stream formed in South Carolina by the union of Wateree and Congaree rivers. It is 150 miles long and is navigable throughout for steamboats. Its lower course is through pine-forests and low rice-lands. It reaches the Atlantic through the North and the South Santee.

Santerre, sãnt'ãr', ANTOINE JOSEPH; revolutionist; b. in Paris, Mar. 16, 1752; was a brewer by trade, and acquired influence by his wealth and generosity. His brewery in the Faubourg Saint-Antoine became a frequent meeting-place for the Jacobins. As commander of a battalion of the national guard, he took part in the storming of the Bastille July 14, 1789, and played a conspicuous part in the riots of the Champ de Mars, the attack on the Tuilleries (June 20,

1792), and the insurrection of Aug. 10. He was appointed commander-in-chief of the national guard of Paris, with the rank of general of division, and governor of the Temple during the imprisonment of the king, whom he escorted to the scaffold. In the summer of 1793 he was made a general of division and sent to the Vendée at the head of an army of 20,000 men, but was beaten at Coron Sept. 18, 1793; recalled and arrested as an Orleanist, he did not regain his liberty till after the fall of Robespierre. After this he withdrew into private life. D. Feb. 6, 1809. See Carro, *Sant-erre, sa vie politique et privée* (Paris, 1847).

Santi, saan'tē, GIOVANNI: painter; father of Raphael Sanzio; b. at Castello di Colbordolo, in the duchy of Urbino, Italy, about the middle of the fifteenth century. His master in painting is unknown, but he seems to have formed his style from that of Melozzo da Forlì and other great painters of his time. Giovanni Santi's best-known work is the fresco in the Dominican church at Cagli (1482). There is a *Visitation* at Fano, and a *Madonna with Saints* in Sta. Croce there. A *St. Jerome* in San Bartolo at Pesaro; an *Enthroned Madonna with Four Attendant Saints*, at the Pieve of Gradara; a *St. Sebastian*, in the oratory of that saint at Urbino, besides a votive picture of the Buflì family in the Franciscan church there, and a fresco of a *Madonna and Child* in Raphael's house in Urbino are recognized as Santi's work. The Brera at Milan and the National Gallery in London possess examples of his art. He was also a poet; a MS. in the Vatican Library (*Codex Ollobonianus*, 1805), consisting of 344 folio leaves in *terza rima* exists, celebrating the virtues of Duke Federigo di Monte Feltro, and is interesting, as it contains allusions to the artists of the time and Giovanni Santi's sentiments and opinions on art. D. in 1494. W. J. STILLMAN.

Santiago, or **Santiago de Chile**, sañ-tē-aa'gō-dā-chee-lā: capital and largest city of Chili; on a plain by the little river Mapocho; 68 miles E. S. E. of Valparaiso, its port (116 miles by rail); 1,755 feet above sea-level (see map of South America, ref. 8-C). It is the most populous city on the Pacific slope of America except San Francisco; is the center of Chilean wealth, fashion, and culture, and exhibits more luxury and taste in building than any other capital of South America. The situation, on the plateau called the valley of Chili, is very fine. The plain, naturally dry, has been improved by an elaborate system of irrigation which keeps the city gardens and parks always green. The snow-capped Andes, including the giant of the range, Aconcagua, are in plain view on the E., contrasting with the barren rocks of the Coast Range on the W. A single rocky hill, Santa Lucia, rises within the city limits, and has been transformed by private munificence into a beautiful park and pleasure-ground. The Alameda, a very wide street, crosses the city and is its main artery; it is ornamented by four rows of trees, with a central promenade and two driveways, and is set at intervals with statues, some of them spoils of the Peruvian war. Many of the finest public and private buildings and retail stores are on this street. The cathedral, municipal buildings, etc., face the old Plaza de Armas, now the Plaza de la Independencia. Among other public edifices may be mentioned the Hall of Congress, fronting a fine square, the mint, the opera-house, said to be the finest in America, and the Exposition Hall. Nearly all the better class of buildings are of stone, and many show great architectural taste. The residences are generally of two or at most three stories, and set in extensive grounds ornamented with orange-trees, etc.; for this reason the city occupies a very large area in proportion to its population. Dwellings are furnished with taste, often with great luxury. There are several public parks, and a well-stocked botanical garden. As a center of learning Santiago has a renowned university and various other institutions of higher education; a national library with 70,000 volumes and 40,000 manuscripts; a museum, academy of fine arts, observatory, etc. It is connected by railway with the northern and southern provinces, and with the coast. Commercially it yields in importance to Valparaiso. Santiago was founded by Valdivia, the conqueror of Chili, in Feb., 1541. Earthquakes are frequent, but have never been very destructive. The climate is changeable, ranging from 23.9° to 91.1° F. Pop. (1885) 189,332; in 1894 probably 225,000. The province of Santiago, of which the city is also the capital, has an area of 5,223 sq. miles, and a population of about 425,000. HERBERT H. SMITH.

Santiago de Compostela, -dā-kom-pōs-tā'lā: city; in the province of Corunna, Spain; at the confluence of the Sar and

the Sarela; 33 miles S. by W. of Corunna (see map of Spain, ref. 12-B). It is the see of an archbishop, and has a magnificent cathedral, a university, and several educational and religious establishments, from which it chiefly derives its importance. The cathedral is said to contain the bones of the patron of Spain, the apostle James. It was built in the eleventh century in the form of a cross, 270 feet long and 204 feet broad, and contains six naves formed by beautiful Gothic pillars. Before the Reformation this church was annually visited by great crowds of pilgrims, but the number of visitors has since decreased and the city decayed. There are manufactures of linen, silk, leather, and paper, and the vicinity is rich in cereals, vegetables, fruit, and wine. Pop. (1887) 24,302.

Santiago de Compostela: the name given to JAMES (q. v.), the son of Zebedee, as the patron saint of Spain.

Santiago de Cuba, -dā-koo'bā, or simply **Cuba** (in old books often called *St. Jago de Cuba*): city and port of Cuba; on a bay of the south coast, near the eastern extremity of the island (see map of West Indies, ref. 5-E). The harbor is one of the finest in the West Indies, but it is separated from the interior by rugged mountains which retard communication; hence the port is only the third in Cuba in importance. The city, surrounded on three sides by mountains, is very picturesque, but hot and subject to epidemics of yellow fever. The houses are generally low, but well built; there are few public edifices of note. The town has several fine squares and public gardens. Short railways run to the interior. Santiago is the center of the Cuban copper region. The principal exports are sugar, rum, coffee, cacao, fruits, and copper ore. Pop. (1891), with the district, 71,307; of the city proper, about 40,000. HERBERT H. SMITH.

Santiago del Estero, -dāl-ās-tā'rō: an interior province in the northern part of the Argentine Republic; surrounded by Santa Fé, Córdoba, Catamarca, Tucumán, Salta, and the territory of El Chaco. Area, 31,500 sq. miles. It is a plain, the greater part included in the region of mingled forests and open lands called the Gran Chaco; in the southern part there are true open pampas. The principal rivers are the Salado and Dulce, neither of which is navigable. Nearly all the civilized population is gathered in the north. S. of the Salado, about 18,000 sq. miles in extent. Grain, grain-planting, and timber-cutting are the only important industries. Pop. (1890) about 250,000 (including wild Indians). Santiago del Estero, the capital, on the Dulce, was founded in 1552, and (disregarding the first settlement of Buenos Ayres) is the oldest town in the republic. It is much decayed, and has frequently suffered from overflows of the river. Pop. 8,000. HERBERT H. SMITH.

Santiago de los Caballeros, -dāl-lōs-kā-baal-yā'rō, or **de la Vega**: town of the Dominican Republic, West Indies; in the central plain called the Vega Real; 85 miles N. N. W. of Santo Domingo, on the road to Puerto Plata (see map of West Indies, ref. 5-H). This is the most beautiful and fertile part of the island, and is free from the heat and fever of the coast. The town is the most populous in the interior of the republic, and has a thriving trade, especially in tobacco. Pop. about 10,000. H. H. S.

Santillana, sañ-tēel-yaa'nā, INIGO LOPEZ DE MENDOZA Marquis of: soldier and poet; b. at Carrion de los Condes, Spain, Aug. 19, 1398; son of the grand admiral of Castile; was created Marquis of Santillana by Juan II. of Castile for his services in wars against Aragon and the Moors, and after the battle of Olmedo against the King of Navarre in 1446 received the title of Conde del Real de Manzanares. Upon the death of Juan in 1454 Mendoza retired from public life and devoted himself to literature. His best-known work is *Los Proverbios*, or *Centiloquio* (1496), a collection of 100 proverbs in rhyme. He wrote also *Diálogo de Bias con Fortuna* (1448); *Doctrinal de Privados* (1453); the *Comedia de Ponza* (a dramatic poem); and *serranillas*. D. at Guadalupe, Mar. 25, 1458. His works have been edited by Andador de los Rios (Madrid, 1852).

Santley, CHARLES: baritone singer; b. in Liverpool, England, Feb. 28, 1834; studied at Milan under Gaetano Navarini under Garcia on returning to England. He sang the part of Adam in Haydn's oratorio *The Creation*, at St. Martin's Hall in London, Nov. 16, 1857. In 1859 he appeared in the opera of *Dinorah* with the Pyne and Harrison Company at Covent Garden theater; and in 1862 made his debut in Italian opera. He made a tour in the U. S. in 1871. In London he sang in *Zampa* and *The Waterman*, with the

and Tom Company in *The Flying Dutchman*, and for part of the musical festivals and concerts. In 1899 he took a tour in Australia, and passed through New York in 1900 en route to England. H. R. VALLBERG.

Santo Domingo, or Haiti (*domo-dōnēō*; *San Domingo*, and formerly *Louisiana*, or *Hispaniola*): an island of the Greater Antilles, West Indies, between the Caribbean Sea and the Atlantic; separated from Cuba on the W. N. W. by the Windward Passage, and from Puerto Rico on the E. by the Mona Passage. Length from E. to W., 403 miles. Area 98,804 sq. miles, divided between the republic of Haiti (area 47,700) to the west and the Dominican Republic to the east. From the sea it appears to be a mass of mountains; actually there are several east and west ranges separating extensive plains such as the beautiful Vega Real in the Dominican Republic and the plain of Artibonite in Haiti. The country everywhere is very fine, some of the mountains reaching to 8,000 or 7,000 feet. The island is abundantly wooded and one of two of the rivers are navigable for short distances. The most important streams are the Artibonite in Haiti and the Yaque, Yuma and Ozama in the Dominican Republic. In the southwest there are two considerable salt lagoons in the Dominican Republic and Ponds in Haiti. The coasts broken by deep indentations from several great bays; the largest of these is Samaná Bay, but the principal commercial ports are Port-au-Prince, Cap-Haïtien, Santo Domingo, and Puerto Plata. The soil of the entire island is very fertile and the mountain forests contain many cabinet-woods and dyewoods. The island does not appear to be rich in minerals. A little gold is obtained, and some platinum, coal, etc., are reported. The climate is hot and occasionally unhealthy in some of the coast towns, mild and salubrious in the interior, the temperature varying with the elevation. The wet season, from April to October, is characterized only by a higher temperature and more abundant rains. Hurricanes are occasionally destructive from July to October. Several severe earthquakes are recorded. The island has no volcanoes.

History.—Santo Domingo, called Haiti by the natives, was discovered by Columbus and Pinzon at the end of 1492, and was the first part of the New World settled by the Spaniards. (See *Colombus*.) The natives, a mild race of Arawak stock, were at first very friendly; later they rose against their oppressors, but were beaten in several wars by Columbus and his successors, and were reduced to the semi-slavery of the *encomendados*; they soon disappeared and their land was only tenanted by the mixed race. Gold-mining, even with enforced Indian labor, was never very profitable, and agriculture became the chief occupation. Negro slaves were introduced as early as 1502, and later great numbers were brought, especially to the western part of the island. Santo Domingo (founded in 1496) became the chief city, and about 1520 was the capital of Spanish America. The island was the point from which subsequent discoveries and conquests were made. From it were settled Cuba (and some Mexico and California), Darien (and hence Peru, Chili, and Ecuador), Santa Marta, and New Granada, Puerto Rico and Florida, Venezuela, and Jamaica. But after the rich discoveries on the mainland, the island was neglected and partly depopulated, and it became the prey of the buccaniers. About 1625 some French buccaniers from Tortuga formed permanent establishments which soon increased in strength; and by the treaty of Ryswick (1697) the western part of the island was definitely ceded to France. This French colony became very prosperous; but the Negro slaves were ten times as numerous as the whites, and the free mulattoes, who were debased from legal rights, were very dissatisfied. The French Revolution of 1789 was quickly followed by a revolt of the mulattoes; both they and the whites appealed to the slaves, and in 1791-92 a terrible Negro insurrection broke out in the French part of the island. The blacks, under different chiefs, massacred the whites as they came out; royalist and republican, white, black and mulatto factions strove for supremacy; and in 1808 the isolated colony was invaded by the British and Spaniards. The French Assembly conciliated the blacks by a grant of compensation (1793); under their favorite leader, Toussaint Louverture, they resisted the British, who were driven out in 1798. Meanwhile, in 1793, Spain had ceded the eastern part of the island to France; it was occupied by Toussaint, who had appointed general-in-chief of the island since 1797, but in reality was dictator. He governed, notwithstanding the name of France, until 1801, when he pro-

claimantly declared independence. In 1802 Bonaparte sent a large force under Leclerc to subdue him. After some resistance he was conquered and sent a prisoner to France. Dessalines, Christophe, and others headed fresh rebellions, and the French were finally driven out in Dec., 1803. On Jan. 1, 1804, Dessalines declared the independence of Haiti, then including the whole island; soon after he proclaimed himself emperor; but he was assassinated in 1806. His successor, the Negro Christophe, proclaimed himself king, but could hold only the northwestern part of the island. The southwestern part formed a republic under Pétion, and the eastern part was seized by Spain. On Christophe's death (1820), Boyer, the successor of Pétion, assumed his dominion; in 1821 the eastern part rebelled against Spain and formed a republic under the protection of Colombia, but was shortly after conquered by Boyer; thus the whole island was united in the republic of Haiti, and this was the most prosperous period of its history. Boyer was overthrown in 1843, and in 1844 a revolution in the east resulted in the formation of the Dominican Republic. For subsequent history, descriptions of the two countries, and bibliography, see HAITI and DOMINICAN REPUBLIC.

QUESTED H. SMITH.

Santo Domingo: capital and most important city and port of the Dominican Republic, island of Santo Domingo, West Indies; on a bay of the south coast; at the mouth of the river Ozama (see map of West Indies, vol. 5-F). It was founded by Bartholomew Columbus in 1496, and is the oldest existing town of European origin in the New World. Many of the buildings and the fortifications date from a very early period, and some of them are associated with the history of Columbus. A fine statue of the discoverer adorns the principal square. The cathedral is a large but bare and rather unsightly building; in it is shown a crypt supposed to contain the remains of Columbus. They were certainly brought from Spain and buried in this cathedral, and it is claimed that the bones transferred to Havana in 1793 were those of another member of the family. Santo Domingo is the principal emporium of the southern part of the republic, and exports coffee, sugar, cabinet-woods, etc. The harbor is exposed to south winds, and is in fact little more than an open roadstead. Pop. about 25,000. H. H. S.

Santon: See *DAZYMUS*.

San'tonin: a crystallizable principle obtained from the drug *Santonica*, or Lavan wormseed. Santonin occurs in flat, quadrilateral, colorless prisms, is inodorous and nearly tasteless, and practically insoluble in water. In overdose it is poisonous to the animal system, producing convulsive tremblings, dilatation of the pupils, and enfeebling of the functions of the heart and lungs. It also causes the urine to acquire an unnatural yellow, and, what is very singular, it produces yellow vision by staining the humors of the eye, the field of view appearing as if seen through a yellow-tinted medium. Santonin is exceedingly poisonous to the round-worm, *Ascaris lumbricoides*, a parasite infesting the intestines in man, and is consequently used in medicine as an anthelmintic or vermifuge. From its poisonous properties it must be given with care. Revised by H. A. BAZE.

Santorin, *san-tō-rēn'*, or *Thera*, *thā-rā*: Greek island in the Aegean Sea; the most southern of the Cyclades. It is crescent-shaped, being the eastern portion of the circumference of a vast crater. Geologically, it is intensely interesting on account of the volcanic phenomena which have taken place in it. Sometimes land in the immediate vicinity has risen from the sea and formed islets, some of which still exist. A prodigious eruption began in Jan., 1866, and continued two years. On its cessation the inhabitants, who had fled in terror, returned to the island. Apparently Santorin was inhabited from earliest antiquity. On some of the rocks may be seen the most ancient specimens of Greek writing known. Pop. (1889) 23,000. Capital, Thera. See Virlet in *Bulletin de la Société géologique de France*, vol. lii.; also Fouqué in *Mission scientifique à l'île Santorin*, *Arch. des Missions*, second series, vol. iv., 1867.

E. A. GUSTAVUS.

Santos, *san-tā*: city and principal port of the state of São Paulo, Brazil; on a low peninsula (formerly an island) fronting the Bay of Santos; 40 miles by railway S. of São Paulo (see map of South America, vol. 7-F). The harbor is one of the best in Brazil, and vessels load directly at wharves. The city has many large warehouses and some good public buildings; but the climate is hot, and, owing to the yearly

epidemics of yellow fever, Santos is the most unhealthy port in Brazil. It is the outlet of the greater part of São Paulo, and exports more coffee than any other port in Brazil except Rio de Janeiro. Great numbers of immigrants pass through it. Santos was founded in 1539. Pop. about 20,000. Six miles S. of it is the small town of São Vicente, the oldest permanent settlement in Brazil (founded 1532), and until 1681 capital of the captaincy of the same name. H. H. S.

Sanzio, RAPHAEL: See RAPHAEL.

São (sown) Carlos: See CAMPINAS.

São Francisco River: a river of Brazil, rising in Minas Geraes near lat. 20° 30' S., flowing N., then N. N. E., and finally curving to E. S. E., and entering the Atlantic in lat. 10° 29' S. Length about 1,800 miles. It traverses the states of Minas Geraes and Bahia, and below its great bend separates Bahia and Sergipe on the S. from Pernambuco and Alagoas on the N. Among the great rivers of South America, the São Francisco ranks in length with the Orinoco; but, unlike the Orinoco, Amazon, and Paraguay, it is essentially a highland river, the greater part of its course being over the surface of the Brazilian plateau; and it is nowhere bordered by extensive forests. Its most remarkable feature is its division into an upper and a lower course by a series of rapids and a great cataract. These mark its descent from the plateau, after it has attained its full volume, only 200 miles from the sea. The cataract of Paulo Afonso is sometimes called the Niagara of Brazil, and it approaches Niagara in grandeur though differing greatly in appearance. The great river is here forced through a narrow gorge—in one place only 51 feet wide—and after rushing down a slope, forms three successive falls, with a total depth of 265 feet. The torrent is churned into a mass of foam, producing an effect of indescribable grandeur. Above this fall there are several rapids, and below it an unnavigable space where the river forms a deep cañon; the total obstructed portion is about 190 miles long. Below it the river is freely navigable from Piranhas to the sea, 148 miles; at Penedo, 30 miles above the mouth, it is nearly a mile wide. The bar, at high water, admits vessels of 15 feet draught. Above the falls there is a navigable space from Pirapora to Sobradinho, 984 miles. Of the numerous affluents the most important are the Paraupeba and Rio das Velhas on the right and the Paracatu, Urucuiyá, Carinhanha, Corrente, Rio Grande, and Rio Preto on the left. All of these are navigable for greater or less distances. The São Francisco was opened to free navigation in 1867, but no foreign commerce has been attracted to it. Brazilian steamers ply regularly on the upper course, which is connected with Bahia by railway; the Rio das Velhas is also navigated. The principal industry of the basin is cattle-raising, but it contains much agricultural and mining land. See Burton, *Exploration of the Highlands of Brazil* (1869); Halfeld, *Relatório concernente á exploração do Rio de S. Francisco* (1858) and *Atlas e Relatório* (1860); Roberts, *Relatório sobre o exame do Rio S. Francisco* (1880); Wells, *Three Thousand Miles through Brazil* (1886).

HERBERT H. SMITH.

São Gonçalo, Rio: See LAGOA DOS PATOS.

São João (-zhō-own') **da Barra, or da Parahyba**, -daa-pā-rah-ee-bā (formerly *Parahyba do Sul*): city and port of the state of Rio de Janeiro, Brazil; on the right bank of the Parahyba river, near its mouth. Formerly it was the commercial center of the lower Parahyba valley, but its importance has decreased since Campos has been united to the Bay of Rio de Janeiro by a railway. It is a port of call for coasting steamers, and exports sugar. The bar is passable only during spring tides; at other times vessels anchor in the roadstead. São João has an important sugar-factory. Pop. about 7,000. H. H. S.

São João d'El Rei, -del-rā'ēē: a town of the state of Minas Geraes, Brazil; 66 miles S. W. of Ouro Preto (see map of South America, ref. 6-G); is connected with Sabará and Rio de Janeiro by railway, and is the commercial center of a large district. It was founded about 1670, and was long famous for its gold and diamond mines. Cattle and hogs are raised in the vicinity, and hides, lard, and the favorite Minas cheeses are exported. Pop. about 10,000. H. H. S.

São Leopoldo: a town of the state of Rio Grande do Sul, Brazil; on the Rio dos Sinos, a branch of the Guahyba or lower Jacuhy; 20 miles N. of Porto Alegre (see map of South America, ref. 7-F). The first German colony in Brazil was established here in 1824, and the town is the center of a thriving agricultural region almost entirely peopled by

Germans or their descendants; it has railway and steamboat communication with Porto Alegre. German is the common language. Pop. about 7,000. H. H. S.

São Luiz: See MARANHÃO (the city).

São Miguel: See ST. MICHAELS.

Saône, sôn: a river of France which rises in the department of Vosges, at an elevation of 1,299 feet above the level of the sea; flows S. and joins the Rhône at Lyons. Its entire length is 282 miles; it is navigable for a distance of 170 miles below the city of Gray, department of Haute-Saône. It is joined by the Doubs on the left side.

Saône-et-Loire, -ā-lwāär: department of France; between the rivers Saône and Loire, and mostly occupied by the mountains of Côte-d'Or. The mountains are low, and rich in coal and iron, and on their slopes is produced the celebrated Mâcon wine. On the pastures along the rivers large herds of cattle and horses are reared. Iron plates and rails, machinery, etc., are manufactured in Creusot and other towns. Area, 3,302 sq. miles. Pop. (1891) 619,523.

Saône, Haute: See HAUTE-SAÔNE.

São Paulo, sown-pow'lo: a southeastern maritime state of Brazil; bounded by Minas Geraes on the N. and E., Rio de Janeiro on the E., the Atlantic on the S. E., Paraná on the S., and Matto Grosso on the W. and N. W. Estimated area, 112,330 sq. miles, but the boundary with Minas Geraes is unsettled. The Brazilian Coast Range, here divided by the Parahyba valley into two parallel chains, traverses the southeastern part, and is separated from the ocean by a narrow strip of lowland. Back of the mountains the surface is an irregular plateau, varied by hills and by the deep valleys of rivers which flow westward to the Paraná. The coast-strip mountains and a wide tract back of them were originally covered with forest, and this is the most fertile and thickly settled portion of the state. Bordering the Paraná and its branches there are other extensive forests inhabited only by a few roving Indians. The river Paraná forms the western boundary, and its branch, the Parapanémá, separates São Paulo from Paraná. The Pardo, Tieté, and Aguapehy are important branches of the Paraná, obstructed by falls near their mouths, but partly navigable in their upper courses. On the Atlantic side the only important river is the Parahyba. The principal harbors are the Bay of Santos and the channel formed by the island of São Sebastião. The climate of the plateau is mild and salubrious; some coast towns, as Santos, are hot and unhealthy. A little gold is washed in the river-beds, and there are deposits of excellent iron, marble, etc. The forests are rich in cabinet woods. São Paulo is the most populous and thriving of the Brazilian states and the most important coffee-producing region of the world; the coffee zone includes the Parahyba valley and the forest strip back of the mountains; sugar-cane is extensively planted, especially in the coast belt; and on the plateau the grazing industry is important. The people, called Paulistas, have always been noted for their enterprising spirit. During the colonial period they discovered the mines of Minas, Goyaz, and Matto Grosso, settling in those regions and the southern province; and their slave-hunters were long a terror to the Indians of Paraguay. Of late they have covered a large part of the state with railways, encouraged exploration and settlement toward the Paraná, and developed manufactures; and they have given some of the best statesmen, authors, and engineers to Brazil. The captaincy of São Paulo, originally called São Vicente, was formed in 1534, with its capital at São Vicente, on the Bay of Santos; this was changed to São Paulo in 1600. The captaincy originally included all of Southern Brazil; Rio de Janeiro, Minas Geraes, Santa Catharina (with Rio Grande do Sul), Goyaz, Matto Grosso, and Paraná were successively cut off from it. Pop. (1888) estimated, 1,396,242; the calculated annual increase is 3.5 per cent. There are many German and Italian immigrants. H. H. SMITH.

São Paulo: capital and principal city of the state of São Paulo; on a small branch of the river Tieté; 236 miles W. S. W. of Rio de Janeiro (870 miles by railway), 38 miles from its port of Santos (see map of South America, ref. 6-G). Owing to its situation on the plateau and near the Tropics of Capricorn, it has a mild and very agreeable and healthful climate. It is well built, and has the aspect rather of a European than of a Brazilian town; there are a number of public gardens and parks. The old Jesuit college is used as the state-assembly building; other notable edifices

sionally fighting with muskets, and at the Garita San Cosme it did excellent service as infantry. After the war it was stationed at West Point to assist in the instruction of cadets at the U. S. Military Academy. In 1853 a detachment accompanied Stevens's survey of the Northern Pacific Railroad. In 1858 the company formed part of the Utah expedition, returning to West Point in the fall of the same year. In the fall of 1858 a detachment was sent to the Pacific coast, where it was engaged until 1861 in opening and repairing roads, constructing bridges, and in fortifying San Juan island at the time of the boundary dispute. In 1861 this detachment proceeded to Washington, where it was engaged upon the defenses and in the instruction of volunteer troops in the preparation of siege-material. The main portion of the company was engaged during the summer of 1861 in the defense of Fort Pickens. In the fall of 1861 it joined the Army of the Potomac. An act of Congress of Aug. 6, 1861, added three companies, of 150 men each, to the engineer troops, and authorized one company of topographical engineers. In 1863 the Corps of Engineers and of Topographical Engineers were merged into one, and the strength of the battalion of engineers thus became five companies. One of these was not organized, however, until 1865. From the fall of 1861 until the end of the civil war the battalion formed part of the Army of the Potomac, and its services were invaluable. Under Capt. Duane (afterward brigadier-general and chief of the Corps of Engineers) the original company had been thoroughly instructed in pontoniering, sapping, and mining. This instruction pervaded the battalion, and it was thus enabled to give lessons to the volunteers which could be obtained from no other source. A number of volunteer regiments were organized as engineer troops, and in addition to these many infantry and artillery troops served as engineer soldiers when occasion required, the high character and intelligence of the volunteers rendering it an easy matter to find men capable of being quickly instructed in these duties. For mining at Vicksburg and Port Hudson practical miners were selected from the different regiments, and temporarily organized as military miners. The sapping at these sieges was done by details from the infantry, as it had been in the seventeenth century, before the time of Vauban. In all cases these troops served under the engineers when on engineer duty.

The most remarkable feats in this branch of the service during the war were, in mining, the Petersburg mine (July, 1864); in sapping, the siege of Fort Wagner before Charleston, July to Sept., 1863; and in pontoniering, the bridge across the James river at Charles City Court-house. The latter was over 2,000 feet long in pontons, besides 200 feet of trestle-work. It was built by the regular battalion of engineers, two companies of the Fifteenth New York and part of a company of the Fiftieth New York, in all about 450 men, in about five hours on the evening of June 15, 1864, the approaches having previously been prepared by the First New York Engineers. The stream was rapid and deep, in some places 85 feet. This was the longest floating bridge ever constructed by an army in the field. Another long bridge was built by the same troops over the Chickahominy in 1862. That stream was a less difficult one, and a large portion of the bridge was built on trestles and cribwork.

Upon the reduction of the army in 1870 the number of enlisted men in the battalion of engineers was limited to 354, one company being reduced to a skeleton of ten sergeants and ten privates; and in 1875 the number was further reduced to 200. In 1884 the number was increased to 450 and in 1889 to 500. One company of 100 men is stationed at the Military Academy at West Point, engaged in the instruction of cadets in practical military engineering. The others are stationed at the engineer school of practice at Willets Point, N. Y. They are kept thoroughly drilled as infantry, and are well instructed in field fortification, sapping, mining, pontoniering, field-sketching, and the service of submarine mines. The officers of the battalion are temporarily detailed from the Corps of Engineers, usually serving with it four or five years.

Napoleon I. considered the proper proportion of engineer troops to infantry to be 1:40. Since his day the advances in the art of war have largely increased this proportion. It should be especially large in a country like the U. S., where the army is rather a magazine of military knowledge than a force capable of resisting a powerful enemy. In France the proportion is about 1:21; in Great Britain, 1:20; in Germany, 1:25; in Russia, 1:18; in Austria-Hungary, 1:19; and in the U. S., 1:25.

O. H. EBNST.

Sappey, sâp'pâ', MARIE PHILIBERT CONSTANT, M. D.: anatomist; b. at Bourg, department of Ain, France, Aug. 10, 1810; graduated M. D. from the Paris School of Medicine in 1843; in 1844 passed the *concours* for associate professor of surgery; in 1868 was appointed Professor of Anatomy. He is a member of many French and foreign medical and scientific societies, and an officer of the Legion of Honor. His great work is his *Traité d'anatomie descriptive* (1847-63, numerous editions).

S. T. A.

Sapphire [from O. Fr. *saphir* < Lat. *sapphirus* = Gr. *σάπφειρος*, from Heb. *sappir*, sapphire]: a gem, among the purest forms of corundum. However, it is not usually called sapphire by dealers in gems unless blue, the red stones being called rubies, the yellow ones Oriental topaz, the green Oriental emeralds, and the purple Oriental amethyst, industrially used for wire draw-plates, watch-jewels, phonograph points, etc. *Asteria* is a variety of sapphire which when cut round shows a star of bright rays, due to its crystalline structure. See CORUNDUM, RUBY, TOPAZ, and PRECIOUS STONES.

Revised by GEO. F. KUNZ.

Sappho, sâf'ô (Gr. *Σαπφώ*): the world's greatest poetess; b. at Eresos or at Mytilene in Lesbos, toward the latter part of the seventh century B. C., contemporary of Alcæus and Solon. In consequence of political troubles she had to take refuge in Sicily, but returned to Lesbos in course of time and there she died. The literary mythmongers of antiquity made up stories out of supposed allusions in her verses. Of this order is the romance of her hopeless love for the fair youth Phaon, and of her leap from the Leucadian rock. But the poetess of love fared worse with the comic poets of Athens, who could not understand the Lesbian songstress and who wrought their wicked will on her memory. To them Sappho was a courtesan; to them the school of maidens whom she trained in the service of the Muses and to whom she addressed her burning verses was a school of vice. Nowadays few are found to controvert the thesis that Sappho was a lofty as well as an ardent soul, to whom all lovers of true womanhood as well as of true art must do homage. Her poems, written in the Æolic dialect, "few but all roses," were arranged in nine books after the number of the nine Muses and according to the measures employed. Of these only two poems remain entire or nearly so, and there are besides a number of fragments, enough at all events to show her ardor, her tenderness, her playfulness, her love of art, her love of nature. In the handling of the language, and of the metrical form she was a supreme artist, and if nothing else remained, the Sapphic strophe would be a monument of her genius. Editions of her poems have been published by Neue (Berlin, 1827); by Bergk, *Poeta Lyrici Græci*; by Wharton, with English translations (2d ed. 1887). See the elaborate work by Cippolini, *Saffo* (1890).

B. L. GILDERSLEEVE.

Sapporo, or Satsûpôro, sâp'pô-rô: a town in Yezo, Japan, and once the capital of the island; in a plain about 20 miles from the mouth of the Ishikari river (see map of Japan, ref. 3-E). When the colonization department (*Kaitakushi*) began its work in 1871, Sapporo became a center of activity. Planing-mills, silk-factories, an agricultural college with model farm attached, a brewery, etc., were organized. A mission from the U. S., with Gen. Horace Capron at its head, was located here, and professors from the U. S. were intrusted with the organization of the college. Since the breaking up, in 1881, of the very expensive colonization department, Sapporo has been merely chief town of one of the three prefectures of the island. Its port is Otaru, 22 miles distant, with which it is connected by a railway which extends inland 40 miles to the coal mines of Poronai.

J. M. DIXON.

Saprophytes [Gr. *σάπρος*, rotten + *φυτόν*, a plant]: plants which live upon the organic matter of dead plants or animals, or at least on their dead parts, as distinguished from PARASITES (*q. v.*), which live upon and obtain their food from living plants or animals. They are all colorless plants, or at least they are not green, and have suffered a greater or less structural degeneration of their vegetative organs, as in the case of parasites. In fact the effect of saprophytism upon the plant appears to be essentially the same as that of parasitism, a result to be anticipated, since in some cases a parasite may become saprophytic, while in others a saprophyte may become parasitic.

Saprophytes occur in four of the six great branches of the vegetable kingdom. Thus of the protophytes, some of the bacteria are saprophytes. Of the phycophytes, the black

moths (*Microgaster*) and the water-moths (*Hydropsyche*) contain many saprophiles. In the saprophiles there are thousands of species of saprophiles, in many of the families of the fungi of the great classes *Ascomycetes* and *Basidiomycetes*, the latter well represented by the rosette, puff balls, etc. The *Hyphomycetes* and *Trichomycetes* contain no saprophiles, and in *Anthophytes* there are few, very species, which are strictly saprophiles. The *Indianas* (*Monotropa*) and their relatives are doubtfully saprophiles, and the same may be said of a few of the orchids. In the other hand, many farm and garden plants under cultivation, are partially saprophilic, obtaining much of their food from the decaying organic matter used for enriching the soil. The saprophiles in the vegetable kingdom are estimated at from 50,000 to 30,000 species, the greater portion of which are saprophiles. CHARLES E. BERRY.

Sap-rol: See **DRY RICE**.

Sapoteo Chino: a corrupt name used in the U. S. for *Passiflora* *chino*. See **CHINA**.

Sapoteo: the yellow-bellied woodpecker (*Sphyrapicus* *seco*) of North America, so named on account of boring its nest in other wood-eating trees to obtain the sap. It is readily recognized by its black throat and decidedly yellow under parts. F. A. L.

Sapoteo: See **ALABAMA**.

Saggarah, or **Makharah** (cf. Egypt, *Sakar*, or *Soker*): a name of Egypt, W. of the site of Memphis, which has given its name to a group of pyramids and to the ancient necropolis of Memphis. The necropolis was in use from the earliest dynasties down to Roman times. The earliest monuments are the pyramids and mastabas and the latest the tombs of the Apis bulls. The whole region is honey-combed with subterranean funeral chambers. The mastabas are rich in representations of scenes of ordinary life in the fifth and sixth dynasties, and some of the pyramids are inscribed with religious texts. The most notable of the Saggarah are the Step Pyramid (see **PYRAMIDS**), the tombs of the Apis bulls (see **SERAPHRIS**), and the tombs of early rulers, such as Ty and Ptahhotep, of the fifth dynasty (see **MENPHIS**). From Saggarah came the oldest cemetery in the world, that of a son of Pepi I. of the fifth dynasty, probably above 6,000 years old. C. R. G.

Saracenic Art: the art of the countries ruled by the Saracens (q. v.). The Arabs who followed Mohammed and his followers had little industry of the finer sort and no letters. With the singular ability they possessed of impressing ideas with their enthusiasm, making them reverences, embracing, talk, Arabic, and fight for Islam, they absorbed and assimilated the far more artistic races of the Mediterranean. The Byzantine style became their type in architecture. The workmen of Syria and Egypt developed new styles under the new dominion, as has been shown under **SARACENIC ART** (q. v.). Saracenic art therefore includes the great work of Syria, Egypt, Asia Minor, the islands, such as Cyprus and Rhodes, and, to its largest extension, of the North African coast and of Southern Spain, all from about 700 to 1400 A. D. Turkish art would thus be excluded by the date and Persian by its eastern situation. R. S.

Saraceni (from Lat. *Saraceni*, *Saracen*, a *Saracen*, from Arab. *Sarac*, *Sarac*, *Sarac*, deriv. of *Sarac*, east, deriv. of *Sarac*, rise): a name originally applied to a tribe or tribes inhabiting the eastern slopes of the Sinai, the great mountain range which reaches from Syria to Yemen (Glaser, *Saraceni*, *Saraceni*, and *Saraceni*, *Arabians*, Berlin, 1890, p. 206). Later Greek and Latin authors used this local name to designate the Semitic Bedouin tribes on the southern frontier of the empire, as even the *Arabians* as a whole (Ammianus 22:4, 23:1). After the rise of Islam, the use of the word was further extended, and included the followers of the prophet, wherever they might be. It has also been used as a term of reproach for wild, uncivilized, pagan, etc. See *Saraceni*, *Saraceni*, *Die Alte Geogr. Arabien* (Bern, 1875, 1880; C. Bousset, *Geographie, Hist. Melchiorische* (Lay-son, 1880, p. 196). See **MOORS**. RICHARD GOTTEN.

Saragosa (Spain, *Saragosa*, and *Cesaris Augusta*): name of the province of Saragosa, Spain; on the Ebro; 60 miles by rail N. E. of Madrid (see map of Spain, ref. 444). It was founded by the Phoenicians. Under the Romans it was a flourishing city, and reached the summit of its prosperity when (in 1118) it became the capital of the kingdom of Aragon. After the union of Aragon and Castile when Madrid became the royal residence,

Saragosa lost some of its splendor, and in 1808 it was nearly destroyed by the French, by whom it was twice besieged during the Peninsular war. The first siege lasted from June to Aug., 1808; the second began on Dec. 30, and the bombardment continued till Jan. 27, 1809, when the city was entered by general assault. The inhabitants offered a determined resistance, and it was not until Feb. 20 that the place capitulated; 80,000 lives were lost during the siege, mainly by disease. Of the two cathedrals, one is an old building in Gothic style and the other is a highly ornamental edifice of the seventeenth century, which contains a pillar upon which, it is said, the Virgin descended from heaven, 4. n. 40. The university (1474) is attended by about 800 students. Saragosa has also an academy of sciences, a library with 18,000 volumes, a law school, and a medical school. Cloth, chocolate, silk, soap, and hats are the principal industrial products. Pop. (1887) 92,407.

Saragosa, Mald of: See **LOUISIANA**.

Sarajva, *sa-ri-va*, *Josef Antonio*: statesman; b. in Bahia, Brazil, 1822. He graduated in law 1844; was president successively of Piahy, Alagoas, São Paulo, and Pernambuco; entered the lower house of parliament 1855, and became senator 1869; was sent on a special mission to the Rio de la Plata 1864, and was prominently connected with the events which led to the wars with Uruguay and Paraguay. As early as 1867 he formed part of a liberal ministry; later he became the leader of the moderate liberals, and from 1890 to 1897 was several times premier. H. H. S.

Sarajevo, *sa-ra-ye-vo*, *Serajewo*, or *Bosna Serai*, *bo-na-se-ri*: town; on the river Milatzka, near its junction with the Bosna; 122 miles S. W. of Belgrade (see map of Austria-Hungary, ref. 10-4). It was formerly capital of Bosnia, and is now of the Austro-Hungarian district of Serajewo. Because of its picturesque appearance and fine situation it is called by the Mussulmans the Damascus of the North. It has iron-works and manufactures side-arms, and is the commercial entrepôt of the province. Pop. (1885) 26,264. To the east, on a cliff 350 feet above the Milatzka, is the imposing castle, built in the thirteenth century by the Hungarian general Castroman, which has given the name to the town.

ROWEN A. GOSWICK.

Sarakhs, or **Serakhs**, *sa-ra-ks*: fort and town of military importance at the northeast angle of Persia; on the plain to the left of the Tajand or lower Heri-rod, where this stream enters the Tarooman plains. The fort is large but ill-provided, the town small and poor. Water is supplied by a canal 10 miles long to a point on the Tajand, where the water flows throughout the year. Opposite the town the stream has water only in the spring or after heavy rains. Sarakhs is of high strategic importance, and the numerous ruins of forts in the vicinity attest that this has long been recognized. Two or three miles to the E., on the other side of the river, is the Russian frontier post of Sarakhs, which is rapidly growing. M. W. H.

Sarasette, *PAULO MARTIN MELIUS*: violinist; b. at Pamplona, Spain, Mar. 10, 1844; entered the Paris Conservatory Jan. 1, 1856, and gained the first prizes for solfeggio and violin; studied harmony in Reber's class, and soon started on a successful career as a concert violinist. He has traveled through Europe and the U. S., playing with the greatest success. He has a very large repertoire and has composed much for the violin. D. E. H.

Sarasya'H (i. e. River of pools): the name of several streams of India. The principal one is a string of pools 125 miles long (fading itself in the sand several times and often dry in places), which rises in the Siwalik hills in the South-east Punjab and empties into the Ghaggar, which lower down loses itself in the Bikanir desert. It is the sacred river of the *Rig-Veda*, where it is referred to as a powerful stream, "the finest of the seven sisters," "the first in beauty and abundance." Many shrines and sacred places are scattered along its course. M. W. H.

Saratoff: government of Russia: W. of the Volga, and S. of Penza and Simbirsk. Area, 122,624 sq. miles. Although a large portion of the government consists of desert steppes, much rye, wheat, and oats is exported, bees and silkworms are extensively reared, and fisheries, distilleries, and many kinds of manufactures are in operation. Pop. (1890) 2,427,690, among whom are about 120,000 Protestant Germans.

Saratoff: city of Russia; capital of the government of Saratoff; on the Volga; 500 miles by rail S. E. of Moscow (see map of Russia, ref. 8-F). It has many fine public build-

ings of stone, 2 cathedrals, 30 churches, and a museum with a fine-art gallery and a library. It manufactures cloth, linen, tobacco, leather, earthenware, rope, etc., has large breweries, distilleries, vinegar-factories, and foundries, and carries on an extensive trade in grain, cattle, and fish. Pop. (1890) 123,410.

Saratoga, Battle of: a decisive battle of the Revolutionary war in the North American colonies. Burgoyne, in command of the British forces, had crossed the Hudson Sept. 13 and 14, 1777, and encamped his army on the heights and plains of Saratoga. Gates, who commanded the Americans, had in the meantime moved his army up to Stillwater and taken possession of Bemis's Heights, to the S. of Saratoga, near the river—a strong position—which he fortified. On Sept. 19 Burgoyne attacked the left wing of the American army under Benedict Arnold, and succeeded in holding the field, though he sustained a loss of over 500 men, that of the Americans falling below 400. Burgoyne then discovered that he had a dangerous foe in his front. He also learned of the capture of his fleet of boats laden with supplies by Lincoln's militia in his rear, and the destruction of his communications with Canada; but, receiving promise of aid from Sir Henry Clinton from below by way of the Hudson, he fortified his position and awaited the latter's coming. As Clinton did not arrive, Burgoyne, finding himself in danger of being cut off from retreat, and his supplies being nearly exhausted, determined to risk a battle, and on Oct. 7 advanced at the head of 1,500 men, with six pieces of artillery. His right was at once attacked by a New Hampshire brigade and Morgan's riflemen. Arnold, who had been relieved from command after the battle of Bemis's Heights owing to some misunderstanding with Gen. Gates, and acting without orders, placed himself at the head of the troops, and with great daring and recklessness led them into action. The British lines were repeatedly broken and Burgoyne with difficulty regained his camp, but with the loss of his able second, Gen. Frazer. Gen. Arnold was also severely wounded in the leg. Renewing the assault, the Americans gained a lodgment in the camp, when darkness put an end to the conflict. During the night Burgoyne retreated and took possession of the heights in his rear. Afraid of being surrounded, he continued his retreat next day to Saratoga. As he received no aid from Clinton, and as every line of retreat was closed to him, it was decided in council to propose a cessation of hostilities while terms of capitulation were being negotiated. Gates at first demanded an unconditional surrender, which Burgoyne refused, but on the 17th terms were agreed upon—the British to march out with the honors of war, and be permitted to embark for England, on condition of not serving against the U. S. again during the war. The number of prisoners surrendered was 5,752. Gates's army numbered upward of 10,000. The terms of the surrender were not ratified by Congress, Burgoyne's army being retained as prisoners until the close of the war. Burgoyne and several other officers, however, were permitted to depart; forty-two guns, between 4,000 and 5,000 muskets, and a large supply of ammunition were among the valuable captures.

Revised by F. M. COLBY.

Saratoga Springs: village (incorporated in 1826); Saratoga co., N. Y.; on the Adirondack, the Del. and Hudson, the Fitchburg, and the Sar. Mt. McGregor and Lake George railways; 38 miles N. of Albany, 182 miles N. of New York (for location, see map of New York, ref. 4-J). It is in the foot-hills of the Adirondack Mountains, has a small valley running through its center, is one of the most famous summer resorts, and is noted for the number and variety of its mineral springs. It is also widely known for the political conventions that have been held here. The village has the Holly system of water-works, supplied from mountain springs; efficient fire department; electric street lights; 3 public parks, Woodlawn, Yaddo, and Congress; several art galleries; and a large number of costly summer residences. It has wide, clean streets and extensive drives.

There are nearly forty mineral springs, of which the best known are the Congress, Vichy, Hathorn, Kissingen, Victoria, High Rock, Carlsbad, Red, Columbian, Royal, Magnetic, Geyser, Patterson, Favorite, Excelsior, Empire, and the Star. They are alterative, diuretic, cathartic, and tonic. (See also MINERAL WATERS.) Four miles E. is Saratoga Lake, a favorite place for regattas, with a straight-away course 3 miles long and wide enough to accommodate fourteen racing sculls abreast. The Saratoga Racing Association has grounds

near the village, with a mile-track and a grand stand accommodating 5,000 persons, and Woodlawn Oval, with the Saratoga Athletic Clubhouse, in the north end, has all conveniences for track and field sports.

The principal public buildings are the new Convention Hall, seating 5,000 persons (cost \$100,000); the town-hall, containing the courts and theater; and the armory of the Twenty-second Separate Company, N. G. S. N. Y. Of hotels, the largest are the Grand Union, the United States, and Congress Hall. These, with eight other large and numerous small ones, have accommodations for 40,000 guests. During the summer season they expend \$40,000 for orchestral music.

There are 2 Presbyterian, 2 Baptist, 2 Methodist Episcopal, and Congregational, Protestant Episcopal, and Roman Catholic churches. The educational institutions comprise seven public schools, including an academic and central grammar school, with enrollment of 2,300, and annual cost of \$40,000, and the Temple Grove Female Seminary, with accommodations for 200 pupils. The charitable institutions include the Children's Home, the Emergency Hospital, and the Home of the Good Shepherd. There are three libraries (Athenæum, Temple Grove Seminary, and Union Free School) with about 10,000 volumes, and a monthly, 2 daily, and 6 weekly periodicals. The annual receipts and expenditures of the village are about \$125,000 each; bonded debt, \$200,000; property valuation, \$6,000,000. In 1895 there were 2 national banks, with combined capital of \$225,000 and surplus of \$155,000. The principal industries are the bottling of mineral waters and the manufacture of medical supplies.

The name Saratoga is derived from the Indian, meaning "Hillside of the Great River." The territory was deeded, by the Indians to the Dutch in 1684. Rip van Dam was the first white owner of the original springs, and Sir William Johnson was the first who thoroughly tested their efficacy. The first hotel was established in 1774. Some of the mineral waters have been bottled and exported to various parts of the world since 1826. The Saratoga battle-field, where Gen. Burgoyne surrendered to Gen. Gates on Oct. 17, 1777, is 12 miles S. E. of the village. Pop. (1880) 8,421; (1890) 11,975; (1895) estimated, 15,000.

LA MONTE WALDRON, EDITOR OF "DAILY SARATOGIAN."

Sarawak: a British dependency on the northwest coast of Borneo. It was granted in 1842 to Sir James Brooke, with the title of rajah, by the Sultan of Brunei. He was succeeded in 1868 by his nephew, Sir Charles Brooke, and in 1888 the state was placed under the protection of Great Britain. Area, 50,000 sq. miles. Pop. about 300,000, consisting of native races—Malays, Dyaks, Tayans, and Muruts, as well as some Chinese. The capital, Kuching, has about 25,000 inhabitants, and carries on a large and steadily increasing trade in timber, edible birds' nests, gutta-percha, sago, antimony ore, and rice, in exchange for which it imports European manufactures and tobacco. The revenue for 1893 was \$457,123; expenditure, \$478,198.

Revised by M. W. HARRINGTON.

Sarcocolla [= Lat. = Gr.; *sarx*, *sarx*, flesh + *κόλλα*, glue] a nauseous gum-resin produced by *Penae sarcocolla*. *P. mucronata*, *Sarcocolla vulgaris*, etc., evergreen shrubs of the order *Penaeaceae*, ranging from the Euphrates to the Cape of Good Hope. It is seldom used in civilized regions.

Sarcophagus [= Lat., from Gr. *sarxophagos*; scil. *αἶμα*, *liter.*, flesh-consuming stone; *sarx*, *sarx*, flesh + *φαγῆναι*, eat]; primarily a limestone found in Assos in the Troad, used for making coffins which were supposed to have the property of destroying the corpse within a brief period. The name came thus to be applied to all stone coffins, and loosely also to any large coffin of other material. The earliest specimens are those of Egypt, which were made of granite, basalt, limestone, alabaster, and jointed wood. In the course of time the forms underwent considerable change. The earliest are from the fourth dynasty and are rectangular, with a flat or curved cover, with little or no ornamentation, and in the shape of an Egyptian house. From the Middle Kingdom the specimens are mainly of wood, the tops being intersected by lines of inscriptions, with figures of gods in the open spaces. Outside they were painted and adorned with false doors, while the interiors were adorned with sacred texts. In the New Kingdom both stone and wood were used, and a more artistic form employed. Sacred texts were placed on papyrus rolls instead of on the coffins, so that the flat sides were no longer needed for this purpose. As a consequence a

lunar shape was given to the coffin, and the deceased was thus represented lying at full length. In the latter dynasty the rectangular shape was again employed, and in those times the wooden coffin was customary. Among other people the sarcophagus has been more or less employed and various beautiful forms have been discovered, but their great use has been an essential bar to their general use. The term in its etymological significance has nothing to do with the Egyptian conception of the sarcophagus; rather the two are historically opposed.

CHARLES R. GILBERT.

Sarcoplasm: See HORMONY (Muscular Tissue).

Sarcosine [from Gr. *sarx*, *sarx*, flesh]: a product of the decomposition of Oxalic acid (q. v.), the crystalline constituent of juice of flesh, discovered by Chevreul. It forms mother crystals, soluble in water with ease, but insoluble in ether and with difficulty in alcohol. It is neutral in reaction, though it forms salts with acids, which react with carbonate is obtainable from other sources than from oxalic acid or by the action of methylamine on chlorosulfate of acid.

Revised by I. A. REMERS.

Sari: See CHALCEDONY.

Sardapappus [Latin form of the Assyrian name]: according to an inaccurate classic tradition, the last king of Assyria. He was noted for avarice and voluptuousness, and in order to escape falling into the hands of the besiegers of Nineveh, ended his worthless life by burning himself in his palace. It seems certain that the original of Sardapappus is Ashurbanipal, King of Assyria, 668-626 B. C. His brother, King of Babylon, who made war against him, was Sardanapallus, and this may be the source of the story that Ashurbanipal was burned. It is also possible that one of his weak successors, on the Assyrian throne met this fate, especially the one reigning at the time of the capture and destruction of Nineveh. Ashurbanipal's large library was mostly a matter of statistics, a form of alliance with the king of some other country. The story related by late classic writers of the tomb erected for himself, with an epitaph stating that there is nothing of life beyond eating and drinking, had its rise, of course, in one of those triumphal monuments which Assyrian kings were accustomed to set up in conquered lands, like the one of Sargon, Ashurbanipal's great grandfather, found on Cyprus in 1845. Ashurbanipal's title to fame and gratitude is the library of clay tablets in the cuneiform character which formed part of his great treasure at Nineveh. Many thousands of these tablets are now in the British Museum. Cf. Carl Bezold's *Catalogue of the Cuneiform Tablets in the Kouyunjik Collection of the British Museum* (3 vols., London, 1899-1903). Many of the best Assyrian two-reliefs have likewise come from the palace of Ashurbanipal.

D. G. LLOYD.

Sardis: See SARDIS.

Sardine (from Lat. *sardinia*, from Gr. *Σαρδία*, Sardis): a name applied to a number of fishes belonging to the family Clupeidae and especially to those preserved in oil and pickled in its brine. The true sardine of the Mediterranean and contiguous ocean is the *Sardinella* or *Clupea pilchardus*, and a very near relative of this species (*Sardinella sagax*) is found in the Atlantic ocean. The sardine of the Mediterranean is small, sleek, and partly dried, then scalded in hot oil, and finally hermetically sealed in tin boxes with hot salted oil and butter. The space space in each box is filled with salt, and, the lid having been soldered on, the box is closed by a short time to the action of steam or hot water. These sardines are largely exported to various countries, where they are esteemed as a delicacy. The real sardine is something like a small pilchard; but many of the fish used as sardines, especially those prepared on the Atlantic coast of France, are sprats, pilchards, or small herrings. The sardines of the U. S. and British North America are small herrings, and even the mahaden (*Brevoortia meridionalis*) See FORESTERS.

Revised by F. A. LUCAS.

Sardinia, an island belonging to Italy in the Mediterranean Sea, nearly halfway between Spain and Italy and between Europe and Africa, and S. of Corsica, from which it is separated by the Strait of Bonifacio, 74 miles wide. It is divided into the two provinces of Cagliari and Sassari. Area of the island, 9,844 sq. miles. Pop. (1893) 741,362. A range of mountains—whose highest peak, Gennargentu, situated about in the center of the island, rises 6,233 feet—traverses the island from N. to S., and sends out branches to both sides. These mountains are in some places completely naked

and barren, but in others they are covered with forests or with fine pastures, and almost everywhere they contain marble, alabaster, lead, copper, iron, rock-crystal, etc., though mines and quarries are not much worked. Between the foothills of the central range lie large tablelands or slightly sloping valleys, in which sandy and stony districts alternate with tracts of fertile soil. Along the coasts, which are in most places steep and rugged, are found extensive salt-marshes and lagoons, which are very unhealthy owing to malaria. Some improvement, however, is being effected by drainage-works. Agriculture takes the first place among the occupations of the inhabitants, in spite of backward farming and heavy taxation. Wheat, maize, and beans, wine, olives, figs, and oranges, tobacco, linseed, cotton, hemp, cheese, butter, and wool are raised in large quantities. Horses are extensively bred, and considerable numbers of cattle, sheep, etc., are kept. The fisheries along the coasts, especially of tunny, anchovies, and sardines, are valuable, but are mostly in the hands of foreigners. Salt is the only manufacture of any importance. In 512 B. C. the island was conquered by the Carthaginians, from whom it was wrested by the Romans in 238 B. C. For several centuries after the time of Thierius it prospered greatly, and was one of the principal granaries of the Roman empire. While owing allegiance to the Eastern empire and the pope it was overrun by the Goths, Vandals, and Saracens. In 1496 it came into the possession of Aragon, and, after a brief period of Austrian rule, in 1720 was given to the house of Savoy, under which it was long neglected. Old forms of society kept the majority of the population in ignorance and indolence, while feudal tenure and feudal jurisdiction were not finally abolished until 1850.

Revised by R. A. REMERS.

Sardinia, Kingdom of: a former kingdom, comprising Savoy, Piedmont, Genoa, and Sardinia, with a total area of 28,769 sq. miles, and a population of over 5,000,000. It was formed Aug. 24, 1720, by a treaty between Austria and Victor Amadeus II., Duke of Savoy. The house of Savoy began to make itself felt in the history of Europe as early as the eleventh century, partly by the loyalty and vigor with which its members supported the emperors against the popes, partly by the shrewdness with which they managed to profit by the wars between Germany and France, in which they could not help being implicated. In 1311 Amadeus III. was created Count of Savoy by the Emperor Henry V., and in 1416 Amadeus VIII. was created Duke of Savoy by the Emperor Sigismund. In the war of the Spanish Succession (1700-18) Duke Victor Amadeus II. (1676-1700) was a claimant for the Spanish throne, and by the treaty of peace at Utrecht (1713) he received the island of Sicily and the title of king. Sicily he was compelled to yield to Austria in 1730, but as a compensation he received the island of Sardinia, from which he took his title of king, and thus was formed the kingdom of Sardinia. In 1801 the elder line of the house of Savoy failed, and the younger line ascended the throne with Charles Albert (1801-49). In his foreign policy Charles Albert was rather unsuccessful, but his interior administration was prudent and vigorous. The material resources of the country were developed with great sagacity, and the state was brought to a most prosperous condition. In 1848 he granted a free constitution, and the whole of Italy looked naturally to Sardinia and Charles Albert as the leaders in a war for liberty and independence. Charles Albert declared war against Austria, but on Mar. 23, 1849, was thoroughly defeated at Novara. He resigned the crown to his son, Victor Emmanuel II., who succeeded in the task of uniting the scattered Italian nation into one free state, for a history of which see ITALY.

Sar'dis, or **Sardes** [= Lat. = Gr. *Σάρδεις*; Turk. *Sart*]: ancient city of Asia Minor; capital of Lydia; situated at the foot of Mt. Tmolus, on the river Pactolus. Under Croesus and its subsequent masters, the Persians, it was one of the wealthiest and most magnificent cities of Asia Minor. Declining under the Romans, and utterly destroyed by earthquake during the reign of Tiberius, it was rebuilt but never regained its former importance. In 1401 it was razed to the ground by Tamerlane, and its site has been almost abandoned ever since. Among its ruins a theater, stadium, gymnasium, the temple of Cybele, and two early churches may be distinguished. One of the "seven churches of Asia" was at Sardis (Rev. iii. 1-5).

R. A. GROVESOME.

Sardonyx: See CHALCEDONY.

Sardon, sār'don, VICTORIEN; dramatist; b. in Paris, Sept. 7, 1831; studied medicine, then history; gained his liveli-

hood as a teacher and by writing for papers, magazines, and cyclopædias; tried his fortune as a dramatist in 1854 with the *Taverne des Étudiants*, which failed; tried again in 1860 with *Candide* and *Monsieur Garat*, which succeeded; and then wrote a number of plays with a rapidity almost unparalleled: *Les Pattes de Mouche*, *Piccolino*, *Les Femmes fortes*, and *Nos Intimes* in 1861; *Les Ganaches*, *La Papillonne*, and *Les Premières Armes de Figaro*, in 1862; *Bataille d'Amour* and *Les Diables noirs* in 1863; *Don Quichotte* and *Les Pommes du Voisin* in 1864; *Les Vieux Garçons* and *La Famille Benoitton* in 1865; *Nos Bons Villageois* and *Maison neuve* in 1866, etc. Most of these plays made a great and decided success, and the author took rank by general consent as the first playwright of his age, ruling the stage wherever there is one. The most prominent of his later works are *Séraphine* (1868); *Patrie* (1869); *Fernande* (1870); *Divorçons* and *Daniel Rochat* (1880); *Odette* (1881); *Fédora* (1882); *La Tosca* (1887); *Cléopâtre* (1890); *Thermidor* (1891); *Gismonda* (1894). He received the decoration of the Legion of Honor in 1863, and was received as member of the French Academy May 23, 1878.

Revised by A. G. CANFIELD.

Saree': town; in the province of Mazanderan, Persia; on the Tejen, 18 miles from its mouth in the Caspian Sea (see map of Persia and Arabia, ref. 2-H); center of a rich and fertile country; is an old place, mentioned by Firdausi, but long ago lost its importance. In 1836 cholera destroyed nearly the whole population, and since that time it has been rising very slowly. Pop. estimated at 8,000.

Sargas'so Seas [*Sargasso* is from Span. *sargazo*, seaweed]: areas in the North Atlantic, North Pacific, and other oceans, having an abundance of the seaweed *Sargassum bacciferum*. The best known is that in the North Atlantic, which is the central area of a whirl of currents, and is a region of light winds. It extends from the Azores to the Antilles, and from lat. 16° N. to lat. 38° N., but the sargasso is most abundant W. of lon. 45° W. The seaweed is found in the Gulf Stream and neighboring waters, and is often cast upon the shores of the West Indies and Florida. In the Sargasso Sea it is in streaks, often scores of feet long, or in islands which may cover many acres, but the outlines of which are constantly changing. It forms a thin superficial layer and offers no resistance to ships. There are twenty to twenty-five plants, on the average, to each square mile, and each plant when pressed together makes from a pint to a quart when wet, or about one-eighth of this when dry. The plant vegetates freely on the Sargasso Sea, but has not been found fructifying there. Its color is greenish olive, varying with age from yellowish to whitish, and bears many berry-like lumps or floats. The patches of seaweed have a veritable fauna of fish, crustaceans, and molluscs numbering sixty or seventy species, several of which have developed marked features of protective imitation. One remarkable fish (*Antennarius marmoratus*), 2 to 4 inches long, can be distinguished from the plant only by close inspection. The Sargasso Sea has remained substantially in the same place and with the same characteristics for the 400 years since Columbus's first voyage.

MARK W. HARRINGTON.

Sargent, AARON AUGUSTUS: U. S. Senator; b. at Newburyport, Mass., Sept. 28, 1827; was in early life a printer and editor; emigrated to California in 1849; studied law while editing *The Nevada Journal*; was admitted to the bar 1854; was district attorney of Nevada County 1855-56; vice-president of the Republican national convention at Chicago 1860; M. C. 1861-63 and 1869-73, and U. S. Senator for the term 1873-79. Became U. S. minister to Germany 1882; resigned in 1884. He was the author of the first Pacific railway act passed by Congress. D. in San Francisco, Cal., Aug. 14, 1887.

Sargent, CHARLES SPRAGUE: arboriculturist; b. in Boston, Mass., Apr. 24, 1841; graduated at Harvard College 1862; from that time served in the Union army until the close of the civil war, attaining the rank of major; then traveled in Europe; appointed director of the Arnold arboretum and botanic garden of Harvard College in 1872, holding that position six years; in 1878 appointed Arnold Professor of Arboriculture in Harvard College; in 1879 became special agent of the tenth census to collect statistics in regard to the forests of the U. S.; became head of the forest division of the northern transcontinental survey; in 1888 became editor of *Garden and Forest*; has written many papers for scientific and other journals on botany, forestry, etc. He is the author of *Report on the Forests of North America*

(being vol. ix. of the *Reports of the Tenth Census of the United States, 1883*); *The Woods of the United States, with an Account of their Structure, Qualities, and Uses* (1885); *The Silva of North America* (begun in 1891); and *Notes on the Forest Flora of Japan* (1894).

Revised by CHARLES E. BESSKY.

Sargent, EPES: journalist and author; b. at Gloucester, Mass., Sept. 27, 1813; educated at the Boston Latin School and Harvard College; was editorially connected at different times with the *Boston Advertiser* and *Atlas* (1837), the *New York Mirror* (1839) and *New Monthly Magazine* (1845), and the *Boston Evening Transcript* (1846). In 1847 he settled at Roxbury, near Boston, and devoted himself entirely to literary work. He was an industrious compiler of readers and speakers for schools; edited many reprints and collections, and wrote a number of successful plays, such as the *Bride of Genoa* (1836) and *Velasco* (1837), besides tales for the young, poems, and novels, some of which were once popular, but are mostly forgotten. Some of his songs were spirited and were set to music. The best known of them is *A Life on the Ocean Wave*. Perhaps his *Life of Henry Clay* (1842) and his *Songs of the Sea* (1847) have the best title to remembrance among his original writings. D. in Boston, Dec. 31, 1880.

H. A. BEERS.

Sargent, JOHN SINGER: portrait and figure painter; b. in Florence, Italy, of American parents, in 1856; pupil of Carlus Duran, Paris; honorable mention, Paris Salon, 1878; second-class medal, Paris Salon, 1881; medal of honor, Paris Exposition, 1889; Legion of Honor 1889. He is one of the greatest living portrait-painters. His works are distinguished by consummate technical skill, and are excellent in the representation of character. He has painted many portraits in Paris, London, New York, and Boston. He lived in Paris for a number of years, from about 1872 to 1885, then went to London where he has since resided. He visited the U. S. in 1888, 1889, and 1891. His picture of a Spanish dancer, *La Carmencita*, first exhibited at the Society of American Artists, in New York in 1890, was bought by the French Government in 1892. He is a member of the Society of American Artists (elected 1880), an associate member of the National Academy, and a member of the Société Nationale des Beaux-Arts, Paris.

W. A. C.

Sargent, WINTHROP: soldier; b. at Gloucester, Mass., May 1, 1753; graduated at Harvard 1771; became captain of one of his father's ships 1775; navy-agent at Gloucester 1776; served at the siege of Boston as captain of artillery, and subsequently in the Long Island, New Jersey, and Pennsylvania campaigns, attaining the rank of major; was connected with Gen. Rufus Putnam's Ohio Company; was made by Congress surveyor-general of the Northwest Territory 1786; became its secretary 1787; was its Governor 1798-1801; was adjutant-general of St. Clair's expedition against the Miami Indians 1791, and in Wayne's expedition 1794-95, being wounded in the former; was a member of the American Academy of Arts and Sciences and of the Philosophical Society, and an original member of the Society of Cincinnati as delegate from Massachusetts; aided Dr. Benjamin S. Smith in preparing his *Papers Relative to certain American Antiquities* (1796); published *Boston*, a poem (Boston, 1803); was Governor of Mississippi Territory 1790, and again 1801. D. in New Orleans, June 8, 1820.

Sargent, WINTHROP: author; grandson of Maj. Winthrop Sargent; b. in Philadelphia, Pa., Sept. 23, 1825; graduated at the University of Pennsylvania 1845, and at Cambridge Law School 1847; practiced his profession in Philadelphia, and subsequently in New York; edited from original MSS., with a valuable introductory memoir, *The History of Braddock's Expedition against Fort Duquesne* (Philadelphia, 1855); edited *The Loyalist Poetry of the Revolution* (1857) and several reprints of curious Revolutionary tracts; and was author of *The Life and Career of Major John André, Adjutant-General of the British Army in America* (Boston, seventy-five copies only, 1861), a work of extraordinary research. He wrote largely for *The North American Review* and other magazines; was an accomplished bibliographer; was for many years engaged in preparing a *catalogue raisonné* of books relating to America (unfinished). D. in Paris, France, May 18, 1870.

Sar'gon [Assyr. *Sharru-kenu*, the true king]: King of Assyria 722-705 B. C.; founder of the last and most illustrious Assyrian dynasty 722-606 B. C. He appears to have been a usurper, though probably of royal stock. Numerous records

of life began, written on clay cylinders and papyrus and on golden tablets, and give a full picture of the royal activities. He was a great general and waged successful wars with the Thubians, Egyptians, Philistines, Hebrews, and many other peoples. In his first year he took Jerusalem, carried the leading inhabitants of Israel into exile, repossessed the land by captives from Babylonia and elsewhere, and thus set an end to the kingdom of Israel. But for the moment, one might suppose (from 2 Kings xvii), that this was done to Sargon, the predecessor of Sargon. In the closing years of his reign he built a new palace at Khorsabad, near Nineveh, where he was murdered 705 B.C. (See ARYAN and ARYANIAN EXPLORATIONS). In the *Kudurrû-Nûr* (vol. 1, Leipzig, 1889) Hugo Winckler has given all accessible Sargon inscriptions in transliteration and German translation. The perfect to the source gives the earlier bibliography; vol. ii (Leipzig, 1899) gives the inscriptions in the same form. D. G. LYNCH.

Sarmat'ia (in Gr. *Sarmatia*): the ancient name for the vast region extending from the Baltic to the Black Sea, and from the Volga to the Vistula.

Sarmiento, sár-men-tyó, DOMINGO FAUSTINO: statesman and educator; b. at San Juan (now in the Argentine Republic) Feb. 18, 1811. He was poor, and from his sixteenth year engaged in teaching, for which he showed a great aptitude, the idea of promoting popular education became a passion with him even while his own studies were hampered by lack of means. In 1830 he fought against Rosas and Goyena, and was forced to fly to Chile. Returning to San Juan in 1836, he established a newspaper; this, though not a political sheet, was seized, and after suffering imprisonment he again fled to Chile. Encouraged by Manuel Montt and others, he was able to carry out some of his educational schemes, established a normal school at Copiapó and from 1844 to 1847 lectured in Europe and the U.S., studying school systems. The results of these studies were embodied in 1847 in a report to the Chilean Government, which was published and had a wide circulation. In 1852 he took part in the overthrow of Rosas. From that time, aided by the Government, he devoted himself to the cause of popular education in Buenos Ayres and the provinces. In 1856 he organized the department of public instruction, of which he became the chief. He was Minister of Public Instruction 1860, and at the latter in 1861; subsequently was governor of San Juan and minister to the U.S., and while occupying the latter position was elected president of the Argentine Republic. During his term, Oct. 12, 1868 to Oct. 12, 1874, the Paraguayan war was brought to a successful close, and an insurrection was put down. The president was indefatigable in promoting education; schools and colleges were founded in all parts of the country; American and European teachers were invited to Argentina, and a national observatory was established. At the same time railways and other improvements were rapidly pushed forward. Dr. Sarmiento was debarred from election only by the constitutional provision. Among his numerous published works are biographies of Lincoln and Quirós, and *Crónicas y heróicas*. D. at Asunción, Paraguay, Sept. 11, 1888. HERBERT H. SMITH.

Sarmiento de Gamboa, sár-men-tyó (often written Pedro de Sarmiento Gamboa): navigator; b. in Galicia, Spain, about 1500. He was long prominent on the Peruvian coast, and was with Mendana in the discovery of the Solomon Islands, 1569. In 1579 he was sent from Callao with a fleet of seven vessels to explore the Strait of Magellan and instruct Drake, who was expected to return that way; Drake missed the Pacific and returned by the Cape of Good Hope; the Sarmiento explored the coasts of the strait and returned in 1580 to Spain, where he submitted a report of his voyage (published). Philip II. resolved to fortify the strait; he then prepared to dispatch Sarmiento, toward the end of 1582, with twenty-four vessels and 2,500 men; Diego Flores Valdez was associated with him. Eight vessels were lost in a storm, and at the entrance of the strait Valdez deserted with his men. In Jan., 1583, Sarmiento established a colony of 400 men at San Felipe (afterward called Port Famine), and returned to Europe, but was captured by an English vessel and kept a prisoner until 1588. Nearly all the colony died of starvation; a survivor was rescued by Cavendish in 1587, and another by Meric in 1589. Sarmiento died soon after his release. HERBERT H. SMITH.

Sarnia: a port of entry; capital of Lambton county, Ontario, Canada; it is situated at the head of Lake St. Clair, and opposite the Michigan town of Port Huron, and is the

terminus of a tunnel under the St. Clair river (see map of Ontario, vol. 5-B). Point Edward (formerly Port Sarnia) is a northern suburb of the town. Sarnia has thriving manufacturing, and extensive commerce by rail and steamers. Pop. (1901) 6,694.

Sarno: town of Southern Italy, province of Salerno, about 12 miles N. of the city of Salerno (see map of Italy, vol. 7-F). It is situated on the western slope of the spur of the Apennines which divides the valley of the Volturno from that of the Sarno. Silk, cotton, linen, and hempen fabrics are manufactured and exported. Besides the more common products of Southern Italy, cotton is grown extensively in the vicinity. Pop. 11,681.

Sarpe'don (in Gr. *Sarpedon*): in Greek mythology, son of Zeus and Laodamia, grandson of Hecuba, Prince of Lycia. He fought on the side of Troy in the Trojan war, and was slain by Patroclus. His body was carried back to Lycia by the brothers Sleep and Death, where it was given honorable burial by his kinsmen. The story is told in the *Iliad* of Homer. J. R. S. S.

Sarpi, sár-pe, Pietro, commonly known under his monastic name, Fra Paolo: ecclesiastic and historian; b. at Venice, Aug. 14, 1582; entered the order of the Servites in 1595; became provincial in 1579 and procurator-general in 1585. As such he resided at Rome, where he enjoyed great favor at the papal court, and kept up constant intercourse both with leading churchmen like Bellarmine and with the foremost scientists of the day. While his eagerness for knowledge was thus stimulated, his faith seems to have been weakened and he was regarded with suspicion. In 1595 he returned to Venice and devoted himself for some years to the study of mathematics, physics, astronomy, and medicine. Several important discoveries—that, for instance, of the circulation of the blood—have been ascribed to him, but the evidence in his favor is insufficient. In 1606 the republic chose him her counselor and theologian in the controversies with Pope Paul V. concerning the relations between Church and state. Sarpi opposed the papal claims with great energy, and wrote several works against the censures pronounced by Rome, and especially against the interdict under which the Venetian republic was placed. At different times attempts were made upon his life, and, in spite of his caution, he was dangerously wounded Oct. 5, 1607. After his recovery he was offered a private residence by the government, but he preferred to spend the rest of his days in his monastic cell, where he died Jan. 14, 1623. His chief work, the *Istoria del Concilio Tridentino*, was published in London in 1619, through the agency of Marco Antonio de Dominis, and under the pseudonym *Pietro Soave Polano*. It was translated into English in 1629 and 1676. It was ably written, but its partisan spirit and erroneous statements called forth several rejoinders, the principal one being Pallavicini's work on the same subject (1656). A collected edition of his works, including his letters, appeared at Venice in 6 vols. in 1677. His *Life* was written by Bianchini in 1596 and by Miss A. G. Campbell in 1875. See also T. A. Trollope, *Paul the Pope and Paul the Friar* (London, 1860), and *Fra Paolo Sarpi, the Greatest of the Venetians*, by Rev. Alexander Robertson (London, 1894). These accounts are favorable. On the other side, see Gino Fontanini, *Storia Arcana della Vita di Pietro Sarpi* (1863); C. Cantù, *Gli Eretici d'Italia* (1870); and the *Civiltà Cattolica*, sixth series, vol. xii. (1867). J. J. KEASE.

Sarracenia [Mod. Lat., named in honor of Dr. Sarrasine, of Quebec]: a genus of North American herbs of the family *Sarracenaceae*, remarkable for the expanded petal-like style, and especially for the hollow pitcher-shaped leaves (see *PITCHER-PLANT*), usually half full of water, and containing many drowned insects. Of the six species *S. purpurea* is the commonest. Its roots, and those of *S. variolaria*, at one time had a great reputation as a remedy in smallpox.

Revised by CHARLES E. BERRY.

Sarsaparilla [from Span. *sarsaparilla*; *sarsa*, bramble, and probably *Parillo*, the name of a physician]: the dried roots of certain species of smilax, indigenous in the northern part of South America and in Central America, especially *Smilax affinis* and *S. medina*. The medicinal species of smilax are climbers, growing from a large woody rootstock, from which long fleshy roots grow horizontally in all directions. These vary in thickness from that of a quill to that of the little finger, and consist of a thick cortical portion covered with a thin epidermis of various colors, a

thin ligneous layer, and a central medulla, which often abounds in starch. The roots have scarcely any smell, but when chewed produce a disagreeable acrid impression in the mouth, which persists for some time. Sarsaparilla contains a crystallizable principle called parillin, upon which such medicinal virtues as the drug possesses most probably depend. There are various sorts of sarsaparilla, obtained from different localities, which are most easily grouped into the mealy and non-mealy, according to the proportion of starch they contain. Of the mealy are Honduras, Guatemala, and Brazilian or Lisbon sarsaparilla, and of the non-mealy Jamaica, Mexican, and Guayaquil. Sarsaparilla was at one time held in high esteem as a medicine, principally as a remedy for syphilis, but it is now accorded but feeble power, and where used is prescribed simply to assist the action of more potent drugs.

Revised by H. A. HARE.

Sarsfield, PATRICK, Earl of Lucan: Jacobite soldier; b. in Ireland about 1645; served on the Continent in the English Life Guards, under the Duke of Monmouth, and against him at Sedgemoor 1685; was at the Revolution a member of the Irish Parliament and one of the wealthiest and most influential Irish Roman Catholics; adhered to the cause of King James, to whom he offered his services in 1689; fought at the battle of the Boyne July 1, 1690; surprised the English artillery before Limerick, and compelled William III. to raise the siege Aug., 1690; commanded the Irish reserve at the battle of Aughrim July 12, 1691; exhibited great gallantry in the second defense of Limerick; obtained honorable conditions of surrender Oct., 1691; retired to France with a corps of Irish volunteers; distinguished himself at Steenkirke Aug., 1692, and was killed at the battle of Landen July 19, 1693.

Sartain, JOHN: engraver, designer, and literary editor; b. in London, England, Oct. 24, 1808; became an engraver and did some important work, including some of the plates for William Young Ottley's works on early Italian prints. He removed to the U. S. in 1830, and settled in Philadelphia. He is generally thought to have introduced mezzotint engraving into America. He also practiced oil-painting and miniature-painting on ivory and vellum. Afterward he was editor and proprietor of *The Foreign Semi-monthly Magazine*, and having bought *The Union Magazine* renamed it, and became the founder of *Sartain's Union Magazine*. He was the designer of several public monuments, among which is that to Washington and Lafayette in Monument Cemetery, Philadelphia.

Revised by RUSSELL STURGIS.

Sarthe, sãrt: department of France, extending on both sides of the Sarthe; comprises an area of 2,396 sq. miles. The surface is mostly level, and the soil often light and sandy. Wheat and wine are produced, but the rearing of cattle, poultry, and bees is the chief occupation. The manufactures comprise iron, glass, porcelain, and falence. Capital, Le Mans. Pop. (1891) 429,737.

Sarti, GIUSEPPE: composer; b. at Faenza, Italy, Dec. 28, 1729; received his musical education in Bologna; composed his first opera in 1752, *Pompeo in Armenia*, which had success; was director of the opera at Copenhagen 1756-65; visited London in 1769-70; was chapel-master at the Cathedral of Milan 1779-84; went in that year to St. Petersburg as director of the opera. D. in Berlin, July 28, 1802. He composed over thirty operas, of which none, however, made any great impression, but of his church music his terzetto, *Amplius Lava Me*, is still remembered. He was the teacher of Cherubini.

Sarto, ANDREA, del; properly ANDREA D'AGNOLO, named *del sarto*, or [son] of the tailor, from his father's calling: painter; b. probably at Gualfonda, in Tuscany, in 1487. It is commonly stated that his family name was Vannucchi. He was apprenticed to a goldsmith, then to Giovanni Barile, a Florentine painter of no eminence, and finally to Piero di Cosimo, an artist of ability, with whom Andrea remained for some years. He was still a very young man when he painted the frescoes at the convent of the Servi, in Florence, on the square of the Annunziata, and those of the convent of the Scalzo in the old Via Larga, now Via Cavour. By the time he was twenty-five he was one of the best fresco-painters in Florence, and also a consummate painter in oil. From that time until his death he was the generally accomplished artist, capable of any kind of work, and incapable, in a sense, of error, as his nickname, *Andrea senza errore*, suggests. Without great elevation of style or much originality of conception, he was still a painter of delightful pictures,

the color of which is especially to be enjoyed. In 1518 he went to the court of France and painted for King Francis I., and the story is told that the king intrusted money to him to be used in the purchase of pictures in Florence, and that Andrea misappropriated it. He was certainly in Florence again in 1521, and never left Italy, and rarely Florence, after that time. D. in Florence, Jan. 22, 1531. Of his numerous frescoes, those in the convent of the Servi represent scenes in the legendary *Life of St. Philip, a Birth of the Virgin*, in which a lovely female figure is asserted to be a portrait of the artist's wife, and a *Procession of the Magi*. In a cloister adjoining is the noble fresco of the Holy Family called *La Madonna del Sacco*, because St. Joseph is leaning on a large full sack. The frescoes in the Scalzo convent are in monochrome, a series of biblical subjects with ornamental borders. At Poggio a Caiano is a very important fresco of *Cesar receiving Tribute*. Of his easel-pictures one of the finest is in the Louvre, *Charity*. There are also there two pictures of the *Holy Family* and an *Annunciation*. In the London National Gallery is a valuable portrait of himself. In the Pitti Palace there are two *Annunciations*, a *Deposition from the Cross*, the portraits of himself and wife, and a dozen other pictures of value. In the Uffizi Gallery is the *Madonna di San Francesco*. Very many other paintings are to be seen in public and private galleries throughout Europe.

RUSSELL STURGIS.

Sarto'ris, ADELAIDE (Kemble): See KEMBLE.

Sarts: a name applied to the sedentary natives, as distinguished from the nomads, in Turkestan and neighboring parts of Central Asia, whatever their ethnic relations, but sometimes limited to the sedentary population of Turkish language and relationship in Russian Turkestan. As thus limited they number about 700,000, are homogeneous, devoted to trade, are Mohammedans, and have a considerable sacred literature.

M. W. H.

Sartwell, HENRY PARKER, M. D., Ph. D.: botanist and physician; b. at Pittsfield, Mass., Apr. 18, 1792; surgeon in the U. S. army during the war of 1812-15; settled at Bethel, Ontario co., N. Y., 1821, and at Penn Yan 1832; for more than forty years was an enthusiastic botanical collector, forming an herbarium of 80,000 species, owned by Hamilton College, Clinton, N. Y. About 1846 he devoted his whole time to the study of the genus *Carex*, and brought out *Carex Americana Septentrionalis Exsiccata* (2 parts, New York, 1848; part iii. unfinished). D. at Penn Yan, Nov. 15, 1867.

Saskatchewan: district of the Northwest Territories of Canada, between lats. 52° N. and 55° N., with Keewatin and Manitoba on the E. and Alberta on the W. Area, 107,042 sq. miles. It is a well-watered and wooded country, thickly scattered with lakes, especially in the northern half, and is crossed from W. to E. by the Saskatchewan river. It is generally level or gently rolling, but a series of lofty hills follow along the south bank of the river just named. A large part of it is considered suitable for colonization, and it is made accessible by a railway extending from Prince Albert southward to Regina on the Canadian Pacific Railway, and by the Saskatchewan, which is navigable. The population in 1891 was 11,150, of whom over half were Indians and nearly one-fourth half-breeds. The latter are mostly of French descent, and, with a few of pure French race, are for the most part settled about Batoche on the South Saskatchewan. The agricultural products are yet small, and include live stock, wheat, barley, oats, peas, and potatoes. There is also a considerable production of pelts, mostly musk-rat. The chief settlements are Battleford and Prince Albert.

MARK W. HARRINGTON.

Saskatchewan River: a river which rises on the eastern slope of the Rocky Mountains in two main branches, flows eastward for about 1,200 miles, and empties into Lake Winnipeg. A few of the minor branches of the South Saskatchewan have their sources in the U. S. It is a part of the drainage system that reaches Hudson Bay through Nelson river, which is one of the great hydrographic basins of North America. From the junction of the North and South Saskatchewan to Lake Winnipeg the river flows through the deserted bed of Lake Agassiz. The sources of the north and south branches are stated by Dr. Hector to be but a few miles apart, in a nucleus of lofty summit-glaciers about lat. 51° 40' N., lon. 117° W., near Mt. Hooker, 15,700, and Mt. Brown, 16,000 feet in height, where the Rocky Mountains are 200 miles in breadth. Thence diverging 300 miles apart, midway, they unite at 550 miles in direct distance eastward.

a smooth and lustrous fabric of silk, of Chinese invention. Of the warp threads only one in every five or ten is raised to allow the shuttle to be passed, but each thread is raised in regular succession as the shuttle is thrown. It is woven with the right side uppermost.

Satin Bower-bird: See BOWER-BIRD.

Satinet: a coarse fabric, of which the warp is cotton and the weft woolen; originally, an inferior variety of satin.

Satin-spar: a fibrous variety of carbonate of lime, of snowy whiteness, found in England, Scotland, and elsewhere, which when polished has a luster resembling that of satin. A fibrous kind of GYPSUM (q. v.), also called satin-spar, is softer than the above, and is frequently made into ornaments resembling cat's-eye.

Satin-wood: a name given to several kinds of ornamental wood. The best is from Guiana, and is the wood of *Ferolia guianensis*, now included in the genus *Parinarium*. Florida satin-wood is from *Xanthoxylum floridanum*, a kind of prickly-ash tree. The West India satin-wood is from different trees, some of it of the very best and others of the poorest quality. The rich and fragrant satin-wood of India is usually of good quality. It comes from the *Chloroxylon swietenia*, a cedrelaceous tree which yields a sort of wood-oil. Satin-wood is used in making workboxes, hair-brushes, and cabinet-work.

Revised by L. H. BAILEY.

Sature [viā O. Fr. from Lat. *satūra*, *satūra* (sc. *lanx*, dish), a dish filled with various kinds of fruits, food composed of various ingredients, a mixture, medley, liter., fem. of *satur*, filled with food, sated]: a form of composition, which, as an attack on the weakness and wickedness of humanity, belongs to all mankind and to universal literature. Prose is at its service as well as poetry; it may take the shape of sermon as well as song. It may be dramatic, as in comedy, mask, and mummery. It may be epigrammatic, as in lampoon and pasquinade. It may be indirect, as in parody and travesty. It may be a formal diatribe; it may be an informal skit. Satire is older than comedy, for the *silli* of XENOPHANES (q. v.) were satirical and every phase of satire was represented in Greek literature. But the great models of satirical art are found in Roman literature. Whenever satire as literature is mentioned Horace and Persius and Juvenal come up to the mind, and the satire is assuredly most congenial to the Italian temperament, ancient and modern. Nor were the Romans slow to claim satire as their especial province. *Satura quidem*, says Quintilian (x., 1, 93), *tota nostra est*, and the loss of the Greek forerunners has enabled the Romans to make good their claim here as in the whole field of didactic poetry to which satire stands related as does the application to the sermon. The first appearance of *satura* in Roman literature is in the *satura* of ENNIUS (q. v.), where it is evidently a medley in verse; the *Satura Menippea* of VARRO (q. v.), of which we have considerable fragments, are in prose and verse, as is the so-called *Satiricon* of PETRONIUS ARBITER (q. v.).

The subjects of Ennius and of Varro covered a wide range, and their miscellaneous character corresponds to the original meaning of the word. In the hands of Lucilius the *satura* was largely used as an instrument for personal attack on the characters of those who had stirred the poet's indignation, and, though the fragments of Lucilius show that motley was the wear of his muse also, still the Lucilian satire has narrowed the range of the word, just as the mocking epigram has prevailed over all the other Greek forms, and just as elegiac has become synonymous with plaintive. In its function, then, the satire was assimilated to that especial form of the Old Attic comedy which dealt with personal abuse, the form known as the *lampuchōidia*; and when the native historians of Roman literature followed the established fashion of paralleling Roman with Greek and tried to adjust the growth of Roman comedy to Aristotle's schemes for Greek comedy, the *satura* naturally took the place of the Old Attic comedy, and the resemblance was emphasized by Horace and Persius themselves. Cratinus, Aristophanes, and Eupolis were claimed as brothers of the same guild. In view then of the largely doctored accounts given by the Romans, both of their history and their literature, scholars may be forgiven for questioning the very existence of the dramatic *satura*, which is said to have been a manner of acted lampoon, akin to the rude *versus Fescennini* of the populace; and it has been recently maintained that this is only another Roman adaptation, another reconstruction of early Roman literary history

after Greek models, just as so much Roman political history has been reconstructed after Greek models. Still it is not to be denied that there is a dramatic element in the classic satires of Rome. It comes out in sundry of the satires of Horace and is awkwardly conspicuous in Persius, but perhaps both these poets are simply living up to a theory. In Juvenal, the third of the great Roman satirists, the dramatic element is not a marked feature, and his declamatory rhetoric has had more influence on modern satire than Horace's *bonhomie*, or the priggish wisdom of Persius. By concentration, then, and crystallization the satire proper came to be as we still have it. Poetry became the medium and the hexameter the form, and though the satirical spirit might manifest itself in prose-fiction with interlarded verse, as in Petronius, or in the various measures employed by Catullus and Martial, satire as such had received its type, and that type is still potent. The accepted satire is in verse and that verse the heroic verse of the nationality—in French the alexandrine, in English the decasyllabic. French satire is represented by Boileau, English satire by Dryden and Pope, for Dryden and Pope are the models, not Butler—*Abraham* and *Achitophel* and the *Dunciad*, not *Hudibras*. Of course, if the term satire is widened to meet the definition given at the outset of the article it will be necessary to include a vast body of literature: Lucian and Apuleius, *Reynard the Fox*, *Tytl Eulenspiegel* (*Howleglas*), the *Piers Plowman* of Langland, the *Epistolæ Obscurorum Virorum*, and so on, down through moralists, essayists, and novelists without number, of all nationalities and of every century. Momus, the spirit of mockery and fault-finding, the son of Night, appears early in the list of Greek divinities, and his worship and his influence are universal. B. L. GILDERSLEEVE.

Satire Ménippée, *sa'tēer'mā'nēepā'*: a famous French satire, so called from the Greek philosopher Menippus, who used in his works the form of prose interspersed with verse, in which it is composed. It is due to the collaboration of Pierre Le Roy, Jacques Gillot, Nicolas Rapin, Jean Passerat, Florent Chrestien, and Pierre Pithou, and appeared in 1594, after having circulated privately in manuscript. It was aimed against the league, and its fuller title was *De la Vertu du Catholicon d'Espagne et de la tenue des Etats de Paris*. It reflects the temper of the bourgeoisie, worn out by the civil strife, and putting the peace and unity of their country above party. Good editions are those of Ch. Read (1876) and C. Labitte (1880).

A. G. CANFIELD.

Satisfaction: See ACCORD AND SATISFACTION, JUDGMENT, MORTGAGE, PAYMENT, and RELEASE.

Satow, *saat'ō*, ERNEST MASON, B. A., C. M. G.: scholar and diplomatist; b. in London in 1842. Appointed student interpreter in Japan in 1861, he was present at the action at Kagoshima, Sept., 1863, and acted as interpreter at the bombardment of Shimonoseki, Sept., 1864. In 1876 he was promoted to be second secretary of legation at Tokio, and in 1883 received the decoration of the cross of St. Michael and St. George. During this period he had obtained a profound acquaintance with the language, history, and antiquities of Japan. In 1884 he was transferred to Siam as agent and consul-general at Bangkok, and became minister resident in the following year. He was transferred to Montevideo in 1888, and in 1893 was promoted to be envoy extraordinary and minister plenipotentiary at the court of Morocco. He has published an English-Japanese dictionary, and has contributed valuable articles to the *Transactions of the Asiatic Society of Japan*.

J. M. DIXON.

Satpura, *sāt-poo'rā* [from Sanskr. *śata-*, hundred + *pu'ra-*, castle, fortified town]: a name originally restricted to the mountains which divide the Nerbudda and Tapti valleys, Northern India, but now generally applied to the great range or table-land which, commencing E. of the famous Amarkantak plateau, runs nearly up to the western coast. Accepting Amarkantak as the eastern boundary, the Satpuras have a range from E. to W. of about 600 miles, and in their greatest depth exceed 100 miles from N. to S. The shape of the range is almost triangular; from Amarkantak, 3,328 feet above the level of the sea, an outer ridge runs S. W. to a point in the Bhandara district. The average height at the crest of the chain is but little under 2,000 feet above the sea; the highest peak, Dhupgarh, in Hoshungabad, rises as high as 4,454 feet. Nearly the whole range consists of trap; toward the W. a series of craggy peaks is met with.

Satrap [viā O. Fr. from Lat. *satrapes* = Gr. *σατράπης*, from O. Pers. *khšatrapāvā*; *khšatra-*, rule, power + *pā-*,

provinces of a satrapy or province of ancient Persia. The satraps imitated the tyranny of their royal masters, and on the decline of the old Kingdom some of the satraps became independent monarchs.

Sa-tsu-ma: a province of Japan, situated at the south-west end of the island of Kjusiu (q. v.), and having for its chief town Katsunuma (q. v.). The ruling family of Chikuzumi has been represented during the nineteenth century by men of singular ability. Under them was reared a race of soldiers and statesmen who contributed the chief element in the downfall of the shogunate, and have, with the clan of Chosin, ruled Japan ever since. The peasants were called *satsuma* from the arrival of Korean settlers, transported at the close of the sixteenth century. The art reached its perfection about 1840 under the direct fostering care of the lords of *satsuma*. This ware is of a cream color, and has a mottled surface. J. M. DRUCE.

Satōpōro: See SATURO.

Saturday [O. Eng. *Saterdag*, *Saterdag*, *Saterdag*, *Saterdag*, *Saterdag*, *Saterdag*; Lat. *Satur* was, Saturn + O. Eng. *dag*, day; the seventh and last day of the week. It is the Jewish Sabbath, and is called *Dies Sabbati* in the Roman Catholic liturgy.

Saturn (Lat. *Saturnus*): the ancient Latin god of planting and sowing, and hence of agriculture in the widest sense, the deity of which was ascribed to him. He was considered as a mythical king of Latium, under whose penitential reign the blessings of agriculture were first disclosed to the human race. His memory was cherished most faithfully by the laboring people and was perpetuated in the great popular festival of the SATURNALIA (q. v.), the observances of which were suggestive of the old Saturnian reign of plenty and equality. In later Roman mythology he was identified with the Greek Cronus. G. L. HENRICSON.

Saturn—the sixth planet in order of distance from the sun, and the third of the superior planets. It travels at a mean distance of 887,000,000 miles from the sun. Saturn completes its orbit in a period of 10,759.2198 days, or 29 years and 167 days. Its synodical period, or the interval between successive oppositions, exceeds a year by about 124 days on an average. Its volume exceeds the earth's about 700 times, and the mean density is so small that its mass exceeds the earth's only about 94 times. In fact the mean density is less than that of any other member of the solar system except, of course, the comets, being only .71 when the earth is taken as unity; if the density of water be taken as the unit, that of Saturn is about .73, or less than the density of mahogany. Its mean diameter is about 70,000 miles, its compression about $\frac{1}{6}$, so that the polar diameter is about 8,500 miles less, and the equatorial diameter about 1,000 miles greater. Saturn is distinguished among all the planets by the remarkable complexity of structure and by the number of subordinate bodies of which it is the center. The gaseous orb is girt by a mighty system of flat rings, visible even in a very small telescope; the span of which from outside to outside amounts to 167,000 miles, or more than six times the circumference of the earth. There are two chief bright rings, the outermost nearly 10,000 miles in width, the innermost about 17,500 miles in width, while between them there is a gap about 1,500 miles across. Inside the system of bright rings there is a dark ring (discovered by the elder Bond, of Harvard Observatory), which has a breadth of about 8,700 miles. Between this ring and the planet intervenes a space more than 10,000 miles in width. After a careful investigation, in which Laplace, Adams, and Clerk Maxwell have taken part, astronomers have been led to the conclusion that the rings are not continuous bodies, but consist of multitudes of small satellite rings, composed probably with vaporous matter, traveling in flat orbits around the central orb. This is, in fact, the only possible interpretation of the actual existence and configuration of the rings; for no system of continuous rings could continue to travel in dynamical equilibrium around Saturn, or under the strains to which the tremendous attractive power of Saturn would subject them. The globe of Saturn is marked like that of Jupiter, by belts, but they are less distinct. The tint of the planet as a whole is yellowish, and the belts show considerable variety of color. An equatorial belt, nearly always seen, is a creamy white; the dark belts are either pale or uncommonly cinnamon-colored; while the polar regions show a faint tinge of azure. As in the case of Jupiter, the conclusion to which we are led by the

careful study of these belts and of the probable condition of Saturn's globe is, that we do not see a solid or liquid orb, but only the outer parts of a deep and cloud-shaded atmosphere. In fact, the general evidence in Saturn's case is identical with that of Jupiter, and there are some points which afford even more convincing evidence as to the condition of these planets.

Satellites—Saturn is attended by eight satellites, which move in orbits outside the ring. All but the outer one move in the plane of the ring. The brightest of all is Titan, which was therefore the first discovered, having been found by Huyghens as far back as 1656. The faintest satellite is Hyperion, next outside of Titan, which was discovered by Bond, of Cambridge, Mass., and two days later by Lassell, in England, in 1848. This satellite exhibits a remarkable peculiarity in its perturbations by Titan, resulting in a revolution of its pericenter occurring in less than twenty years, and in a curious libration between the two bodies. These perturbations form a very interesting chapter in celestial mechanics, which has so far defied the efforts of the best mathematicians to work out a complete and satisfactory solution.

The outer satellite of all is Iapetus, which has the remarkable peculiarity of being much brighter on one side of the planet than on the other, showing that it performs a revolution on its axis in the same time that it revolves around the planet, and that it is much whiter on one side than on the other.

The positions of the satellites of Saturn can be found at any time from a diagram given annually in *The American Ephemeris*. The following is a list of these satellites, with their times of revolution:

ELEMENTS OF SATURN'S SATELLITES.

NAME.	Sidereal revolution.	Distance in radii of Saturn.
Mimas	9 h. 47 m.	0.003
Enceladus	1 d. 13 h. 23 m.	4.512
Tethys	1 d. 21 h. 24 m.	6.889
Dione	2 d. 17 h. 41 m.	6.599
Rhea	4 d. 12 h. 37 m.	9.542
Titan	9 d. 20 h. 45 m.	23.145
Hyperion	21 d. 21 h. 7 m.	28.040
Iapetus	79 d. 7 h. 55 m.	34.758

S. NEWCOMB.

Saturnalia [= Lat. *litet*, *ant.* plur. of *Saturnalia*, pertaining to Saturn, deriv. of *Satur* was, Saturn]: the old Latin festival of the god Saturn, celebrated in ancient Rome with feasting and mirth. Slaves were permitted freedom of speech and act, and all classes threw off care and toil. During the republic it was celebrated on Dec. 17; Augustus made it embrace the 17th, 18th, 19th, but popularly it included seven days. Of these seven days, the first two were the true Saturnalia, and the three following were the Opalia, in honor of Ops, while the last two were called Sigillaria, from the *sigilla* or clay toys exchanged as presents at that time. The Christian Christmas festival has retained in many parts of the world traces of the observances of the Saturnalia. Revised by G. L. HENRICSON.

Saturnian Verse: See METRIS.

Sat'yr-drama: in Greek literature, the fourth play of the tetralogy, which was made up of a tragic trilogy and this afterpiece. It received its name from the chorus, which was regularly composed of satyrs. The action was taken from mythology and not from everyday life, and the tone was merry. The satyr-drama held most faithfully, of all dramatic forms, to the original character of the Dionysian festival, and may be regarded as a survival of the time preceding the perfected organization of tragedy. It was, in fact, a tragedy drunk with new wine, and in the Æschylean stage of the trilogy the subject of the satyr-drama was so chosen as to burlesque the fundamental theme and thus relieve the tension of the spectators. Æschylus, whose tragic strain often comes perilously near the line of travesty, was the greatest master of the satyr-drama, but the only extant specimen of a complete satyr-drama is the *Cyclops* of Euripides, made familiar to English readers by the translation of Shelley, who was attracted to it by the spirit of revolt.

B. L. GILDERSLERVE.

Satyr [from O. Fr. *satire* < Lat. *satyrus* = Gr. *satyros*, satyr]: in Grecian mythology, the companions of Dionysus, demons of the forest, akin to the mountain nymphs and the

dancing Kuretes. In their earliest form they were caricatures of the elder or bearded Dionysus; they were half-animal, and were depicted in early vase-paintings with long sharp-pointed ears, long horse-tails, long hair, and long, pointed beards. They were half-animal, not only in form, but in character; they were lustful and sensual, and vase-paintings represent them as ravishers of the nymphs and Bacchantes, and even of Iris. This antique type of satyr was supplanted by a less sensual type, which was created by Praxiteles in his famous statue, and has remained the norm of the Satyr. In the Satyr of Praxiteles we have the Puck of antiquity, the figure of a lusty youth, in which the animal nature is brought out by the goat-ears, the teat-like protuberances (*phrea*) on the neck, the animal cast of countenance, stump nose, bristly hair, thick lips, cynical smile, and diminutive tail. In some cases sprouting horns on the forehead indicate a transition stage between the Satyr and Pan and Panisks. The Satyr must be carefully distinguished from Pan and Silenus, and especially from the Faunus of the Romans, a creation that arose from their confounding the Satyrs and Pans. J. R. S. STERRETT.

Saugerties, saw'ger-teez: village; Ulster co., N. Y.; on the Hudson river at the mouth of Esopus creek, and on the West Shore Railroad; 12 miles N. of Kingston, the county-seat (for location, see map of New York, ref. 7-J). It is in an agricultural region, has good water-power for manufacturing, and ships large quantities of bluestone, limestone, and agricultural products. There are 7 churches, 4 graded schools forming Union Free School District No. 10, a parochial school, a Young Men's Christian Association with library and reading-room, a national bank with capital of \$200,000, a state bank with capital of \$125,000, a savings-bank, manufactories of paper, blank books, brick, and wood-pulp, and a daily, a monthly, and 2 weekly periodicals. Pop. (1880) 3,923; (1890) 4,237; (1895) estimated, 6,000.

EDITOR OF "DAILY POST."

Saugor: island and town of India. See SAGAR.

Sauk Center: city (founded in 1857); Stearns co., Minn.; on the Sauk river, and the Gt. North. and the N. Pac. railways; 117 miles N. W. of St. Paul, the State capital (for location, see map of Minnesota, ref. 8-C). It is in an agricultural region, has several flour-mills and other manufactories, and contains 10 churches, public graded and high schools, private academy and training school, a national bank with capital of \$50,000, 2 private banks, and 2 weekly newspapers. Pop. (1880) 1,201; (1890) 1,695; (1894) school census, 1,955.

EDITOR OF "HERALD."

Sauk Rapids: village (located in 1850); capital of Benton co., Minn.; on the Mississippi river, and the Gt. North. and the N. Pac. railways; 75 miles N. W. of St. Paul, the State capital (for location, see map of Minnesota, ref. 8-D). It has excellent water-power and extensive quarries of fine granite, is engaged in farming and dairying, and contains 6 churches, high school, German Lutheran school, steam sawmill, planing-mill, feed-mill, and 2 weekly newspapers. Pop. (1880) 598; (1890) 1,185; (1895) estimated, 2,800.

EDITOR OF "SENTINEL."

Saul [from Heb. *Shā'ul*, liter., asked for]: the first King of Israel, a son of Kish, of the tribe of Benjamin; was anointed by Samuel; fought with great success against the Philistines, Moabites, Ammonites, Edomites, and Amalekites, and governed well in the earlier part of his reign, but afterward became possessed of "an evil spirit from the Lord," committed great cruelties, and fell, together with three of his sons, in the battles of Mt. Gilboa against the Philistines, about 1055 B. C. The history of the latter part of Saul's reign is simply a part of the history of David. For further details concerning Saul, see the articles DAVID and JEWS.

Sauley, sō'see', LOUIS FÉLICIEN JOSEPH CAIGNART, de: numismatist and Hebraist; b. at Lille, France, Mar. 19, 1807; studied at the École Polytechnique; was appointed Professor of Mechanics at the military school of Metz in 1838, and shortly after keeper of the museum of artillery; gained celebrity first as a numismatist by his *Essai de Classification des Suites monétaires byzantines* (1836); studied Assyrian and Celtic inscriptions, and wrote *Les Campagnes de Jules César dans les Gaules* (1860), but devoted himself more especially to Hebrew antiquities; visited the Holy Land in 1850, and wrote *Voyage autour de la Mer morte et dans les Terres bibliques* (2 vols., 1852-54); *Études sur la Numismatique judaïque* and *Histoire de l'Art judaïque* (1858); *Voy-*

age en Terre-Sainte (1865); *Les Derniers Jours de Jérusalem* (1866); *Histoire d'Hérode* (1867); *Étude chronologique des Livres d'Esdras et de Néhémie* (1868); and *Sept Siècles de l'Histoire judaïque* (1874). D. in Paris, Nov. 4, 1880.

Saulsbury, WILLARD: U. S. Senator; b. in Kent co., Del., June 2, 1820; educated at Delaware and Dickinson Colleges; was admitted to the bar 1845; was attorney-general of Delaware 1850-55, and U. S. Senator 1859 to 1871, when he was succeeded by his brother ELI (b. Dec. 29, 1817), who was re-elected for third term Jan. 16, 1883. In 1874 Willard Saulsbury was appointed chancellor of Delaware. D. at Dover, Apr. 6, 1892. Another brother, GOVE, was Governor of Delaware 1865-71.

Sault Sainte Marie, soo'sānt-mā'ree, Fr. pron. sō sāt-māa'ree: village; port of entry; district of Algoma, East Ontario, Canada; on the St. Mary river, the St. Mary Falls Ship-canal, and the Canadian Pac. Railway; opposite the city of the same name in Michigan; 622 miles W. of Montreal (see map of Ontario, ref. 6-H). It has a water-power canal, electric-light plant, a pulp and paper mill operated by water-power (cost over \$1,000,000), branches of the Imperial Bank of Canada and the Canadian Bank of Commerce, schools for Indian boys and girls, and two weekly newspapers. The village is in an agricultural and mineral region, is a popular summer resort, and is the seat of the Anglican Bishop of Algoma and of the Roman Catholic Bishop of Northern Canada. Pop. (1891) 2,414. CHASE S. OSBORN.

Sault Sainte Marie: city; capital of Chippewa co., Mich.; on the St. Mary river, near the outlet of Lake Superior, the ship-canal around the rapids, and the Duluth, St. Shore and Atlantic, and the Minneapolis, St. P. and St. Marie railways (for location, see map of Michigan, ref. 2-I). It is connected with a village of the same name on the Canadian side by an international railway bridge, 1½ miles long, which cost \$1,000,000. Navigation between Lakes Superior and Huron is facilitated by a lock and canal, which cost about \$1,000,000. The U. S. Government is building a second lock, which will be the largest in the world, and will cost with improved approaches \$5,000,000. The annual tonnage passing through the canal is greater than that of the Suez Canal. The city has direct connection by the bridge with the Canadian Pacific railways. There are 6 churches, 6 public-school buildings, public-school property valued at \$75,000, parochial-school property valued at \$8,000, 2 national banks with combined capital of \$150,000, a state bank (savings) with capital of \$50,000, a building and loan association, a monthly and 2 weekly periodicals, water and sewer plants, electric lights and street-railways, and an assessed valuation of \$1,600,000. The industrial establishments include 23 sawmills, 2 cigar-factories, 2 brick-yards, 2 machine-shops, foundry, flour, shingle, and planing mills, shipyard and marine railway, and a branch of the State fish hatchery. Pop. (1880) 1,947; (1890) 5,764; (1894) 7,185. CHASE S. OSBORN, EDITOR OF "NEWS."

Saumaise: See SALMASIUS.

Saumur, sō'mūr': town of France, department of Maine-et-Loire; on the Loire; 80 miles S. E. of Angers; is famous for its rosaries made of cocoanut-shells, has manufactures of linens and cambrics, and trades in wine, corn, hemp, and spirits (see map of France, ref. 5-D). It was the seat of the celebrated Protestant academy founded in 1598 by the national synod of Montpellier, and suppressed by a royal edict of Jan. 8, 1685. That academy developed the first French school of criticism in modern theology. Pop. (1891) 12,527.

Saunders: See SANTAL-WOOD.

Saunders, FREDERICK: author; b. in London, Aug. 14, 1807; established himself in the publishing business in New York in 1836, and subsequently was for some time an assistant editor of the *New York Evening Post*. In 1858 he received the appointment of assistant librarian of the Astor Library, which office he continued to hold until the beginning of 1876, when he was made chief librarian and acting superintendent. He has published *Memories of the Great Metropolis* (1852); *Salad for the Solitary* (1854); *Salad for the Social* (1856); *Pearls of Thought and Mosaic* (1858); *Festival of Song* (1865); *About Woman, Love, and Marriage* (1868); *Evenings with the Sacred Poets* (1872); a revised and illustrated edition of *Salad for the Solitary* and the *Social* (1872; new ed. 1883); *The Story of the Famous Books* (1887); and *The Story of the Discovery of the New World by Columbus* (1892).

Revised by H. A. BEERS.

Saunders, Remondino Marciano; jurist; b. in Caswell Bay, N. Wales, 1770; studied at his University of North Wales; he did not graduate, resided some years in Tennessee where he was admitted to the bar 1812; returned to North Wales; was a member of the Legislature 1815-20, a member of that body two years; member of Congress 1827-28; 1831-35; attorney-general of North Carolina; was a member of the board of commissioners on claims toward France 1837; judge of the Supreme Court of the State 1837-39, when he was displaced by Alex. Holden; minister to Spain 1840-50; was subsequently again a member of the Legislature, and took a leading part in promoting the construction of railways in North Carolina. D. at Raleigh, Apr. 24, 1867.

Saunders, Thomas William; legal writer; b. in England, 1818 or 1814; entered the Middle Temple in 1832; called to the bar 1837; was employed as a revising barrister in the counties of Essex 1840-49. He was a magistrate of the Thames valley from 1878 until within a few weeks of his death, and was remarkable for the leniency of his sentences. D. at Haverham, Hants, 1890, 29, 1890. His voluminous works, among the more important of which are *Law and Practice of Municipal Registration and Elections* (ed. 1873); *Law and Practice of Orders of Affidavits and Proceedings in Habeas Corpus* (ed. 1888); *Practical Magistrate's Courts* (ed. 1892); *Treatise on the Law of Association and Representations upon the Sale of Goods* (1894); and *Treatise upon the Law Applicable to Insurances*. F. STURGES ALLEN.

Saunders, Nicholas; mathematician; b. at Thirlestree, Leicestershire, England, in 1689; lost his sight by an attack of smallpox in infancy, but was carefully instructed by his father; learned Latin and Greek at academies; was taught the higher mathematics by private tutors, and displayed such mastery of all the allied sciences, including astronomy, that in 1707 he lectured upon them at the University of Cambridge, and on the recommendation of Sir Isaac Newton was in 1711 chosen to succeed Whiston as Lucasian Professor of Mathematics. D. Apr. 19, 1755. After his death appeared his *Elements of Algebra* (1749), to which he prefixed a biographical sketch by his son John. His *Method of Fluxions* appeared in 1755.

Saunders, Joseph

Sauria (Gr. *sauris*, lizard) the group of reptiles common to most countries. See LIZARD.

Saurin, Jean

Sauris (Mod. Lat.; Gr. *sauris*, lizard + *gêis*, look, appearance) a group of vertebrates containing the reptiles and some which are distinguished on account of many structural peculiarities which mark them off from the mammals and some from the fish-like forms (*Ichthyosaurus*) and others. In their development they have both annular and linear (see CONVERGENCE). In the adult the lower jaw is united to the skull by a quadrate bone; a parasphenoid bone is lacking; there is a single occipital condyle for ar-

thulation with the neck; and the coracoid bone, except in bird-like forms, is well developed. They are either oviparous or viviparous. In both there is a tendency to develop scales upon the surface of the body. Though birds and reptiles are seemingly very different in the Mesozoic age there were many structural resemblances between them.

J. H. KROMBEY.

Saururus (Mod. Lat.; Gr. *sauris*, lizard + *ur*, tail) a subgenus of birds characterized by a tail of many vertebrae, each vertebra bearing a single feather on either side. The digits of the hand are free from one another and clawed; the jaws furnished with teeth; the pelvis not ankylosed with the sacrum; the sternum small. The only known member of the group is the *Archaeopteryx lithographica*, from the Jurassic strata of Solenhofen, Bavaria. See ANOMALOPTERYX. F. A. L.

Saur, Saur-pika, or Skipper: a fish (*Neomachirus auratus*) of the family *Scombridae*. These fishes go in great shoals and are very active, leaping far above the surface of the water. Although small, they are esteemed for the table.

Sausalito: town; Marin co., Cal.; on San Francisco Bay, and the N. Pac. Coast Railroad; 6 miles N. of San Francisco (for location, see map of California, ref. 7-B). It is a yachting, fishing, and bathing resort, and is principally engaged in agriculture, dairying, and stock-raising. A fine walk, leading around the promontory by way of Lime Point to Point Bonita, the north horn of the Golden Gate, affords good views of the entrance to San Francisco Bay. The town is the southern terminus of the railway, and has regular steamboat connection with San Francisco. Pop. (1880) 476; (1890) 1,254.

Saussure, Horace Bénédict, de; physicist and geologist; b. at Cordon, Switzerland, Feb. 17, 1740; studied under his uncle, Charles Bonnet, and under Haller, and was appointed Professor of Physics and Philosophy at the University of Geneva in 1762. In 1768 he began a series of scientific mountain-excursions, crossing the Alps fourteen times by eight different routes, ascending Mont Blanc in 1787 and Monte Rosa in 1789, encamping for seventeen days on the Col du Géant, and visiting the Jura, Vosges, and Auvergne Mountains, Germany, England, Sicily, and Italy. The result was a multitude of the most valuable observations on the minerals, botany, geology, and meteorology of the countries he visited. These were published in his *Voyages dans les Alpes* (4 vols., Geneva, 1779-96). Among his minor works are *Sur l'Hygrométrie* (1783) and *De Aqua* (1771). In 1789 he resigned his chair, but after the annexation of Geneva to France was appointed Professor of Natural History at the central school of the department of Léman. D. at Geneva, Jan. 23, 1830. See *Dr. Saussure and the Alps* (Great Explorers Series, London, 1892).

Savage, James, Jr.; D.; antiquary; b. in Boston, Mass., July 12, 1784; graduated at Harvard 1804; was active in politics for a few years, after which he devoted himself to literary work. Besides publishing many pamphlets on historical and political subjects, he edited several works of importance relating to New England history. He compiled on the basis of Farmer's *Register a Genealogical Dictionary of the First Settlers of New England, showing Three Generations of those who came before May, 1632* (Boston, 4 vols., 1822-64), a work of great value, displaying extraordinary industry and research, but confused in plan, unequal in execution, and disfigured by the exhibition of spleen against many of the parties to the colonial controversies of the seventeenth century. D. in Boston, Mar. 8, 1874.

Savage, Minor J.; clergyman and author; b. at Norridgewood, Me., June 10, 1841; educated at Bowdoin College and Andover Theological Seminary, where he graduated in 1864; was a Congregational missionary in California; pastor of churches at Framingham, Mass., and Hannibal, Mo.; in 1873 became a Unitarian and took charge of a church in Chicago; in 1874 became pastor of the Church of the Unity, Boston. He is the most popular representative among Unitarians of the scientific interpretation of religion. Among his numerous works are *Christianity the Science of Manhood* (Boston, 1873); *The Religion of Evolution* (1876); *Life Questions* (1879); *Heaven* (1882); *Beliefs about the Bible* (1883); *My Creed* (1887); and *Evolution of Christianity* (1892).

Savage, Richard; poet; claimed to be the illegitimate son of Anne, Countess of Macclesfield, by Richard Savage,

Earl Rivers, alleging that he was born in London, Jan. 10, 1698; was reared in poverty. He obtained a tolerable education in a grammar school at St. Albans, and was afterward apprenticed to a shoemaker; but having displayed literary tastes, he went to London about 1716, where he obtained the patronage of Steele, and of Wilks and Mrs. Oldfield, the actors, and assumed the name of his alleged father. In 1717 he translated from the Spanish a play, *Woman's a Riddle*, which had a run of twelve nights; produced in 1723 a successful tragedy, *Sir Thomas Overbury*; in 1726 a volume of *Miscellaneous Poems and Translations*; in 1728 *The Bastard*, a Poem, which speedily ran through five editions; and in 1729 his best work, *The Wanderer, a Moral Poem*. In 1727 he was condemned to death for killing a man in a tavern brawl, but was pardoned in opposition to the wishes of his alleged mother; was then taken into the house of Lord Tyrconnel, but soon quarreled with his protector; subsisted thereafter upon money subscribed by Pope and his literary circle; obtained from Queen Caroline an annual stipend of £50 in consequence of some verses he had written on her birthday; resided several years at Bristol, where he was thrown into prison for debt Jan., 1743. D. there Aug. 1, 1748. He is now best remembered by the pathetic *Life* written by his friend Johnson. For an exposure of the improbability of Savage's story, see W. Moy Thomas in *Notes and Queries* (1858). Revised by H. A. BEERS.

Savanilla: See SABANILLA.

Savan'na [from Span. *sábana*, large cloth, sheet, savanna (in this sense also *sabana*, with accent on second syllable) < Lat. *sa'bānum* = Gr. *sáβanon*, linen cloth, towel]: a grassy plain in a tropical region, yielding pasturage in the wet season, and often having a growth of under-shrubs. It corresponds to the prairie of more northern latitudes. The word is chiefly used in tropical America.

Savanna: city; Carroll co., Ill.; on the Mississippi river, and the Chi., Mil. and St. P., and the Burlington Route railways; 10 miles W. of Mt. Carroll, the county-seat (for location, see map of Illinois, ref. 2-D). It is an important shipping-point, and has several manufactories, a State bank with capital of \$50,000, and two weekly newspapers. Pop. (1880) 1,000; (1890) 3,097.

Savan'nah: city (originally Yamacraw Bluff); port of entry; capital of Chatham co., Ga.; on the Savannah river, and the Cent. of Ga., the Fla. Cent. and Pen., and the Sav., Fla. and West. railways; 18 miles above the mouth of the river, 115 miles S. W. of Charleston (for location, see map of Georgia, ref. 5-K). It has an excellent landlocked harbor, which has been improved by the U. S. Government since the war of 1861-65, with 23½ feet of water between the city and the bar. The city is partly built on a bluff 40 feet above the level of the river, has an area of 6 sq. miles, was laid out on a plan original with the founder, and is adorned with a large variety of ornamental trees and shrubbery. Since 1884 the city has been drained thoroughly and provided with an improved system of sewerage and twenty-five artesian wells, the latter having a total capacity of over 6,500,000 gal. per day.

Streets and Buildings.—The streets are laid out at right angles to each other, are lighted by electricity, and have over 25 miles of electric railway. There are many fine shell-road avenues leading to places of interest in the suburbs. The principal wholesale houses are on Bay Street; the chief shopping thoroughfares are Congress and Broughton Streets; and the fashionable promenade is Bull Street to Forsyth Park and the Parade-ground. Among the notable public buildings are the city-hall, court-house, U. S. Government building, the Oglethorpe Club-house, formerly the Masonic Hall, in which the ordinance of secession was adopted; the Telfair Academy of Arts, containing valuable collections of paintings, statuary, casts, and other works of art; Hodgson Hall, in which are the library and collections of the Georgia Historical Society; the Commercial Club-house; and the Independent Presbyterian Church, considered one of the handsomest church edifices in the South.

Parks and Resorts.—Savannah has 34 public parks and squares, with a total area of 65 acres. The largest is Forsyth Park, 10 acres, which is noted for its beautiful fountain and trees. Adjoining it is the Parade-ground, 20 acres, which contains a Confederate memorial monument. Johnson Square contains a monument to Gen. Nathanael Greene; Madison Square, one to Sergt. Jasper; and Monterey Square, one to Count Pulaski. The favorite seaside resorts are the Tybee island beach, at the mouth of the river; Thunderbolt, on

Thunderbolt river; White Bluff, 9 miles W. of the city, and reached by a fine shell road; the Isle of Hope and Beaulieu, on the Skidaway river. The Sea Islands are also much frequented. Bonaventura, 4 miles S. of the city, one of four cemeteries, is widely known for its avenues of ancient live-oaks, whose branches are covered with long, waving gray or Spanish moss.

Churches, Schools, etc.—The city is the seat of a Roman Catholic bishopric and contains 41 churches of various denominations. On the site of Christ Church, the oldest Protestant Episcopal edifice, John Wesley established the first Sunday-school in America. The city has a school population of over 10,000, a public high school, 9 public-school buildings, public-school property valued at over \$300,000, a private secondary school for boys, and Savannah Academy (non-sectarian, chartered in 1864). There are 3 libraries containing over 25,000 volumes; 14 charitable institutions; 19 social and literary clubs; 3 free dispensaries; 5 hotels; and 2 daily, 7 weekly, and 2 monthly periodicals.

Finances and Banking.—In 1898 the city had a net debt of \$3,494,450, and an aggregate assessed valuation of \$33,424,663. In 1895 there were 2 national banks with combined capital of \$800,000, 6 State banks with capital of \$2,250,000, a safe and trust company with capital of \$125,000, a private bank, and 16 loan companies.

Business Interests.—Savannah is the third largest cotton-shipping port in the U. S. Besides cotton it exports large quantities of rice, lumber, and naval stores, and ships vegetables and melons to Northern cities. In the fiscal year 1893-94 its exports of domestic merchandise aggregated a value \$25,527,468, and its imports of foreign goods \$302,948. The principal industries are the manufacture of fertilizers, rice cleaning and polishing, and foundry and machine-shop work. In 1890 the city had 187 manufacturing establishments, representing 42 industries, with combined capital of \$2,977,450, employing 1,643 persons, paying \$42,766 for wages and \$2,597,652 for materials, and turning out articles valued at \$4,467,688.

History.—The city was settled by Gen. JAMES EDWARD OGLETHORPE (q. v.) in 1733; repulsed a British attack in 1776; was captured by the British in Dec., 1779, and was held by them to the close of the war. It received a city charter in 1789. In 1796 and 1820 it suffered severely by fire. At the beginning of the war of 1861-65 the fortifications of the harbor were seized by the State authorities, and during the war the city was a Confederate military post. Gen. Sherman invested the city on Dec. 10, 1864, the Confederates abandoned it, and the Union army took possession on Dec. 21. Pop. (1880) 30,709; (1890) 43,189; (1895) estimated at 62,107.

THOMAS M. NORWOOD.

Savannah: town; capital of Andrew co., Mo.; on the Chi., Gt. West. and the Burlington Route railways; 2 miles W. of the One Hundred and Two river; 14 miles N. E. of St. Joseph (for location, see map of Missouri, ref. 2-D). It is in an agricultural, fruit-growing, and stock-raising region and contains 8 churches, a graded public school with high school department, 2 State banks with combined capital of \$44,340, 4 newspapers, a large flour-mill, and a creamery. Pop. (1880) 1,206; (1890) 1,288; (1895) estimated, 1,500.

EDITOR OF "REPUBLICAN."

Savannah River: a stream which forms the boundary line between Georgia and South Carolina. From its source to its mouth on Tybee roads its channel is 450 miles long, while the distance in a direct line is only 250 miles. With its tributaries it drains an area of over 8,000 sq. miles. The Savannah is a turbid stream, and the current in the upper portion of the river and its tributaries is rapid and carries a great deal of silt, particularly during the seasons of freshets. Bars are therefore formed in the broader portions of the river where the current is less rapid. At Savannah the mean rise and fall of tide is 6½ feet. The tidal wave ordinarily ascends to a point about 28 miles above Savannah or 45 miles from Tybee roads. The river is navigable to Savannah for vessels drawing 22 feet of water, and by small vessels to Augusta, 231 miles. Under appropriations of Congress improvements in the river and harbor of Savannah (1895) in progress, having in view the securing of a 26-foot channel to Savannah.

Savary, *sā'vā'ree'*, ANNE JEAN MARIE RENÉ, Duke of Ravenna; general; b. at Marcy, department of Ardennes, France, Apr. 26, 1774; entered the army in 1790; served on the Rhine and in Egypt; was raised to the rank of colonel after the battle of Marengo, and in 1803 became general of brigade.

ive provisions will be seen in the fact that in the years from 1817 to 1872 the interest paid by the Government to savings-banks exceeded that which it had received from investments on their account by the sum of £4,169,427 10s. 5d. As an incentive to industry and economy, and a check to pauperism, the Government could afford to bestow this bounty upon savings-banks, but only upon terms that would tend to exclude from any considerable share in it the opulent classes, whom the liberal interest allowed and the security afforded by savings-banks would naturally attract. Trustees in England are made liable only for their own personal malfeasance, but in Ireland they are made liable for losses, unless by their rules they limit their liability to a fixed sum, which is not to be less than £100. The Government has never conceded its liability to make good the losses sustained by savings-banks, though in one instance of exceptional hardship Parliament appropriated £30,000 as a partial restitution to depositors.

The following table gives the number of depositors and the balance to the credit of savings-banks, including interest, on the books of the national debt commissioners in quinquennial periods from 1817 to 1882. The year 1861 is also included, as marking the highest limit reached by savings-banks before their decadence. This began under competition with the post-office savings-banks, from which, however, the savings-banks afterward recovered:

Year ending Nov. 30.	Number of depositors.	Amount to credit of savings-banks.	Year ending Nov. 30.	Number of depositors.	Amount to credit of savings-banks.
1817.....	* 9,291	£231,028	1857.....	1,366,560	£35,255,722
1822.....	* 204,584	6,546,690	1861.....	1,609,103	41,790,788
1827.....	* 395,000	14,188,708	1862.....	1,558,189	40,809,578
1832.....	440,861	14,416,885	1867.....	1,385,782	36,792,912
1837.....	636,389	19,711,797	1872.....	1,425,147	40,000,462
1842.....	875,098	25,406,642	1877.....	1,509,847	44,238,686
1847.....	1,096,066	30,236,632	1882.....	* 1,552,988	* 44,594,451
1852.....	1,309,934	31,912,413	1887.....	.....	* 47,262,222

* Partly estimated.

Since 1887 the deposits of trustee savings-banks have been decreasing, while those of the post-office savings-banks have been rapidly growing.

Post-office Savings-banks.—In 1861 a system of post-office savings-banks was established, which, however, was little more than an expansion and adaptation to existing conditions of the scheme of Patrick Colquhoun, made prominent by Whitbread in 1807. No arbitrary interference with the existing system of savings-banks was attempted, but these were left to hold their own in competition with the new system as best they could. The practical operation of the latter may be briefly stated: Certain post-offices throughout the United Kingdom are designated at which sums of not less than one shilling or some multiple thereof will be received for transmission to the central office in London. Not exceeding £30 in one year, or £150 in all, or £200 including interest, is received from any one person. The depositor receives a book in which his deposits are entered, and a receipt for each deposit is also forwarded to him in due course from the central office. The moneys are invested in the public funds, and deposits of not less than £1 or multiples thereof receive interest at the rate of 2½ per cent. per annum. The Government is responsible for the repayment of all moneys received, thus affording to depositors perfect security. A depositor may apply at any post-office savings-bank in the kingdom for the purpose of withdrawing money, and may direct payment of the same to be made to him at that or at any other post-office savings-bank. His order is forwarded to the Postmaster-General, by whom a warrant for the designated amount is drawn upon the postmaster where payment is to be made, which is forwarded to the depositor, who presents the same, together with his book, and receives his money.

The system was inaugurated by opening in England and Wales 301 postal savings-banks, which number was increased before the close of the year to 1,629. The system was extended in the following year to Ireland and Scotland. In 1866 the number of postal savings-banks in the United Kingdom was 3,369, or more than five times the highest number under the old system; on Mar. 31, 1882, the number was 6,645, and on Mar. 31, 1891, it was 10,063. In the ten years from Sept., 1861, to Sept., 1871, there had been deposited, including interest, £44,198,743, withdrawn £28,044,539, leaving due depositors £16,154,204. During the calendar year 1881 there was deposited £11,345,957; interest

credited, £826,990; withdrawn, £9,469,668; balance due depositors Dec. 31, £36,194,495. In 1892 the number of postal savings-banks was 10,519, the amount deposited was £21,384,903, and the total amount due depositors £75,853,079.

Penny savings-banks, military savings-banks, and savings-banks for seamen have been established as auxiliaries of the general system, for the purpose of meeting the special needs of classes for which the ordinary savings-banks did not hold out adequate inducements or facilities. The penny savings-banks have commonly been tributary to the larger institutions, making them the depositories of their aggregate accumulations. The military and seamen's savings-banks have been conducted independently. Their statistics are unimportant, and fail to exhibit any distinctive features concerning the thrift of the classes they represent, for large numbers of these prefer to deposit in the regular institutions.

Savings-banks in the U. S.—Shortly after the successful inauguration of savings-banks in Great Britain upon a popular and practical plan these institutions began to attract attention in the U. S. The first organization of which there is record was effected in the city of New York, Nov. 29, 1816. The first to go into practical operation was in Philadelphia, which as a purely voluntary association began to receive deposits Dec. 2, 1816, which would indicate an organization effected prior to that in New York. The first to become incorporated was in Boston, Dec. 13, 1816, and it organized and began business in the spring of 1817. Thus the U. S. anticipated Great Britain in giving to this interest the sanction and protection of law. The savings-bank of Salem, Mass., was next incorporated Jan., 1818, and commenced business in April following. The savings-bank of Baltimore opened as a voluntary association for receiving deposits on Mar. 16, 1818, and was duly incorporated in December of that year. The example of these cities and towns was rapidly followed by others.

The plan of organization of savings-banks is not altogether uniform. In some States there is a large body of corporators, empowered to enlarge their number indefinitely, who elect from their number annually a board of trustees or directors, to whom the management of the institution is committed. In others the corporators are a defined and limited number, who are themselves the trustees and responsible for the management. These are commonly empowered to fill vacancies that occur, though in some cases this is done by designated authority outside of the board. In the Northeast savings-banks are managed by trustees for the depositors; in other parts they are frequently managed by corporations with capital stock.

AGGREGATE SAVINGS-DEPOSITS OF SAVINGS-BANKS, WITH THE NUMBER OF DEPOSITORS AND THE AVERAGE AMOUNT DUE TO EACH BY STATES, TERRITORIES, AND GEOGRAPHICAL DIVISIONS IN 1893-94.

STATES, TERRITORIES, AND DIVISIONS.	Number of depositors.	Amount of deposits.	Average to each depositor.
EASTERN:			
Maine.....	153,922	\$53,261,309	\$346
New Hampshire.....	109,510	70,616,944	417
Vermont.....	92,289	27,966,855	303
Massachusetts.....	1,214,493	399,995,570	329
Rhode Island.....	130,610	69,053,724	529
Connecticut.....	335,879	133,967,230	399
Totals.....	2,096,653	\$754,861,622	\$364
MIDDLE:			
New York.....	1,586,155	\$617,089,449	\$390
New Jersey.....	137,897	34,266,298	249
Pennsylvania.....	248,244	66,025,821	266
Delaware.....	18,264	3,693,311	202
Maryland.....	144,318	43,758,875	303
District of Columbia.....	1,258	72,667	578
Totals.....	2,136,036	\$764,906,421	\$356
SOUTHERN:			
West Virginia.....	3,522	\$296,025	\$84
North Carolina.....	* 8,750	416,686	47
South Carolina.....	* 23,246	3,939,976	169
Georgia.....	* 7,196	896,823	124
Florida.....	681	175,115	257
Alabama.....	* 2,590	102,347	39
Louisiana.....	7,796	2,067,845	264
Texas.....	2,450	301,648	123
Arkansas.....	.....	.....	.....
Tennessee.....	9,664	1,412,840	146
Totals.....	66,085	\$9,479,314	\$142

* Partly estimated.

able to resist the prophetic spirit which compelled him to speak his Master's words. The sentence of excommunication followed (1497). The *Arrabbiati* got possession of Florence. Fra Girolamo's letters to foreign sovereigns, urging them to call a council to dethrone the Borgia and elect a new pope, fell into the hands of his enemies. On Apr. 7, 1498, occurred the famous attempt at a "trial by fire," to decide whether he was divinely commissioned, but its fiasco turned the people against him, and on the night of the following day the convent of San Marco was attacked by an infuriated mob. The signoria sent thither officers to demand the surrender of the prior, who, with two of his brethren, was conveyed to the dungeons of the Bargello, and brutally tortured the same night. These barbarities were continued for weeks, and suspended only when the life of their victim was in danger. In the delirium of agony Savonarola sometimes gave confused answers as to his prophetic gifts, but no confession of guilt could be extorted from him. His destruction, however, was inevitable. The pope threatened Florence with an interdict and with every other form of vengeance if she spared the hated friar. Sentence of death was pronounced on May 22, 1498, and the next day he and his two friends and fellow monks Domenico and Silvestro were publicly hanged and then burned in the Piazza della Signoria and their ashes thrown into the Arno. The judgment of history has acquitted Savonarola of the charges brought against him in his own day, and the sincerity of his faith and the disinterestedness of his aims are as unquestioned as the purity of his life and the power of his intellect. Even the Roman Catholic Church, through Popes Paul V. and Benedict XIV., has declared his works irreproachable, and placed him among the servants of God. In the convent of San Marco are preserved various objects of interest once belonging to the martyred prior, such as his Bible filled with annotations by his own hand, etc., and a portrait, probably by his friend Fra Bartolommeo. He was of middle stature, dark complexion, plain in feature, pallid and worn with abstinence; his expression severely noble, but benevolent, and when animated his keen dark eyes glowed like flames. It is incorrect to speak of him as "a reformer before the Reformation," for he had no thought of leaving or opposing the Church. Yet his insistence upon the Bible as the surest guide to the knowledge of spiritual things, and his protests against the corruptions of the Church, had unquestionable influence in hastening the Reformation which followed so shortly after. Among the many works of Savonarola the best known is his *Triumphus Crucis de Veritate Fidei* (Florence, 1497; Eng. trans. *Triumph of the Cross*, London, 1868; also translated *Sorrow and Hope: Meditation on the 31st Psalm, written in Prison*, 1894). The principal *Life of Savonarola* is by Prof. Pasquale Villari (2 vols. 8vo, Florence, 1860; translated into English by Horner, London, 1863; 2d ed. 1888), with full references to authorities and a list of Fra Girolamo's works, both published and unpublished; see also W. R. Clark's *Life and Times of Savonarola* (1878).

Revised by S. M. JACKSON.

Savory: popular name of the *Satureja hortensis* (summer savory) and of the *Satureja montana* (winter savory), labiate garden-herbs of Old World origin, employed in domestic cookery for their flavor.

Savoy: formerly a political division of the kingdom of Sardinia, and originally the family possession of the dynasty now reigning in Italy. In 1860 it was ceded to France, and it is divided into the two departments of Savoie and Haute-Savoie. Savoy is the loftiest mountain region of Europe, containing the highest peak, Mont Blanc. Bounded N. by the lake of Geneva and E. by Piedmont, it is covered by the Graian Alps, and entirely broken up into mountains and valleys. It contains very little arable land, but that which it contains is most carefully cultivated, planted with vines and mulberry-trees, and generally produces wheat enough for home consumption. The mineral wealth of Savoy is not great, though coal, lead, iron, etc., are found, and to some extent worked. But the pastures which cover the mountains are very important, and feed large herds of cattle and sheep; dairy-farming is the principal occupation. The area of the two departments is—Savoie, 2,224 sq. miles, with (1891) 263,297 inhabitants; Haute-Savoie, 1,667 sq. miles, with (1891) 268,267 inhabitants. The Savoyards are an honest, industrious, intelligent, and hospitable race, deeply attached to their native country. They emigrate in large numbers, but when they have amassed enough wealth they return to live in their fatherland.

Savoy Conference: a conference between Episcopalians and Presbyterians held in London soon after the Restoration. The Episcopalians were determined to restore the Church of England to what it was before the civil war, but the Presbyterians, who mainly had been in possession of church benefices and church power for many years, contended for some modification of the former system. A royal commission was issued on Mar. 25, 1661, appointing certain Church of England and Presbyterian divines to confer together, and gave them authority to review the Book of Common Prayer, to compare it with ancient liturgies, to consult respecting exceptions made to it, and by agreement to make alterations such as would satisfy tender consciences and restore unity to the Church. The instrument appointed "the master's lodgings in the Savoy," London, as the place of meeting. As the terms of the commission specified advice and consultation as purposes of the meeting, friendly conference seemed necessary; but the Episcopal party manifested no disposition for anything of that kind. They required written communications from their opponents stating their exceptions to the Liturgy, and to them gave answers both uncourteous and captious, not indicating any disposition to conciliate, but foreclosing the possibility of removing Presbyterian objections. They said: The alterations asked, if allowed, would be a virtual confession that the Liturgy was an intolerable burden, a cause of schism, and would justify past nonconformity. Taking such ground, it mattered not what the objections made might be—none was admissible; and therefore to advise and consult was a thing out of the question. It had been arranged that, while the rest of the Presbyterian brethren employed themselves in drawing up exceptions against the Book of Common Prayer, Baxter should prepare additions. In one fortnight he accomplished his task and presented his reformed Liturgy. The author tells us that he compared what he did with the Assembly's Directory, the Book of Common Prayer, and Hammond's *l'Estrange*; but he seems to have borrowed little or nothing from these sources, beyond introducing or allowing the use of the creeds—sometimes the use of the Athanasian Creed—the *Te Deum*, and the Psalms in order for the day. A rejoinder to the bishops' answers touching exceptions made to the Liturgy followed on the part of the ministers, but no effect was produced by it. At last it was settled that there should be a formal debate, to be conducted by three persons on each side. Strangers were allowed to be present, and the room was full of auditors, young Tillotson, the eminent preacher and archbishop of later days, being among them. The debate turned upon vague abstractions and upon subtle theological distinctions, occasionally interrupted by outbursts of temper and uncivil personalities. As might be expected, the hall of the Savoy Palace became an arena for logical gladiatorship, the object of the meeting was a strife for victory, and the end of the conference was hopeless disagreement. Baxter's *Reformed Liturgy* was reprinted, edited by Charles W. Shields, under the title *The Book of Common Prayer as Amended by the Presbyterian Divines of 1661* (Philadelphia, 1864; 2d ed. New York, 1883).

Revised by S. M. JACKSON.

Savoy Declaration: an ecclesiastical document, deriving its name from the Savoy Hospital in London, where it was framed. Before the death of Oliver Cromwell a meeting was convened by notice from the clerk of the council of state, addressed to the Congregational elders resident in London. Cromwell, though not favorable to the proceeding, yet permitted it; but the ministers did not meet until after his decease; then they assembled in the Savoy Sept. 29, 1658, to declare the principles of their faith and polity. The business was disliked by people about the court, who feared it might lead to fresh divisions between the Independents and Presbyterians. There might be political intrigues at the background of the movement, for Cromwell said in reference to some of its projectors, who were republican officers, "They must be satisfied, or we shall all run back into blood again." At all events, when the meeting came to be held nothing was done which the Protector would have disapproved. The Declaration did not clash with the sentiments of broad charity so dear to his heart. As to doctrine, the Declaration is substantially the same as the Westminster Confession. Its speciality consists in its outline of ecclesiastical order. Whereas the covenants or mutual agreements into which Congregationalists had entered at the formation of their churches in the time of the civil wars generally contained some references

in another light breaking in upon them from God's word, there is in the Savoy Declaration no language of that kind; and it seems to be assumed in the document that Congregationalism, as to the knowledge of its principles, had by that period attained to something like completeness.

JOHN STODOLSKY.

Savoy. The: a spot between the Strand and the Thames Embankment, London, remarkable for its ancient buildings and historical associations. The Savoy Palace was first built by Peter, Count of Savoy, uncle of Eleanor of Provence, queen of Henry III. It came into the possession of John of Gaunt, and within its walls John, King of France, was confined after the battle of Poitiers (1356). In 1381 it was burned during Wat Tyler's insurrection. It was rebuilt toward the close of the reign of Henry VII., who made it a hospital or refuge for 100 poor people. It afterward became a resort for abandoned characters, until the reign of Queen Anne, when the institution was dissolved, and the buildings began to fall into ruin. In 1811 the shattered walls were swept away, with the exception of the chapel wall built in 1515. This chapel was much injured by fire in 1793, but was restored at the expense of Queen Victoria. See *Memorials of the Savoy*, by W. J. Loftie.

Saw (H. Eng. *saw*; < O. Eng. *sage*; O. H. Germ. *saga* < H. G. *sagum*, edge), a thin plate of metal usually having sharp angular teeth upon one edge, used for dividing materials by a cutting, crumbling, or abrasive action.

The word has been known and used from a very remote period. W. M. Flinders Petrie has discovered indisputable evidence that bronze saws having jeweled teeth were used by the ancient Egyptians for cutting the hardest stones, and a two-handled saw of iron 6 ft. 8 in. long by 4½ inches wide was found by Lyaudet at Murooud. Saws are mentioned in the Bible. Some of the Christian martyrs in apostolic times "were seen sawing." The Greek carpenters used saws that were quite similar to some in use at the present time. In a painting discovered at Herculaneum two men are shown at the end of a bench supported by two long-legged "incuses." The piece of wood to be sawn through is secured by straps in the shape of the figure seven, the ends pass through, and are seen below the bench. The saw has a perfect resemblance to our frame-saw. Clovis, a hunter for Chastaigne, speaks of an ingenious saw with which a thief sawed out the bottom of a chest. Pliny says that among the Belgæ saws were used for cutting white marble. The saws of the Japanese and other Oriental peoples have their teeth so shaped that the saw cuts when pulled by the workman, and not when pushed; such saws are superior, inasmuch as they are not liable to flexure and consequent breakage by the force employed, and can be used much longer, and therefore require less strength to operate than the saws used in Europe and America.

The uses to which saws are put suggest their classification into reciprocating and cross-cut saws. The first have their teeth specially adapted for dividing materials in a direction parallel to their faces. In the second class the teeth are designed for cutting at right angles in the direction of the face. There are over 100 varieties in each of these classes, and each with reference to the execution of a specific kind of work. These several varieties may be arranged in four groups, viz., reciprocating saws, circular saws, cylinder or drum saws, and endless-hand saws.

The reciprocating saw is the oldest, and there are more of this variety than of all others combined. Circular saws, having parallel teeth, were known to the ancient Egyptians, who used such saws in shaping small stones, but there is no evidence that they were used by them for cutting wood. Circular saws were used for cutting the spaces between the teeth of wheels for clocks and watches (the teeth were afterward shaped by a file) many years before they were applied to the cutting of wood, and may properly be regarded as anticipating the tool called a mill, commonly used for such purposes. The circular saw was patented in England by Samuel Miller on Aug. 5, 1777, although it is known it was used in Holland nearly a century before. The use of this form of saw has become indispensable in saw-mill establishments. Cylinder or drum saws are mentioned in the invention of Hippocrates (b. 460 B. C.), and were used by him in the operation of trepanning the skull. Such saws are largely used for cutting out bottom-boards, knees for blocks, and similar forms. They are also used for making curved staves for barrels, tubs, pails, and other articles of woodwork.

The endless-hand saw (sometimes called ribbon-saw) consists of an endless band or ribbon of steel, one edge of which is provided with teeth of a form suitable for the work expected of the saw, which in use is strained over two large wheels placed one over the other, and is made to move by turning one of these wheels, the wood to be divided being pressed forcibly against the descending portion of the saw. The hand-saw was invented in 1808 by William Newberry, of London, England. Notwithstanding the many valuable features of the invention it did not attract attention until its principle was embodied in a sawing-machine invented by Tancard, of Paris, in 1846; but it is to the persistence of M. Péro, another Frenchman, that the world is indebted for the practical development of this invention. W. F. DUNBAR.

Sawakin: See SHAKIN.

Sawfish: See PRISTINE.

Saw-fly: a hymenopterous insect of the family *Tenthredinidae*. See ENTOMOLOGICAL and HYMENOPTERA.

Sawmill: usually a building containing mechanism for operating saws; the term is also applied to the combination of a saw with its actuating machinery.

Marble was cut by power-saws as early as A. D. 900, and it is not at all improbable that mills for preparing lumber were also in use at that time. The ancient method of preparing boards, planks, and joists, was to split round logs with wedges, and then hew the rough lumber resulting in the required dimensions. This process is still used in making certain kinds of lumber, such as staves for heavy casks and strips for wooden hoops.

The first reliable evidence of the employment of sawmills for cutting lumber relates to one at Augsburg, Bavaria, in 1322. Soon after the discovery of Madeira, in 1493, sawmills were erected there for the purpose of making lumber for exportation to Portugal. In 1427 there was a sawmill in the city of Breslau, and in 1480 the magistrates of Erfurt established one in a forest which they had purchased. The first sawmill in Norway was built about 1330, and the number of such mills rapidly increased in that country. A sawmill was in operation at Lyons, France, as early as 1553. On the Danube, near Ratibon, in 1575, there was a sawmill having "gang-saws" by which several boards were cut at the same time. A work published at Lyons in 1578 by Jacobi Bessoni gives illustrations of two forms of sawmills having gang-saws; in one of these the saws have teeth on each edge. The first sawmill in Holland was erected at Zaandam in 1596. A sawmill was first operated in Sweden in 1663. The building of sawmills in England was violently opposed, because it was thought that the hand-sawyers would be deprived of their means of living; one erected in 1653, near London, had to be abandoned, and it was not until over one hundred years later (in 1768) that another attempt in this direction was made. A wealthy timber-merchant, under the patronage of the Society of Arts, caused a sawmill driven by wind to be constructed at Limsbous. This mill was destroyed by a mob, but the damage having been made good by the Government, it was rebuilt and allowed to run without interference. Some years earlier a sawmill had been erected at Leith, in Scotland. Probably the first sawmills in America were the three, driven by wind, which were erected at New Amsterdam (now New York) in the year 1623; one of these was located on Nut (now Governor's) Island. In 1706 the first sawmill in Canada was built on the river Richelieu, near Montreal, by a Mr. Sawyer, of Lancaster, Mass. (who had been made prisoner by the Indians), as the ransom of himself and son. In 1803 there was a steam-sawmill in New Orleans run by an engine built by Oliver Evans, of Philadelphia. This mill was burned by the hand-sawyers.

All these mills were of the vertical reciprocating type; their saws were strained in a strong rectangular frame, or gate, to which a vertical reciprocating movement was given by a crank on a revolving shaft, usually placed below it. The gate was moved in and kept from swerving by suitable vertical guides. The log to be cut was secured upon a sliding carriage automatically moved a certain distance at each stroke of the saw, until finally the saw had cut its way from end to end of the log. In mills in which but one saw was used the log had to be moved laterally after each cut a distance equal to the thickness of the lumber required; this necessitated as many longitudinal movements of the log as there were cuts made, but in the best mills which had abundant motive power several saws (called a gang), placed the thickness of the intended lumber apart, were strained in the

same gate, and then the entire log could be cut into boards by a single traverse of the carriage.

In the more recent gang-saw mills there are two gates, in one of which there are but two saws, through which the log is first passed and made parallel-sided; it is then turned upon one of these sides and passed through the second gate, in which there is a sufficient number of saws to cut the log into the desired thickness of boards or planks.

Circular saws, driven by steam or water power, have been largely used for the manufacture of lumber, especially in the U. S., where their use for that purpose originated in a patent granted on Mar. 16, 1820, to Robert Eastman and J. Jaquith, of Brunswick, Me. Multitudes of other patents for circular-saw mills have been granted, covering more or less valuable improvements, but this form of mill remains a very wasteful means of converting timber into lumber.

The band-saw has been adapted to the sawing of logs, and is used to a large extent on the Pacific coast of the U. S. for utilizing the large timber of that region; this form of saw is less wasteful and works rapidly.

W. F. DUFFEE.

Sawyer, LEICESTER AMBROSE: biblical scholar; b. at Pinckney, N. Y., July 28, 1807; graduated at Hamilton College, Clinton, N. Y., 1828; studied theology; was ordained as a Presbyterian minister in 1832, and from 1840 to 1847 was teacher in Central College, Ohio, after which he preached in several places; subsequently was editorially connected with the *Utica Morning Herald*. Author of *Elements of Biblical Interpretation* (New Haven, 1836); *Mental Philosophy* (1839); *Moral Philosophy* (1845); *A Critical Exposition of Baptism* (Cincinnati, 1845); *Organic Christianity, or the Church of God* (1854); and *The Reconstruction of Biblical Theories, or Biblical Science Improved* (1862). In 1838 he began a new translation of the entire Bible, which he completed about 1862. The New Testament was published at Boston, Oct., 1858. The prophetic books of the Old Testament were issued Dec., 1860, and the book of Daniel, with the apocryphal additions, was separately issued in 1864. The remaining (earlier) portions of the Old Testament were not published.

Revised by W. H. WHITSITT.

Sawyer, PHILETUS: U. S. Senator; b. at Whiting, Vt., Sept. 22, 1816; went to Wisconsin 1847; engaged in the lumber business at Oshkosh on an extensive scale; was a member of the Legislature 1857 and 1861; mayor of Oshkosh 1863-64; was a delegate to the Loyalists' convention 1866, and sat in Congress as a Republican from 1865 to 1875, when he declined a re-election. He served on several important committees connected with the business interests of the Northwest, and became chairman of the committee on Pacific railways. He was U. S. Senator from Wisconsin 1881-93.

Sawyer, THOMAS JEFFERSON, D. D.: clergyman; b. at Reading, Vt., Jan. 9, 1804; graduated at Middlebury College 1829; was pastor of a Universalist church in New York 1830-45, and again 1852-61, having in the interval been principal of the Liberal Institute at Clinton, Oneida co., N. Y.; taught theology in the same institution; resided on a farm at Clinton 1861-69, after which he became Professor of Theology in Tufts College, Medford, Mass., an institution which he had been instrumental in founding (1852), as he had also been in the establishment of the theological department of the St. Lawrence University (1856). He has defended the doctrines of Universalism in public discussions with clergymen of other denominations, and some of these polemics have been published, the most important being the discussion with Rev. Isaac Westcott, entitled *The Doctrine of Eternal Salvation* (New York, 1854). In opposition to the views of Henry Ward Beecher, he published *Who is our God? the Son or the Father?* (1859).—His wife, CAROLINE M. FISHER, b. at Newton, Mass., Dec. 8, 1812, was married 1832; has written much in prose and verse for periodicals, especially *The Christian Messenger*; published several translations from the French and German, and edited *The Ladies' Repository*, a Universalist monthly magazine. She also published the *Poems of Mrs. Julia H. Scott* (1854), preceded by a *Memoir*.

Saxe, JOHN GODFREY: poet and humorist; b. at Highgate, Vt., June 2, 1816; graduated at Middlebury College 1839; was admitted to the bar at St. Albans 1843; practiced law in Franklin County 1843-50; was editor of the *Burlington Sentinel* 1850-56; was State's attorney of Vermont one year, after which he devoted himself chiefly to literature and to popular lecturing; was Democratic candidate for Governor 1859 and 1860. Author of several volumes of humorous poems, the longest of which were delivered at college com-

mencements and other anniversary occasions. His published works include *Progress* (1846); *New Rape of the Lock*; *The Proud Miss McBride*; *The Money King* (1859); *Clever Stories of Many Nations*; *The Masquerade* (1866); and *Leisure Day Rhymes* (1875). More than forty editions of his collected poems have been issued in the U. S. and in England. D. at Albany, N. Y., Mar. 31, 1887.

Revised by H. A. BEERS.

Saxe, MARSHAL: the name by which Maurice, Count of Saxony, is generally known. He was born at Goslar, Oct. 28, 1696; a son of Augustus II. the Strong, Elector of Saxony and King of Poland, and Aurora von Königsmark. In his twelfth year he was in the army of Prince Eugene, and in 1711 received formal recognition from his father, who raised him to the rank of count, but his debaucheries and dissipations, in which he surpassed even his father, developed as early and as rapidly as his brilliant talents. He served in a campaign against the Turks in 1717, and two years later went to France, bought a regiment, was appointed *maréchal de camp*, and studied with great energy mathematics, mechanics, and fortification. In 1726 the estates of Courland elected him duke, but, declining the proposed marriage with the duchess, he maintained his ducal authority against her opposition with great difficulty, supporting a small army by means of the money lent him by Adrienne Lecouvreur, the actress. In 1727 he withdrew to Paris. At the outbreak of the Austrian War of Succession he offered his services to his native country, but by the fault of Count Brühl they were not accepted, and he received a French command. He took Prague by storm in 1741, and fought with great distinction in Bohemia, Bavaria, and on the Rhine; but his fame as a great general he gained chiefly by his campaigns in Flanders from 1744 to 1748. He won a brilliant victory at Fontenoy May 11, 1745, and at Raucourt Oct. 11, 1746. He took Brussels, Bergen-op-Zoom, and Maastricht, and conquered the whole of Belgium. The enthusiasm of the French people and king knew no bounds; honors were heaped upon him; he was made marshal-general of all French camps and armies, and presented with the palace and estates of Chambord, where he led a princely life, and died Nov. 30, 1750. His *Réveries*, written in 1731, but afterward revised and much enlarged, is full of ingenious and audacious ideas; his *Lettres et Mémoires*, published in 1794, have also some interest.

Revised by F. M. COLBY.

Saxe-Altenburg: a duchy of the German empire; area, 511 sq. miles; pop. (1890) 170,864; budget of 1895, 3,847,116 marks; public debt (July, 1893), 887,450; is situated N. E. of the Thuringian Forest, and consists of two separate parts called the eastern and the western district. Capital, Altenburg. By the division of 1485 the country fell to the Albertine line. In 1553 it was returned to Duke Johann Friedrich the Magnanimous, of the Ernestine line, and was under dukes of its own from 1603 to 1672, when the reigning family became extinct, and it fell to Saxe-Gotha. As the line too became extinct the country fell, according to the convention of Nov. 15, 1826, to the Duke of Saxe-Hildburghausen, who gave up his own country, Hildburghausen, and became Duke of Saxe-Altenburg. His descendants are still reigning.

Revised by M. W. HARRINGTON.

Saxe-Coburg and Gotha, -gō'tā: two duchies which together form a constitutional and hereditary monarchy, under the sovereignty of a duke, and an independent member of the German empire; area, 755 sq. miles, of which 217 1/2 miles belong to Coburg and 538 sq. miles to Gotha; separated from each other by the Thuringian Forest—Coburg to the S. and Gotha to the N. Pop. (1890) 206,513. Capitals, Coburg and Gotha. Each duchy has a legislative chamber of its own (Gotha 19 and Coburg 11 deputies). These deputies also form a common diet for the united duchies. Coburg has a budget of 1,238,200 marks, with a debt of 3,213,800 marks; Gotha, a budget of 4,204,150, and a debt of 140,100. There is also a budget of 2,012,182 marks, common to the two duchies. Since the accession of Duke Ernst II. in 1844, the two small duchies have formed the starting-point for much intellectual progress. The union of the two countries dates from 1826. The house of Saxe-Coburg, founded in 1680, became extinct in 1699. The contest concerning the heritage ended in 1720. The Duke of Saxe-Saalfeld received the country. The Dukes of Saxe-Saalfeld-Coburg reigned till 1826, when they ceded Saalfeld to Meiningen, and received Gotha, whose own dynasty had died out. Ernst II. was succeeded in 1893 by his nephew, the Duke of Edinburgh.

Revised by M. W. HARRINGTON.

Saxo-Lauenburg: the name of the former duchy of Lauenburg (L. 1.), from the twelfth to the eighteenth century.

Saxo-Welfingen: a duchy of the German empire, area, 1,700 sq. miles; pop. (1890) 229,852; budget, receipts, 7,105,000 marks; expenses, 6,410,000; public debt, 11,708,074 marks; as situated to the S. of the Thuringian Forest. Capital, Bismarck. The reigning line was founded in 1091 by Bernhard, third son of Kuno the Pious. In 1629 Duke Bernhard acquired the duchy of Hildburghausen, with Saalfeld and other estates, but, having allied with Austria in 1690, he was expelled to Altona, and was succeeded by his son Georg.

Revised by M. W. HANSEN.

Saxo-Welfmar: a grand duchy of the German empire; area, 1,700 sq. miles; pop. (1890) 229,852; annual budget 1890-91, 7,105,000 marks; public debt, 11,708,074 marks in 1891. It consists of three districts—Weimar, Neustadt, and Eisenach—situated along the Elbe and the Thuringian Forest. The capitals are Weimar and Eisenach, and there is a university at Jena. The reigning line descends from William, third son of Johann III., the ancestor of the living Ernestine line. In 1623 the house was divided into the lines of Weimar, Eisenach, and Jena. That of Jena became extinct in 1801, and the countries were again united in 1741 under Ernst August. The congress of Vienna enlarged the country with 31 geographical sq. miles and 77,000 inhabitants, and made it a grand duchy. In 1850 Carl Alexander began the reign.

Revised by M. W. HANSEN.

Saxifrage [*sax* O. Fr. from Lat. *saxifraga* (see *herb*), *fraga*, *maidenhair*, *bliss*, *bliss*, of *saxifraga*, stone-breaker; *maiden*, *stature* + *fraga*, *freedom*, break; applied to some plants as growing in clefts of rocks, to others as supposed to break up stones in the bladder; a name popularly applied to a very great number of plants of widely different characters, though properly limited to plants of the genus *Saxifraga* (family *Saxifragaceae*). This large genus comprises many species and high northern species, some of them highly ornamental in culture. Some species were once used in medicine, but none have active properties. The U. S. has numerous species, some of which are natives of Europe also. The early saxifrage (*S. virginiana*) is a very common spring flower in the eastern U. S. The swamp-saxifrage or meadow plantain (*S. pennsylvanica*) is common in wet grounds in the same region, and its radical leaves are gathered and used as potherbs in spring.

Revised by CHARLES E. BESSEY.

Saxifrage Family: the *Saxifragaceae*; a group of about 20 genera of dicotyledonous herbs and shrubs, comprising the saxifrages, buttercups, gooseberries, currants, grass-of-Parnassus, monk-orange (*Pseudoliparis*), and numerous other plants, many of them ornamental and some useful. Some few are cultivated. The family is moderately represented in the U. S. The true *Saxifragaceae* are most nearly related to the *Ranunculaceae*, from which they differ in the delicate, succulent, and succulent seeds, and in the tendency to succulentation of the corolla, and in possession of opposite leaves without genuine stipules.

Revised by CHARLES E. BESSEY.

Saxo Grammaticus: *Historia*; b. in Denmark, date unknown. He was probably secretary to Bishop Absalon, from whom he received valuable assistance in his work. His *Gesta Danorum*, or *Historia Danica*, consists of sixteen books, and dates to the year 1190. The last six books contain reliable historical material, but his representation of the heathen era, based on Norse inscriptions, old songs, the writings of the Icelandic, etc., is untrustworthy in the extreme. His sentence is received from the correctness and elegance of his Latin, which excited the admiration even of Erasmus. His work was first printed in Paris in 1514 under the direction of U. Fagius. The best edition is that by P. E. Müller (H. S. Copenhagen, 1894-95). It was translated into Danish by P. E. Müller in 1872, and by Grundtvig in 1878. C. Christensen is also said to have made a translation, which has been used. The classical Danish version is by N. A. Holm (1878).

Revised by D. K. DOUG.

Saxo: see *LOW DUTCH LANGUAGE*.

Saxa, Low: see *FLAVIUS*.

Saxons (Fr. *Saxons*; Celtic, *Saxones*, *Saxmyn*, perhaps from *Saxa*, a battle-knife): a Low German tribe that lived on both sides of the Elbe in its lower course and on the middle and S. coast (family *Saxones*). They were first mentioned as Saxons in 957 A. D., when they appeared on the coast of Gaul. Their name survives in Saxony, Prus-

sian Saxony, the minor Saxon states, etc. (On the relations of the Saxons to the Angles of Britain, see *Anglo-Saxons*.) They were early colonists of Normandy and France, where they were soon compelled to give way before the Franks. There is a large number of so-called Saxons in Transylvania, descendants of the Low German colonists introduced in 1140 and 1147 by the Hungarian kings. They are one of the dominant races of that region, and preserve the use of the German language, which, however, is considerably corrupted. At home the Saxons enlarged their territory by conquest north and northwest to the North Sea, the Vistula, and the Rhine, and east to the Weser and Waere, the southern Harz, the Elbe, and the lower Saale. After many years of heroic contest with Charlemagne in defense of their national religion and national independence they were forced to accept Christianity and to acknowledge the supremacy of the Holy Roman empire.

Saxony: province of Prussia, between Hanover, Brandenburg, Silesia, Hesse-Nassau, the kingdom of Saxony, and Thuringia; area, 9,740 sq. miles; pop. (1890) 2,500,010. The western portions are occupied by the Harz Mountains; the rest is low and level, sloping northward and watered by the Elbe and its affluents. The soil is very fertile and very well cultivated, and many branches of manufacture are developed with great energy and success. Capital, Magdeburg.

Revised by M. W. HANSEN.

Saxony, Kingdom of: a part of the German empire, comprising an area of 5,767 sq. miles, with (1890) 5,592,784 inhabitants. It lies between Prussia and Austria, a position fraught with great political difficulties and the principal cause of most of the historical vicissitudes of the country. It belongs to the North German mountainous region, two-fifths of the surface being mountainous (Erzgebirge S., Lausitzergebirge E., with the Saxon Switzerland), two-fifths hilly, and one-fifth lowland. The principal river is the Elbe, with its affluents, the Black and the White Elster, the Mulde, and the Pleisse. The population is very dense, 600 per sq. mile; 56,000 Wends, nearly all settled in the government of Hagen, live among the Germans, who belong partly to the Franconian and partly to the Thuringian tribes. In administrative respects the country is divided into four governments—Bautzen, with 470,739 inhabitants; Dresden, with 350,530; Leipzig, with 271,122; Zwickau, with 1,110,283. The principal towns are—Dresden, with 280,844 inhabitants; Leipzig, with 357,122; Chemnitz, with 138,954; Zwickau, with 14,105; Plauen, with 47,007; Glauchau, with 21,405; Freiberg, with 28,935; and Meissen, with 22,446. With respect to creed, there are 3,337,830 Protestants, 129,509 Roman Catholics, 870 other Catholics, 11,510 of other Christian sects, and 2,268 Jews. Agriculture is carried on with a high degree of perfection. Wheat, rye, oats, barley, millet, etc., are cultivated; also flax. The vine is grown along the Elbe. Cattle-breeding is important; sheep especially are very numerous. The arboriculture is excellent; 28 per cent of the total area is covered with forest. Mining is an old occupation here, especially in the Erzgebirge, and is very flourishing. Silver, iron, gold, lead, sulphur, arsenic, zinc, etc., are produced; 2,500,000 tons of coal and about 450,000 tons of brown coal are annually raised. Manufacturing industry is much developed; Chemnitz, Zwickau, Plauen, Zittau, Bautzen, and Leipzig especially are important. Linen, cotton, and woolen goods, paper, chemicals, metal ware and machinery, straw goods, porcelain, musical and mathematical instruments are manufactured. Leipzig has large type-foundries and printing-establishments. The commerce is also very comprehensive; its principal center is Leipzig, which is also the seat of the highest commercial court of Germany. The most important financial institutions are the Bank of Leipzig, the Saxon Bank in Dresden, and the Agricultural Bank of Bautzen. The kingdom is better provided with railways than any other part of Germany; 1,736 miles were in operation in 1892. Public education stands very high; the numerous educational institutions comprised, in 1891, a university in Leipzig, a mining academy in Freiberg, an academy of arboriculture at Tharand, a polytechnic school in Dresden, an industrial school at Chemnitz, 5 commercial schools, 24 schools for the exact sciences, 15 gymnasia, and 2,171 Evangelical and 109 Roman Catholic public elementary schools. The Government is a constitutional monarchy, established in 1831 and modified in 1849, 1861, 1863, 1865, 1868, and 1874. In all foreign affairs and in many important interior questions the authority of the German empire has wholly superseded that of

the particular Saxon Government, which is independent with respect to the interior administration. The reigning king is Albert, who ascended the throne Oct. 29, 1873; the representation of the people is composed of two chambers. The finances are in good order. The budget estimate for each of the years 1892-93 was 97,683,109 marks, with a special revenue and disbursement of 51,405,100 marks, relating to public works. More than half the total revenue is derived from state domains, forests, and railways, the last alone giving, in 1892, a net revenue of 30,597,450 marks. The total debt in 1892 was 625,780,750 marks, nearly all incurred in the acquisition of railways and telegraphs, and the promotion of other works of public utility. The total income of all classes of the population was estimated in 1892 at 1,584,950,632 marks, an increase of 17,000,000 marks over the preceding year. The army forms the Twelfth Corps of the German imperial army. The Saxon colors are green and silver.

History.—That German tribe which the Romans called Saxones was in ancient times settled between the Eider, the Elbe, and the Trave. Charlemagne made war upon them 772-804, and subjugated them, and Saxony became a dukedom, belonging to the Frankish and afterward to the German empire. Under Otto the Magnificent, Thuringia was united to it, and Otto's son, Henry, became King of Germany in 919. His successor, the Emperor Otto I., gave the dukedom of Saxony to Hermann Billung. Under the house of the Billungs, Saxony made war upon the Emperor Henry IV. in 1073, but in 1106 the house became extinct, and under the Emperor Lothar, in 1125, the country came into the possession of Duke Henry of Bavaria. His son, Henry the Lion, increased the dukedom, but when he was placed under the imperial ban his dominions were scattered, and, after being reduced to a small piece of land, the dukedom of Saxony was given to Margrave Bernhard of Ascania. The house of Ascania branched off in 1260 into two lines, of which one, the Wittenberg, became extinct in 1422, while the other, the Lauenburg, reigned until 1680. The title of Duke of Saxony followed the Wittenberg branch; it was changed in 1355 to that of elector, and both land and title were bestowed on Frederick the Valiant, Margrave of Meissen, in 1423. Thus the name of Saxony, which originally designated a tribe, became a princely title, and was transferred to countries with which it had no historical connection. Since 1088 the house of Wettin has reigned in the margraviate of Meissen. In 1485 the grandsons of Frederick the Valiant, Ernst, and Albert, divided the inherited countries, so that Ernst received Thuringia, and Albert, Meissen, and two lines were thus formed, which still flourish, the Ernestine and the Albertine, of which the former reigns in the Saxon duchies, the latter in the kingdom of Saxony. After the Peace of Westphalia, in 1648, the rise of Brandenburg became an impediment to the development of the electorate. The Elector Augustus embraced Roman Catholicism in 1697, became King of Poland, and involved Saxony in war with Charles XII. of Sweden. His successor, Augustus, sided with Maria Theresa of Austria against Frederick of Prussia, and in the Seven Years' war Saxony suffered heavy losses. Under Frederick Augustus III. (1763-1827) the country again began to rise, though it had some very hard years also during this period. As a member of the German empire it took part in the war against France, and concluded an alliance with Prussia in 1806, but after the defeat at Jena it concluded an alliance with Napoleon and entered the Confederation of the Rhine, after which the elector received the title of king. By the Peace of Tilsit the King of Saxony obtained the duchy of Warsaw, which had just been established, and portions of Prussia and Austria, but after the battle of Leipzig he was taken prisoner by the allied Russians, Prussians, and Austrians, and at the Congress of Vienna (1815) was deprived of 7,720 sq. miles of territory. In the long period of peace from this moment, and up to 1866, the country became very prosperous, though a narrow and short-sighted policy of government presented many obstacles to its development. The revolutionary years of 1848-49 brought many great and beneficial reforms to Saxony. Aug. 9, 1854, King John ascended the throne, and both he and his minister, Beust, made a most stubborn opposition to the Prussian policy, and showed a decided partiality for Austria as the leader of the small states. The war of 1866 brought the independence of Saxony in imminent danger, and the king, John, saved his crown only by entering the North German confederacy, over which Prussia presided, by paying 30,000,000 marks in

war indemnity, and by dismissing Beust. The liberal party in Saxony hailed this event with enthusiasm, but the party consisting of the court, the nobility, and the army officers continued hostile to Prussia. In 1870-71 the Saxon soldiers fought under the leadership of the crown prince, afterward King Albert, as true allies by the side of the Prussians, and the interior development of the country has not only kept pace with that of the rest of Northern Germany, but in some respects even advanced beyond it. A new modification of its constitution took place Oct. 12, 1874, giving to the lower house of representatives a more democratic character, while the upper house is still strongly aristocratic in its membership. Revised by M. W. HARRINGTON.

Saxton, JOSEPH: inventor; b. in Huntingdon co., Pa., Mar. 22, 1799. His mechanical ingenuity was early shown by improvements in the machinery in his father's nail-factory. At the age of eighteen he went to Philadelphia, and there invented a machine for cutting the teeth of chronometer wheels, an original escapement with a compensating pendulum, and made the clock which marks the time from the belfry of Independence Hall. In 1828 he went to London, where he resided for nine years. He was placed as chief assistant in the Adelaide Gallery, then the great scientific repository, and while there constructed a magneto-electric machine by which the first magnetic spark was produced. He also constructed the apparatus used by Wheatstone in his experiments on the velocity of electricity in its passage through a wire. He next invented a locomotive differential pulley, by means of which high speed may be given to vehicles by horses traveling at a slow rate, and a medal-ruling machine for tracing lines on metal or glass, representing by an engraving the design on the face of the medal. He returned to the U. S. to superintend the construction of the machinery and balances for the Philadelphia mint, and subsequently was placed in charge of the construction of the standard weights and measures for the U. S. This position he filled with ability, furnishing the State capitals and the custom-houses with accurate sets of weights and measures. A gold medal was awarded him at the London Exhibition of 1851 for a large class-balance of extreme precision. He was one of the original corporators of the National Academy of Sciences. Among his many ingenious devices and inventions, the mirror-comparator for comparing and the tracing-machine for dividing standard measures, his deep-sea thermometer, used in the exploration of the Gulf Stream by the U. S. Coast Survey, his self-registering tide-gauge, and his immersed hydrometer, deserve especial mention. D. at Washington, D. C., Oct. 26, 1873.

Revised by R. H. THURSTON.

Saxton, RUFUS: soldier; b. at Deerfield, Mass., Oct. 19, 1824; graduated at the U. S. Military Academy July 1, 1849, as brevet second lieutenant of artillery; from 1855 to 1859 was on coast-survey duty, and for a year was assistant instructor of artillery tactics at West Point. On the outbreak of the civil war he was stationed at St. Louis, and participated in dispersing the Confederate force at Camp Jackson, May 10, 1861; appointed assistant quartermaster U. S. army May 13, 1861, he served on the staff of Gen. Lyon as chief quartermaster until transferred in July to the staff of Gen. McClellan in West Virginia. In September he accompanied the expedition to Port Royal, S. C.; appointed brigadier-general U. S. volunteers in Apr., 1862, he commanded at Harper's Ferry when threatened by Jackson; assigned to duty as military governor of the department of the South July, 1862, where he was engaged in organizing Negro laborers and troops, and as commissioner of the Freedmen's Bureau until Jan., 1866, when he was mustered out of the volunteer service; brevet major, lieutenant-colonel, colonel, and brigadier-general. In 1872 he became deputy quartermaster-general U. S. army, with rank of lieutenant-colonel; in 1882 assistant quartermaster-general, with rank of colonel; retired Oct. 19, 1888. Revised by JAMES MERCUR.

Say, JEAN BAPTISTE: economist; b. in Lyons, France, Jan. 5, 1767; was educated for a commercial career, and spent a part of his youth in England; found employment on his return to Paris on Mirabeau's paper, *Courrier de Provence*, and afterward as secretary to Clavière, Minister of Finance; edited from 1794 to 1800 *La Décade*; became a member of the tribunate in 1799; published his celebrated *Traité d'Economie politique* in 1803, and enjoyed a great reputation when his thorough disagreement with Napoleon's policy compelled him to retire into private life. He established a large spinning-mill, and published in 1815 *Catéchisme*

de l'économie politique and in 1810 *De l'Angleterre et des Américains*. After the fall of Napoleon he again took an active part in public life, and was appointed professor at the Ecole des Arts et Métiers in 1816, and at the Collège de France in 1822. D. in Paris, Nov. 15, 1833. He was the first writer to popularize the doctrines of Adam Smith on the Continent. His lectures were published 1828-30 under the title *Cours complet d'économie politique*.

SAY, JEAN BARTHELEMY (Léon); economist; b. in Paris, June 6, 1793; grandson of Jean B. Say; studied political economy; took an active part in conducting the *Journal des Débats*; was appointed prefect of the department of the Seine in 1821, and elected a member of the Legislative Assembly; was Minister of Finance in 1823, 1825, and 1827, minister to England in 1829, and in the same year president of his nation; and published *Théorie des changes étrangers* (translated from the English), *Histoire de la Cour de Commerce*, *Les Villes de Paris et de l'Orléans*, *Examen critique de la situation financière de la Ville de Paris*, etc.

SAY, THOMAS; zoologist; b. in Philadelphia, Pa., July 27, 1817; was one of the founders, and the first curator, of the Philadelphia Academy of Natural Sciences; accompanied Moore, Pease, and Ord in their scientific exploration of Georgia and Florida 1842; was zoologist to Maj. Long's expeditions to the Rocky Mountains 1849-50, and to St. Pierre 1850; published *Vocabularies of Indian Languages* (Philadelphia, 1822); issued his principal work, *American Zoology*, in 3 vols. (Philadelphia, 1824-28); removed with Haver and Owen to New Harmony, Ind., 1826, as one of the founders of that socialist experiment; remained there after the separation of his associates; published 7 numbers of a great work on *American Conchology* (1830-32) with colored plates. D. at New Harmony, Oct. 10, 1834. His *Complete Writings on Conchology* was edited by William G. Barron (New York, 1850), and his *Complete Zoology on Zoology* was issued by Le Conte (New York, 1850). Say must be regarded as the father of American systematic zoology. His work, mostly on invertebrates, was of the highest character.

Revised by J. S. KIRSTEY.

SAYCE, ALBERTUS HENRY, J. D. D.; philologist; b. at Shrewsbury, England, Sept. 28, 1846; graduated at Oxford in 1869, where he became a fellow of Queen's College; was appointed Deputy Professor of Comparative Philology at Oxford in 1870, which office he resigned in 1890. He has worked in a great variety of fields, classic, biblical, Assyrian, Hittite, Persian, Egyptian, and has published a number of books and essays. Among these are *Introduction to the Science of Language* (3 vols., 1890); *The Ancient Empires of the East* (1891); *The Hittite Language* for 1887 (on the religion of the ancient Babylonians); and *The Records of the Past* (2 vols., 1898-99).

D. G. LYON.

SAYRE, LEWIS ALBERT, M. D.; surgeon; b. at Madison, N. J., Feb. 29, 1820; graduated at the University of Pennsylvania in 1837. Having selected the medical profession, in 1839 he joined the office of Dr. David Green in New York; in 1842 took the degree of M. D. in the College of Physicians and Surgeons; was appointed resident physician of Bellevue Hospital, New York, in 1850, and soon after was elected Professor of Orthopedic Surgery in the Bellevue Hospital Medical College. In 1846 he advocated free incision for the treatment of suppurative diseases of the joints; and in 1852 he amputated the head of the os femoris and portion of the os pubis with success—an operation he has performed since probably more than the whole profession besides. He inaugurated important steps in the treatment of hip-joint disease and various of the osteitis, lecturing on these subjects at the U. S. and Europe, and may be said to be the founder of orthopedic surgery as a specialty. Dr. Sayre is the author of several monographs on orthopedic surgery. In 1872 the King of Sweden appointed him a Knight of the Order of Vasa.

Revised by S. T. ARMSTRONG.

Scab, a disease of sheep much resembling the itch which sometimes affects the human species. Like that disease, it is caused by the presence of a minute scarus or spider-like mite. Sulphur treatment, arsenical washes, tobacco-water, and mercurial ointments are all useful, and the disease can generally be cured without difficulty. It may be suspected when the sheep rub themselves much or have bare and scurfy patches upon the skin.

Scab on man, the popular name of several diseases, characterized by a roughening of the surface of the affected

part. **Apple-scab** is a disease in which the fruit becomes more or less covered with black scab-like spots, varying from mere specks a millimeter in diameter to blotches nearly or quite an inch in diameter. It is caused by a minute hyphomycetous fungus (*Phoma pomorum*).

Apple-scab is a disease in which the fruit becomes more or less covered with black scab-like spots, varying from mere specks a millimeter in diameter to blotches nearly or quite an inch in diameter. It is caused by a minute hyphomycetous fungus (*Phoma pomorum*), which grows upon the surface and in the superficial cells of the leaves and fruit. According to Prof. Scribner, whose figures we reproduce, the loss in some States from the apple-scab amounts to one-half the crop. Spraying the trees in the spring with potassium solutions (iron or copper sulphate) is beneficial. **Cherry-scab** is a similar affection of the pear, caused by the same or a very nearly related fungus known as *P. pyracanthæ*. **Grape-scab**, or more properly anthracnose, occurs upon the leaves, twigs, and berries of the grape, forming brownish or grayish scales with darker margins. It is one of the most destructive of the grape diseases and is caused by a minute melanconicaceous fungus (*Uromyces ampelophagum*, or, according to de Bary, *Sphaeria ampelophagum*) which attacks the superficial cells of the affected parts. The application of potassium solutions by spraying has been found beneficial. **Potato-scab** is a disease of the tubers of common potatoes in which the surface becomes more or less covered with rough warty scales, greatly injuring their appearance and value. Careful investigations by Prof. Bolley show that it is caused by bacteria which invade and destroy the outer cells. As a consequence, the tuber develops masses of cork-like cells to close the wounds resulting from the action of the bacteria. Soaking the potatoes before planting for an hour and a half in a solution of corrosive sublimate in water (1 to 1,000) will destroy the bacteria. The planting should be upon ground free from contamination. **Beet-scab** is a disease of sugar-beets similar to the potato-scab, and, as shown by Prof. Bolley, caused by the same species of bacteria. The scabby patches occur upon the upper portion of the bedroot, and greatly disfigure it. It is therefore necessary in growing sugar-beets to avoid the use of fields in which scabby potatoes have been grown. **Wheat-scab** is a disease of the heads of wheat in which they turn pale yellow, wholly or in part, the kernels shriveling and drying up. The chaff also becomes coated over with a sticky growth, which the microscope shows to be a hyphomycetous fungus, probably *Fusarium tritici*. Early sowing upon well-prepared soil tends to decrease this disease. See F. L. Scribner's *Fungus Diseases of the Grape* (U. S. Dept. Agric., 1886); *Fungus Diseases of the Grape and other Plants* (1890); J. C. Arthur, *Wheat Scab* (Bull. Purdue Univ. Expt. Station, 1891); H. L. Bolley, *Potato Scab and Beet Scab* (Bull. N. Dak. Expt. Station, 1891).

CHARLES E. BRISSET.

Scabhard-fish: the *Lepidopus argenteus*, a species of the family *Trachinotidae*, distinguished by the elongated, ribbon-like body, pointed head, formidably armed mouth, elongated dorsal and anal, and well-developed and forked caudal fin. The species is an open-sea fish, and rather rare on the coasts of Europe.

Scabies, or **Itch** [*sabies* is Mod. Lat., from Lat. *scabies*, scurf, mange, itch]; a parasitic disease of the skin. It affects chiefly the hands, more especially the webs of the fingers, their inner surfaces, and the back of the hand. Less frequently it extends to the arms, and rarely the feet, legs, and abdomen are affected. The scalp may be invaded, but the face is exempt. This disorder infests children, the peculiar insect being transmitted from person to person by contact at school or play, and its lodgment being facilitated by neglect to wash perspiration and dirt from the hands. Persistent and annoying itching is experienced; careful inspection detects small red elevations, points of irritation, papular at first; soon these become vesicular or watery at the tip, and often from scratching are rendered pustular, and later scaly. Closer inspection discloses small red lines connecting these vesicles or branching from them into adjacent healthy skin. These red lines are subcutaneous channels,



Apple-scab: a, an affected apple, reduced; b, a section showing the parasites, much enlarged.

produced by the burrowing of the itch-insect beneath the cuticle or scurf-skin, and the vesicles are the result of inflammation to which its presence and irritation have given rise. The insect will not be found in the fluid or cavity of the vesicle, but by laying open the diverging canals with a fine needle may often be found at its end. This parasitic insect is known as the *Acarus scabiei*, or *Sarcoptes hominis*. It is a whitish insect, from $\frac{1}{16}$ th to $\frac{1}{8}$ th of an inch long. The male is migratory in his habits, and small. His head is provided with two mandibular organs and four palpi or bristles; the adult male has eight legs. The female is sedentary in habits, and more easily found, especially at the ends of channels, where she lays her eggs. The acarus makes its progress beneath the epidermis by means of suckers or disks upon its legs, and by aid of bristles upon its back, directed backward. Hahne-mann ascribed itch to a supposititious cause, a subtle humor, which he termed *psora*, and which he regarded as the cause of multitudinous ailments of all kinds; but the microscope has established the parasitic nature of the disease. The treatment of scabies consists in killing the parasites. Remedies producing this end are termed parasiticides. Chief among these is sulphur, in ointment, powder, or vapor. Sulphurous acid is a convenient application. Carbolic acid, kerosene, petroleum, strong alkalies, and solution of corrosive sublimate are also efficacious. Even when cured as a specific disease, the redness and vesicles may linger, a chronic condition of irritation. Soothing ointments are then indicated.

Revised by W. PEPPER.

Scad: the *Trachurus trachurus*, a fish of the family *Carangidae*, distinguished by its elongated, fusiform body, completely plated lateral line, and silvery color. When fresh it is scarcely edible, but it takes salt well, and when pickled is very good. Immense quantities are taken in the British seas. The name has been extended to congeneric species, as well as to species of like form belonging to the genera *Trachurops* and *Decapterus*.

Scævola, sev'ô-lă: a cognomen common among the members of the plebeian family of the Mucii in ancient Rome. The two most prominent members of the family were QUINTUS MUCIUS SCÆVOLA, THE AUGUR, and QUINTUS MUCIUS SCÆVOLA, THE PONTIFEX, both celebrated as jurists, and nearly contemporary. The former was tribune of the people in 128 B. C., prætor in 121, consul in 117, and died soon after the outbreak of the war between Marius and Sulla. Cicero, who was born in 106 B. C., states that after assuming the garb of manhood (*toga virilis*) he was taken by his father to Scævola to be instructed in law, and that he remained in close attendance upon him until his death. The Pontifex Scævola was tribune in 106 B. C., and consul in 95. He was proscribed and put to death by the party of Marius in the year 82. Cicero, who, after the death of Scævola the Augur, attached himself to the Pontifex, characterizes him with the epigrammatic phrase that of juriconsults he was the most eloquent, and of orators the most deeply versed in the law.

Revised by G. L. HENDRICKSON.

Scagliola, skāl-yô-lă [from Ital. *scagliuo'la*, liter., dimin. of *scaglia*, scale]: an imitation of marble, made by mixing ground gypsum with glue, coloring it, applying it to the surface to be marbleized, and setting into the soft mass, if it be desired, bits of various ornamental stones. When hard the surface is smoothed and polished. It is an admirable imitation of the more costly marbles, but is not durable, especially in damp places.

Scala, skaal'ă (Lat. *Scaligeri*): the name of a celebrated Italian family which reigned in Verona from 1260 to 1387. After a long series of internal disturbances, tyranny alternating with anarchy, Mastino della Scala succeeded in 1260 in making himself master of the city. He ruled with firmness and wisdom; the city prospered, and, although he was assassinated in 1277, the power continued in his family for more than a century. Under Cangrande (1311-29) the fortune of the family culminated. He was confirmed in his possessions, to which were added Vicenza, Padua, Treviso, etc., by the Emperor Henry VII. At his court lived Dante, and many of the most magnificent architectural monuments of the city were erected during his reign. Most of his successors, Cangrande II., Paolo Alboino, and others, were worthless and infamous tyrants, and in 1387 Galeazzo Visconti of Milan expelled Antonio della Scala. The male line of the family, which flourished in Bavaria under the name of Scaligeri, became extinct in 1598; the female is still flourishing in the families of Dietrichstein and Lamberg.

Scala Nova (anc. *Nedrolis*): town; in Asia Minor, vilayet of Aidin; 7 miles S. W. from the ruins of Ephesus (see map of Turkey, ref. 5-D). It has a good and sheltered harbor, and is the main port of the towns in the valley of the Meander. Pop. 7,500, almost all Greeks. E. A. G.

Scald: See BURNS AND SCALDS.

Scaldhead: See FAVUS.

Scale [from Lat. *sca'la*, flight of steps, for **scadla*, deriv. of *scan'dere*, climb]: a mathematical instrument used in plotting and in other branches of applied geometry. It consists of a slip of wood or other material divided into parts in accordance with some mathematical law. The common ivory ruler of the instrument-maker has a great variety of scales stamped on its faces, of which the *scale of equal parts* and the *scale of chords* are of most frequent use.

Scale of Equal Parts.—This consists of a number of inches, or aliquot parts of an inch, laid off along a line. The representative fraction gives the ratio between the scale and the object it represents. Thus if the scale is of 1 inch to 8 miles the representative fraction is 1:506,880. The first part, counting from the left, is subdivided into ten equal parts, the 0 of the scale being at the beginning of the second part. The *principal divisions* are numbered from the 0 toward the right, and the *subdivisions* toward the left. This scale is used, in connection with a pair of dividers, for laying off and measuring the lines of a drawing. The diagonal scale is used to further divide the subdivisions. If the division is into tenths, ten parallel lines at equal distances are drawn above the simple scale, and the perpendiculars are erected at the ends of the division. Then from the points of subdivision on the uppermost line parallel lines are drawn to the corresponding points one subdivision to the right on the base line. The intercepts of these diagonals on the lines parallel to the base determine the length of the farther subdivision.

Scale of Chords.—This scale is used for laying off and for measuring the angles of a drawing. It is constructed by laying off from the left-hand extremity of a given line the chords of all the arcs from 0° up to 90°, corresponding to some assumed radius. The extremity of each chord is marked by a corresponding number; the origin of the scale and the extremity of the chord of 60°, which is equal to the radius, are marked in a more conspicuous manner than the other divisions. To lay off an angle, the vertex and one side being given, take the chord of 60° as a radius, and from the vertex of the angle as a center describe an arc cutting the given side; then from the point in which this arc cuts the side as a center, with a radius equal to the chord of the arc corresponding to the given angle, describe a second arc cutting the first; join this point of intersection with the given vertex; the last line will make the required angle with the given side. The method of measuring an angle by means of the scale is obvious.

Scale: in music, the regular series of sounds, or degrees on the stave, which form the gamut. The scale in its simplest form consists of seven steps or degrees, counted upward in regular order from a root or prime, to which series the eighth is added to complete the octave. By reverse motion the same notes form the descending scale; and by the addition of other notes above or below in a continuous order the scale may be extended to seven, eight, or more octaves. The *diatonic* scale is that which consists of the tones and semitones of the octave in their natural order and relation; as, for example, A, B, C, D, E, F, G, A. (For the origin of this scale, see the article GAMUT.) Of the diatonic scale, only two varieties are in use in modern music—viz., the *major* and the *minor*. The chief characteristic interval in both these scales is the *third*, which is one semitone greater in the major than in the minor. In ancient music several other diatonic scales were in use as described under the head of MODE (*q. v.*). The word scale means also the entire range or compass of sounds producible by any given instrument, as the scale of the violin, flute, organ, or piano. It is also applied by organ-builders to a graduated rule, plan, or scheme showing the lengths and diameters of the various pipes comprised in any stop. In like manner the length and thickness of the strings of a piano are regulated by a carefully graduated scheme called the *scale*; hence the terms new or improved scale refer to changes adopted by manufacturers in regard to the length and thickness of the strings.

Revised by DUDLEY BUCK.

Scale-carp: See CARP.

Scaldis (cf. *Rubus*): See *ANACARDIUM*, *DISPARANETTES* (*Murder-net* species).

Scaliger, JESSE (former classical scholar); tenth child and third son of JESSE (classical scholar); b. at Agon, Guyenne, France, Aug. 8, 1640. He was carefully educated by his father and studied in Heidelberg and Paris under TURNERUS (1658), and was professor in Witten 1672-74. The succeeding twenty years were spent in travel and on the coast of America, in the Netherlands. In 1698 he accepted a call to the University of Leiden, where he remained till his death Aug. 11, 1699, by inadvertent poisoning of the fumes of burning incense offered by the numerous attacks upon his character which SCALIGER (q. v.) hurled against him in the *Neuburg Hypobolismus* (1697). *Scaliger* has been justly styled the "most richly stored intellect that ever spent itself in acquiring knowledge." He insisted on fewer than fifteen languages, and his acquisitions in mathematics and the sciences generally were profound, and his acquaintance with ancient antiquity all-embracing. He opened new regions of research for the classical scholar, being virtually the founder of epigraphy, numismatics, and chronology as sciences. His critical talent was of the highest order, and none is so sure as an ancient author whom he has not been misled by *Scaliger's* genius, although he has said of himself: "Natus modestus quam remedia novimus." His most important works are *Expositio* (1675); *Caesars*, *Tibullus*, *Propertius* (1677), a work unfortunately marred by a wanton disregard of MS. tradition; twenty-four indexes to *Varro's Thesaurus*, *Isidorus*, *Latinitas* (1691), a colossal and epoch-making achievement; *De emendatione Temporis* (1686) and *Thesaurus Temporis* (1696), immortal masterpieces and the basis of all subsequent chronological research; the restoration of the last portions of the *Chronicon* of Eusebius being perhaps the greatest triumph of his critical skill on record, for when the missing parts were discovered in an Armenian translation they were found identical with *Scaliger's* reconstruction. See JACOB BARNES, *Joseph Justus Scaliger* (Berlin, 1855), pp. 370 (list of his works, pp. 207-208); L. MULLER, *Geschichte der class. Philologie in den Niederlanden*, pp. 222-227; M. PATISSON, *The Lives of the Two Scaligers*, in *Essays*, vol. I, pp. 196-216.

ALFRED GUDEMAN.

Scaliger, JESSE (former classical scholar); b. at Riva, near Genoa, Italy, Apr. 24, 1640; the son of Benedetto Barnes, a miniature-painter of Padua. The latter assumed or assumed the name Della Scala (de l'Escale) from the street where he lived, for the genealogy by which his descent from the noble family of the Della Scala was made out is a pure fabrication, though obstinately upheld by his illustrators. The elder *Scaliger*, according to the account given in his son, served as a page under Maximilian I., and as a soldier of fortune in the armies of François de Valois. He studied medicine, and after living for some time at Poissy served JESSE at Agon, France, in 1629, as physician in the hospital of the diocese. D. Oct. 21, 1695. He was a man of great learning and a versatile Latin poet, but of a very enervate and pugnacious nature. His best-known works are *Commentarii* (1661), commentaries on Hippocrates, *De insomniis* (1658); Aristotle, *De somno*; *Thesaurus*, *De causis plantarum* (1696); and a monumental work, *De assis Lingue Latine* (1640). His attack on Erasmus (*Prologus pro Oratione contra Erasmus*, 1600) is characterized by a most virulent invective, remarkable even for an age so tolerant of personal vituperation. See JACOB BARNES, *De virtutibus et splendore gentis Scaligeri* (1697); *Scaligeri vita* (Leyden, 1691); JACOB BARNES, *Vita JESSE Scaligeri* (1694); A. MAGN, *Documenta de JESSE Scaligeri et de familia* (1880).

ALFRED GUDEMAN.

Scallops (from O. Fr. *escalope*, a shell; of Dutch *schelp*): a common name for mollusks of the family *Pectinidae*. The word, the two valves of which are usually unequal, is circular or oval, the straight hinge having ear-like lobes at one end. There are many species, most of them being used for food. The Eastern markets of the U. S. are supplied by the *Pecten irradians*, which abounds on the south shore of Cape Cod and southward. Only the muscle which forms the shell is good for food. A scallop-shell was formerly worn by pilgrims to show that they had been to the holy land.

J. S. KINGSLEY.

Scalp, the outer covering of the top of the human head, consisting of the hairy integument, the flattened tendon of the occipito-frontal muscle, and subcutaneous cellular tissue.

Wounds of the scalp are peculiarly liable to take on an upward kind of inflammation, and their treatment requires great care. The removal of the scalp of a dead (or even a living) enemy as a token of triumph is one of the customs of many tribes of North American Indians.

Scaly Ant-eater: See *MANIDIA*.

Scamander (in Gr. *Σκαμάνδρ*): a stream in the plain of Troy. Homer says that it was called *Xanthos* by the Greeks, but *Scamander* by men; it is probable, however, that it received the name *Xanthos* from the yellow or brownish color of its water, which was believed to have the power of dyeing the wool of sheep which drank of it. According to Homer, it arose from two sources, one of hot, and the other of cold water. To-day, at all events, the waters of the stream of *Scamander* do not differ in temperature. The river is still called *Menderes* by the Turks.

J. R. S. S.

Scammony (via O. Fr. from Lat. *scammonia*, *scammonium* = Gr. *σκάμνη*): a cathartic drug obtained from the *Convolvulus scammonia*, a twining plant of the family *Convolvaceae*, indigenous in Greece, Syria, Anatolia, and Southern Russia. The root of this convolvulus contains a milky juice which, collected from the cut surface of a fresh root, dries into a slate-colored lump, hard and brittle, and constitutes the drug in question. At the time of collection the juice is much adulterated, so that scammony varies greatly in purity. The purest quality is called virgin scammony. The active principle of scammony is a resin which may be used in medicine instead of the crude drug. Scammony has been known from a remote period. It is a powerful drastic cathartic, and in overdose is capable of exciting dangerous inflammation. Its principal advantage is the fact that an emulsion of the drug is nearly tasteless, but it is very seldom used except in combination with other purgatives. Resin of scammony is an ingredient of the U. S. compound extract of colocynth, and therefore of the compound cathartic pill.

Revised by B. A. HARK.

Scamozzi, *skā-mōt-sō*, VINCENZO: architect; b. at Vicenza, Italy, in 1532. His father, also an architect, grounded him in his art. He then studied at Venice with Palladio and Sansovino, and in 1579 he went to Rome to study ancient monuments. In 1583 he returned to Venice to establish himself, and was commissioned by Marc Antonio Barbaro to erect a monument to his family in the Church of the Carità. This work was so much approved of that Scamozzi immediately was appointed to finish the library of St. Mark's. The Cornaro Palace on the Grand Canal, Venice, is his work, also the Trisino Palace at Vicenza. The second or uppermost story was added to the Palazzo Strozzi, at Florence, by Scamozzi, and he built the Ravascheri Palace at Genoa. His designs were in request all over Europe, for he was acknowledged to be one of Italy's best architects. He published several works, and had completed six parts of his *Ideas of Universal Architecture*, when he died in Venice, Aug. 7, 1616.

W. J. STILLMAN.

Scam'derberg: soldier and patriot; b. 1404. His real name was George Castriotes, and he was fourth son of John Castriotes, despot of Northern Albania. The four brothers were given as hostages to Murad II. in 1423, when he invaded Albania. The three elder died from poison, but the beauty and brightness of George rendered him a favorite of the sultan, who made him a janissary and gave him the title of Iskender (Alexander) Bey; hence his popular name of Scanderbeg. He gained great distinction in the Ottoman campaigns in Asia, but when his father died in 1432 the sultan incorporated Albania as a province. Scanderbeg was offended and indignant, but bided an opportunity for freedom and revenge. In 1443 he was sent as second in command of a large army into Hungary. He so maneuvered as to give the victory to the Hungarian Hunyadi, and fled with a few followers to Croia. Previously he had compelled the sultan's secretary to sign an order, bidding the Ottoman commander of Croia to give up his office to the bearer of the order, and had then killed the secretary to prevent discovery. He thus obtained possession of the chief Albanian fortress, Adjuring Island; he called upon his countrymen to rise against their Mussulman masters. The country responded; even the rival, semi-independent Albanian chiefs forgot their jealousies and agreed to pay him tribute. During seventeen years Scanderbeg successfully resisted the whole power of the Ottoman empire, fifteen times defeating armies always far more numerous than his own, commanded by the ablest generals and often by Murad II. or his successor, Mohammed

II., in person. In 1461 the sultan, hopeless of victory, acknowledged the independence of Albania and Epirus. Persuaded by the pope to violate the treaty and attack the Ottomans, Scanderbeg won eight splendid victories, the last, with 24,000 men, over Mohammed II., who had 100,000. He died at Alessio, Jan. 17, 1468, and was buried at Scutari in Albania. When in 1477 the Ottomans captured Scutari, they broke open his tomb, divided his bones into fragments as precious relics, had them set in gold and silver, and wore them around their necks as talismans to give intrepidity and success. Despite his ferocity and lack of faith, Scanderbeg is deservedly honored and revered as the "hero of Albania."

E. A. GROSVENOR.

Scandina'via: a name applied by the Romans to a supposed great island N. of Germany, probably the southern point of Sweden, extended by moderns as a geographic name for the peninsula between the Baltic Sea and Gulf of Bothnia on the one hand, and the North Sea and Atlantic Ocean on the other. It includes Norway, Sweden, and part of Finland. The name is sometimes used in an ethnographic sense, when it also includes Denmark. See NORWAY, SWEDEN, DENMARK, FINLAND, and LAPLAND. M. W. H.

Scandinavian Languages: the name applied collectively to the Teutonic languages of the Scandinavian north, inclusive of settlements from Scandinavia, notably Iceland and the Faeroes. With Gothic and West Germanic Scandinavian forms the Teutonic branch of the Indo-European family of languages. An earlier classification made Scandinavian and Gothic East Germanic as opposed to West Germanic, but, although coincidences in some points exist, no other relationship than the one at present assumed is probable. The linguistic territory of Scandinavian is Norway, Sweden, including parts of Finland and Esthonia, Denmark, including the adjoining northern parts of Schleswig and the Danish dependencies of the Faeroes, Iceland, and Greenland. At an earlier period Scandinavian was, at least for a time, the language of conquered territory elsewhere—viz., in Swedish settlements in Russia from the ninth to the eleventh century; in Norwegian settlements in the Orkneys and Shetlands from 800 to 1800; in the Hebrides, Northern Scotland, and the Isle of Man from 800 into the fifteenth century; and in Ireland from 800 to 1800; in Danish settlements in England from the ninth into the eleventh century; and in Danish and Norwegian settlements in Normandy from 900 until after 1000. From the Shetlands, Ireland, Scotland, England, Normandy, and Russia there is, however, no extant monument from ancient times.

In its historical development Scandinavian falls chronologically into several periods. Common Norse, the first, extends from the earliest time down to the beginning of the Viking age in 700. It is the homogeneous parent language of the north before it shows traces of dialectic differences. The second period is coincident with the so-called Viking age, from 700 to 1050. Instead of a single language, three dialects appear—Old Norwegian, Old Danish, and Old Swedish, including the sharply defined dialect of the island of Gotland, Old Gutnic, to which was added after the settlement of Iceland, principally from Western Norway, in the ninth century, a fourth, Old Icelandic. This dialectic separation, furthermore, proceeded in such a way that two groups were formed—an eastern, made up of Old Danish and Old Swedish, together, accordingly, called East Norse, and a western, comprising Old Norwegian and Old Icelandic, together called West Norse. At the end of the Viking age these dialects again had differentiated into languages, properly so called, whose early or "old" period extends to the Reformation, or about the year 1530, at which time the modern or "new" period begins. The whole development of the Scandinavian languages down to the Reformation is commonly included under the one term Old Norse. In Scandinavia itself, in the Viking age and later, *dǫnsk tunga*, Danish language, was applied to the language of the entire north; in the same signification *norðrǫn mál*, Norwegian language, also occurs in Norway and Iceland, but it is usually limited specifically to West Norse.

Common Norse is only scantily preserved in Scandinavian loan-words adopted by the neighboring Lapps and Finns in the early centuries of the Christian era, and in something over a hundred runic inscriptions in the earlier Germanic alphabet of twenty-four characters, the oldest of which date from about the year 500. Of the Teutonic dialects Common Norse even more than Gothic stands nearest in essential points to Common Teutonic. Important differences be-

tween Scandinavian and Gothic observable in the earliest time are: Norse retention of final *a*, *i*, *u* of stem in substantives, syncopated in Gothic; Norse *a*-stems end genit. sing. -*as*, dat. sing. -*e*, Goth. -*ia*, -*a*; *an*-stems end genit. and dat. sing. -*an*, Goth. -*ina*, -*in*; *u*-stems end dat. sing. -*iu*, Goth. -*au*; *r*-stems end nom. pl. -*iR* (*R* palatal liquid), Goth. -*jus*; 1 sing. pret. of weak verbs ends -*o*, Goth. -*a*. The most important points of coincidence with Gothic are the development of Teutonic *jj* to Gothic *ddj*, Norse *ggj*; Teutonic *uv* to Gothic *ggu*, Norse *ggu*; Teutonic *z* to Gothic *s*, Norse *k*.

During the Viking age (700-1050) it is possible to obtain for the first time a tolerably complete view of the language. The sources of information are, as in the earlier period, loan-words, and not only in Finnish-Lappish, but in Keltic, Russian, and Anglo-Saxon. Runic inscriptions, besides, occur in great numbers over the whole Scandinavian north, written after the middle of the ninth century exclusively in the shorter or Old Norse alphabet of sixteen characters. To these, after the end of the ninth century, is to be added a literature consisting of the oldest Eddic lays and early Skaldic poetry cited in Icelandic MSS. of the thirteenth century, until then orally transmitted and still preserving an archaic form. The Viking age was not only pre-eminently a period of rapid organic change, but local differentiations occur also at an early period, as has already been noted, in two well-defined groups, and after the introduction of Christianity, which marks the end of the period, there are four languages instead of the one at its beginning. After the middle of the twelfth century a native literature begins in Icelandic-Norwegian, soon abundant enough to show comprehensively the facts of the language. The alphabet used is essentially the Latin. From the runic alphabet *f*, thorn, was retained, and the Anglo-Saxon *ð* was borrowed. To indicate new vowel-conditions the MSS. use, but inconsistently, various digraphs and modified forms. Vowel-length in the oldest MSS. is indicated by accent.

Old Norse in the literary period exhibited the following phonetic conditions:

A. Sonants:

Vowels: Palatal. Short: *i*, *j*, *e* (*ę*), *y*, *ø*. Long: *ī*, *ē*, *ǣ*, *ý*, *ē*.
Guttural. Short: *a*, *o*, *u*, *ʊ*, *q*. Long: *ā*, *ō*, *ū*, *q̄*, *ē*.

In the function of sonants (only in unstressed syllables):

Nasals: *m*, *n*.

Liquids: —, *l*, *r*.

Diphthongs: *ei*, *au*, *øy* (*ey*); *ja*, *jo*, *jō*, *ju*, *jā*, *jō*, *jē*, *jū*; *va*, *ve* (*vę*), *vi*, *vq*, *vā*, *vē*, *vā*, *vī*, *vq̄*.

All vowels and diphthongs may be nasalized. *e* has a twofold value: close Teutonic *e*, whose corresponding long form is *ē*; open *e*, by umlaut from *a*, whose long form is *ā*. The two values fall together in most MSS. *ø* has a twofold value: short close *ø* from close *e* or *o*, the long form *ē*; or short open *ø* from open *e* or *q*, the long form lacking *ē*, which is used in most printed texts, was borrowed from German in the sixteenth century.

B. Consonants:

CLASSES OF CONSONANTS.	Labials.	Interdentals.	Dentals.	Palatals and gutturals.
Explosives: voiced....	<i>b</i>	—	<i>d</i>	<i>g</i>
voiceless..	<i>p</i>	—	<i>t</i>	<i>k</i>
Spirants: voiced.....	<i>f</i> , <i>v</i>	<i>ð</i>	—	<i>ǰ</i> (i. e. <i>z</i>)
voiceless....	<i>f</i>	<i>þ</i>	<i>s</i>	<i>h</i> , <i>g</i>
Nasals.....	<i>m</i>	—	<i>n</i>	<i>ɲ</i> (i. e. <i>ɲ</i>)
Liquids.....	—	—	<i>l</i> , <i>r</i>	—
In the function of consonants.....	<i>u</i> , <i>v</i> , (<i>w</i>)	—	—	<i>i</i> , <i>j</i>

There was, in addition, breath (laryngeal) *h*; *ts* is represented by *z*; *ks* by *x*.

The consonants occur long (geminated), with the exception of the spirants where *s* is the only one lengthened. *ff* occurs in loan-words. Common Norse palatal (dorsal) *R* (Teutonic *z*) is merged in Old Norse *r*.

Of the Common Teutonic vowels Old Norse maintained, under circumstances, in direct continuity: Short: *a*, *e*, *i*, *o*, *u*. Long: *ā*, *ē*, *ī*, *ō*, *ū*. Diphthong *au*. Teutonic *ā* is represented throughout by Old Norse *ā*, by *i*, *R*-umlaut *ē*. Teutonic *ai* by Old Norse *ā*, by *i*, *R*-umlaut *ē*; by *i*-umlaut *ei*, which in its turn as final is contracted to *ē*, and sporadically to

corresponding active form, which then ends in *-k*, *-sk*, *-zk*. These endings were supplanted early in the thirteenth century by *-z* or *-s*, which somewhat later became *-zt* or *-zst*. Modern Icelandic has *-st*; Swedish and Danish have *-s*.

The Use of the Definite Article.—The definite article *enn* (*inn*) stands before an adjective, but after a substantive, to which it is suffixed with (original) declension of both substantive and article. That it was originally free in the same position is shown by instances in the Old Icelandic Stockholm Book of Homilies, so called, from early in the thirteenth century.

For the history of the individual Scandinavian languages, see DANISH LANGUAGE, ICELANDIC LANGUAGE, NORWEGIAN LANGUAGE, and SWEDISH LANGUAGE.

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Scandinavian Literature: the literary monuments of the Scandinavian language or languages. See SCANDINAVIAN LANGUAGE, DANISH LITERATURE, ICELANDIC LITERATURE, NORWEGIAN LITERATURE, and SWEDISH LITERATURE.

Scandinavian Mythology: the system of myths pertaining to the Scandinavian peoples. It is frequently called Norse or Northern mythology, but might more properly be denominated Teutonic mythology, since its chief deities were worshiped not only in Iceland, Norway, Sweden, and Denmark, but also in Germany and England—in short, by every branch of the Germanic or Teutonic race.

Original Sources.—Some information in regard to this mythology is to be gleaned from the old runic inscriptions found on monumental stones throughout the lands inhabited by Teutonic races, but mainly in the Scandinavian countries. Heathen Germany supplies a few ancient laws and glossaries containing mythological words. Formulas are also preserved by which converts to Christianity renounced the old gods and in which names of heathen divinities accordingly occur. Richer veins of information are such German heroic poems as the *Nibelungen Lied*, the *Gudrun*, the Saxon *Heliand*, and the Anglo-Saxon *Beowulf*. Cæsar, in his *De Bello Gallico*, gives us glimpses of the manner in which the Teutonic Druids preserved their mythological songs and epics, and with Cæsar Tacitus ranks as a source of information. Next after Cæsar and Tacitus come the Christians who wrote in Latin down through the Middle Ages, but they are, as a rule, very silent on the subject of the heathen religion. Among this class of writers Denmark furnishes a remarkable exception in Saxo Grammaticus. The first eight books of his *Historia Danica* contain an outline of Scandinavian mythology, the deities being presented as kings and potentates of early times. Mythological fragments must also be looked for in the customs, habits, speech, traditions, proverbs, ballads, folk-lore tales, and in the usages of the Christian Church throughout Teutonic lands. The chief sources of Scandinavian mythology are to be found in Iceland, and in Icelandic literature the most important documents are the *Elder* and the *Younger Edda*. (See EDDA and ICELANDIC LITERATURE.) The *Younger Edda* gives in prose a succinct account of the Odinic religion. It also contains some poetic quotations not found in the *Elder Edda*.

Interpretations.—Modern Authorities.—Both Snorre and Saxo Grammaticus present the euhemeristic interpretation of the myths, and this view prevailed until late in the eighteenth century. Euhemerism was finally superseded by the so-called physical interpretation making the divinities represent the various forces and phenomena of nature. This theory was most elaborately developed by the Icelandic

Finn Magnusson in his *Eddalæren og dens Oprindelse* (Copenhagen, 1824-26). More recently an ethical has been combined with the physical interpretation—that is, while accepting the phenomena and forces of nature as the basis of the myths, the scholar seeks to establish its deeper, philosophic, poetic, and moral value to its votaries.

The most prominent writers on Scandinavian mythology of the nineteenth century are Finn Magnusson, *Lexicon Mythologicum* (Copenhagen, 1828); Jacob Grimm, *Deutsche Mythologie* (4th ed. 1875; an Eng. trans. by Stallybrass, London, 1880); Karl Simrock, *Deutsche Mythologie* (several editions); Wilhelm Mannhardt, *Germanische Mythen* (1858); P. A. Munch, *Nordmændenes Gudelære i Hedenold* (Christiania, 1847); R. Keyser, *Nordmændenes Religionsforfatning i Hedenommen* (Christiania, 1847); N. F. S. Grundtvig, *Nordens Mythologi* (Copenhagen, 1808-32); N. M. Petersen, *Nordisk Mythologi* (Copenhagen, 1849); Benjamin Thorpe, *Northern Mythology* (London, 1851); Rasmus B. Anderson, *Norse Mythology* (5th ed. Chicago, 1891). Finally, special attention should be called to the elaborate investigations made since 1880 by the Norwegian linguist Sophus Bugge (*Studier over de nordiske gude- og helle-sagns Oprindelse*, Christiania, 1890) and by the Swedish scholar Viktor Rydberg (*Undersökningar i germanisk mythologi* (Göteborg, 1886-90). Bugge attempts to show the influence of classical mythology and early Christianity upon Scandinavian myths, while Rydberg, in opposition to Bugge, vindicates the exclusive Teutonic origin, and seeks to establish the harmonious connection between the various myths as parts of an all-embracing mythological epic. In his conflict with Bugge he is ably supported by the German scholar Müllenhoff (*Deutsche Alterthumskunde*, vol. v., 1881). An English translation of Rydberg's work by R. B. Anderson appeared in London in 1889, and bears the title *Teutonic Mythology*.

General Features.—The various forces and phenomena of nature—heat and cold, night and day, the seasons, thunder and lightning, life and death—led the old Teutons to speculate on the rise, development, and fall of all living things. The Scandinavian myths are inferior to the Greek in point of beauty, but, on the other hand, they outrank them in deep significance and wealth of thought. The Greek gods live a happy life, free from care. The life of the old vikings was characterized by constant struggle and warfare, and so their gods too are engaged in an unending conflict with the powers of evil which they never wholly overcome. A peculiar feature of the *asa-faith* is its eschatology, by which it presents in the clearest manner the idea that the present world must perish and give place to a new and better one. The gods themselves know that they are in common with all other beings are sinful and contaminated by evil. They are conscious that they can not escape death and destruction, but they seek in every way to ward off that terrible catastrophe as long as possible. They also know that after the destruction of this world and out of its fragments there are to rise a new heaven and a new earth which are to be more beautiful than the present universe and free from sin and sorrow and care. In the regenerated world gods and virtuous men shall enjoy eternal happiness. The Scandinavian myths form a drama, in which every detail leads up to Ragnarok, the twilight of the gods, which constitutes the final act.

The Creation.—In the beginning (the prechaotic period) there were two worlds, Niflheim to the N. and Muspelheim to the S., and between them was Ginnungagap, the wide abyss. In Niflheim were the well Hvergelmir, from which flowed twelve ice-cold streams, called the Elivoggs, into Ginnungagap. Muspelheim, on the other hand, was intensely bright and hot, and in the midst of it sat Surt guarding its borders with a flaming sword in his hand. The Elivogs flowed far into Ginnungagap, where the venom they carried with them became ice. Vapors rose and froze to rime, and in this way were formed many layers of congelation. Meanwhile sparks flew from Muspelheim, and when the heated blasts came in contact with the frozen vapor it melted into large drops, and by the might of him (Surt) who sent the heat these drops quickened into life and took the form of an immense giant named Ymer and of a great cow named Audhumbla (chaos). Ymer was nourished by the cow's milk, and the cow fed herself by licking the salt rime on the stones, and by this licking she produced in the course of three days a man named Bure. Bure begot a son, named Bor, by the giantess Bestla, daughter of the giant R. Bor became the father of three sons, Odin (spirit),

Ygg (earth) and Yggdrasil (tree). These three herithers slew the giant Ymer, and from his dead body they created the present world, heaven, earth, and sea. Of his body they made the earth, of his blood the ocean, of his bones the rocks, of his hair the forests of the world the wooded sky, and of his brains the clouds. In the flat, round earth they built a high wall about Midgard as a protection to the abode of man against the giants. Outside of this wall was Jotunheim, the home of the giants who descended from Ymer. Above Midgard was Asgard, the home of the gods. The rains, which were not of the same race as the seas, originally dwelt in Asgard, but after a prolonged warfare peace was declared and seas and rains were united into one family of deities, the earth and rocks dwell the dwarfs. The elves lived in Asgard, and the inhabitants of the lower world and the dwellers in Asgard and Nifheim. Dwarfs, elves, and men were created by the gods, were subject to their protection, and owed them obedience and service. The giants and the dwellers in the upper world were the enemies of the gods and men. One day three gods, Odin, Hoenir, and Loken, found two trees by the water, an ash and an elm. Of them they made the first human pair, Ask and Embla, and gave them such as their dwelling place.

The Golden Age, the Norns, and the Conflict between the Good and Evil Powers.—Immediately after the creation of the world there was a golden age. The gods met on the slopes of Ida, where they built temples and altars of gold, of bones, of stones, and implements were made of gold. They played with golden tablets, and their happiness was complete. This condition lasted until there came three maidens from Jotunheim. They were the so-called Norns, Frigg (the past), Verdande (the present), and Skuld the future. They were the rulers of fate, and time and the gods were subject to their decrees. With the advent of the Norns the active life of the gods began. Henceforth their lives were full of care and trouble. With the Norns came strife, strife, and warfare into the world. From that time on there is constant activity and conflict between all powers until the world shall fall dead. The movement of the cosmic world consists in a ceaseless strife between the good and the evil powers, neither side gaining advantage over the other. The gods gain temporary advantage and subdue the giants for a time, but the powers of evil gradually increase in strength, the world grows in decrepitude until the final day comes when all perish in an enormous flood in Ragnarok, a catastrophe which is most fully described in the *Eddas*.

Yggdrasil.—One of the most poetic and significant myths in Scandinavian mythology is that of the world ash-tree Yggdrasil, which symbolizes the whole universe. It has three main branches: one into Nifheim, a second into Jotunheim, and a third into Asgard. The branches of Yggdrasil grow over the whole world and aspire above heaven itself. Yggdrasil is the house of Odin, and the *Elder Edda* says Odin hung nine nights on this tree and sacrificed himself to himself. While hanging there he discovered the runes.

The Principal Deities.—The *Eddas* call the Scandinavian gods *ases* (as, pl. *asir*) and the goddesses *asynjas*. The chief god is Odin (9: 1). As Alfather he is active in every part of the world created by him and his brothers Vili and Ve. No one knows better than he the fate of the world, and hence he is more interested than he in warding off as long as possible the Ragnarok doom. This can be done by enlisting all the forces possible on his side. He is accordingly the god of war who sends forth his mailed warriors, the valkyries, to gather the faithful heroes slain in every battle-field and to conduct them as sinners to Valhalla, where they are to dwell with Odin, and whence they will follow him to the Ragnarok battle-field. Other prominent gods were Thor, Balder, Hoenir, Tyr, Krage, Heimdal, Ullr, Vali, Ull, Vane, and Forsete. Njord and Frey were originally *ases*, but were adopted by the *ases*. Loke, though of giant race both by father and mother, early became a sworn brotherhood with Odin, and he too unfortunately was adopted by the *ases*. While the most of these *ases* are of war, still some of them also have other functions. Thus Frey is the god of song and eloquence, and is the god of the sea, presides over fishing and commerce. Frey is a *vanir*, and rules over harvests and the fertility of the earth. Heimdal represents eternal vigilance, he is the god of the rainbow bridge and proclaims the coming of danger to the gods with blasts from his trumpet *gullinbursti*. Forsete was worshiped as the god of

justice. Thor (Thursday—*i. e.* Thor's day—is named after him) is the god of thunder, and he is foremost in the conflict with the giants. The *Eddas* contain elaborate accounts of his conflicts with the giants Hrungnir, Gialfred, Thrym, and others. Balder is the representative of moral purity, wisdom, peace, and good will. While he lived the power of the *ases* was secure, but when Balder, at the instigation of Loke, was slain the fall of creation could not be prevented. Thus the death of Balder, which is told very fully and with great pathos in the *Eddas*, forms the turning-point in the great drama. Loke is the Mephistopheles of Scandinavian mythology. He is the personification of evil, though he constantly assumes the guise of virtue; but when he has accomplished the slaying of the good Balder he throws off the disguise by which he gained the favor and confidence of the gods. He is then put in chains, but finally gains his liberty, and in Ragnarok is the leader of the hosts of Hel that rally forth to the Vigrid plains.

Of goddesses there are in all twenty-six, and chief among them is Frigg, the wife of Odin. Several goddesses of lower rank serve her in her magnificent hall called Fensal. Thor's wife is Sif, and Balder's is the graceful Nanna. Frey's wife is Idun, who possesses the apples of eternal youth. Freya (Friday is named after her) is also called Menglad. She is the goddess of love, the Norse Venus. Njord married Skade, and Frey's wife was the giantess Gerd, for whom he gave his trusted sword.

The Giants.—Next in importance to the gods are the giants and giantesses. They are countless in number and are the chief foes of the gods. They bring about the destruction of the world. Loke, himself a giant, because the parent of three terrible children in Jotunheim. These are (1) the Fenriswolf, (2) the Midgard-serpent, and (3) Hel, the goddess of death. The gods knew that these terrible monsters were growing up and would some day cause them great mischief. They therefore bound the Fenriswolf on a barren island and put a sword in his open-stretched mouth, but for this the god Tyr had to sacrifice his right hand. They cast the Midgard-serpent into the ocean, where he encircles the whole earth and bites his own tail. Hel was thrown into Nifheim, and Odin commanded that all who die from sickness or old age should go to her. The giants were older than the gods, and hence surpassed them in knowledge. The wisest one among them is Mimir, who presides over the fountain of wisdom. Many of the giants are represented as good-natured, and fond of gold and silver and other riches. Egi, the giant of the sea, is the wealthiest of all, and he once entertained all the gods in his magnificent hall in grand style.

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KARSTEN B. ANDERSEN.

Scanzo's [Mod. Lat., *liter.*, climbers, from Lat. *scandere*, *scandere*, climb]: a name applied by Illiger, in 1811, to a group of birds containing those having the toes two before and two behind. The group was purely artificial, containing such dissimilar forms as the cuckoo, toucan, woodpecker, and parrot, and its members are now distributed among several orders.

F. A. L.

Scanzoni, skantzō-ni, FRIEDRICH WILHELM, von, M. D.: obstetrician and gynecologist; b. at Prague, Bohemia, Dec. 21, 1821; graduated M. D. from the University of Prague in 1844; after a tour abroad he returned to Prague, and was appointed assistant obstetrician to the Imperial Royal Lying-in Hospital; later he was appointed assistant to the chair of Obstetrics in the university; in 1850 he was appointed Professor of Obstetrics and Gynecology in the University of Würzburg, resigning this chair in 1888 to retire to private life. He was a voluminous writer, his better-known works being *Lehrbuch der Geburtshilfe* (Vienna, 1849), a work that passed through many editions and was translated into nearly all the European languages; *Lehrbuch der Krankheiten der weiblichen Sexualorgane* (Vienna, 1857). D. June 12, 1891.

S. T. LEMSTRONG.

Scaphiopus [from Gr. *scaphos*, *scaphos*, spade + *pus*, foot]: a genus of toad-like animals belonging to the family *Pelobatidae*; externally recognizable by having teeth in the upper jaw, the fingers and toes without sucking-disks, and

the heel with a flat-edged spur. The spade-foot toads burrow by day and feed at night. In the breeding season they frequent temporary pools, and at this period their voices are very loud. The allied genera belong, with one exception, to the Old World.

Scaph'oid, or Navic'ular Bone [*scaphoid* is from Gr. *σκαφον*, boat + *ειδης*, appearance, form, likeness; *navicular* is from Lat. *navicula*, dimin. of *navis*, boat]: a name applied to one of the bones of the wrist, and another of the foot, on account of their fancied resemblance to a boat in shape.

Scaphop'oda: See MOLLUSCA.

Scap'ula [Mod. Lat., from Lat. *scapula* (plur.; sing. not used), shoulder-blades, back]: the shoulder-blade, a bone of the anterior or upper extremity, forming part of the shoulder. It is regarded as a pleurapophysis of the occipital (fourth cephalic) vertebra. In man and nearly all mammals it is normally firmly united to the coracoid bone, which is regarded as a process of the scapula, though representing a hæmapophysis of the occipital vertebra. The dorsum of the scapula is marked by a prominent keel or spine. The scapula is developed from seven centers, and is in man not fully ossified till the twenty-fifth year of life.

Scap'ular [from Late Lat. *scapula*, shoulder, formed as sing. to Lat. *scapula*, shoulder-blades]: (1) a garment worn by lay brethren and professed monastics of various Roman Catholic orders. It is a long piece of serge, one end of which falls in front and behind the wearer. Its size, color, and proportions vary. (2) A small concealed emblem worn by many Roman Catholics, who bind themselves to a certain round of religious exercises called the Devotion of the Scapular. There are several scapulars, as that of the Passion and that of the Seven Sorrows of Mary, but the original one, that of Our Lady of Mt. Carmel, was, it is claimed, revealed by the Virgin to the Blessed Simon Stock, an English Carmelite and general of that order, who died in 1265.

Scar'ab, or Scarabe'us: a black or metallic-colored dung-beetle (*Scarabæus ægyptiorum* or *Ateuchus sacer*) found in tropical countries, particularly in Egypt, where it was regarded as the symbol of the god KHEPER (*q. v.*), and the emblem of the revivification of the body and the immortality of the soul. This was by virtue of the solar significance of the object, whose Egyptian name (*kheper*) signified to be or exist and also to roll, as of the sun. The daily revolution and re-appearance of the sun typified the return of the soul to life. The beetle places its eggs in a mass of ox-dung which it rolls into a ball. The ball is propelled by the beetle with its hind legs. According to Horapollo and early Greek and Syrian writers, the female did not exist, and hence, as procreated by the male only, the scarab was held to be a symbol of the self-begetting and of the immortal, while in the hermetic literature it was regarded as the type of the "only-begotten," of "generation," of "father," of "man," and of the "world." It is evident, however, that these latter ideas are for the most part foreign to the original Egyptian conception.

The Egyptian figures of the scarab were made of gold, silver, precious stones, granite, basalt, steatite, faience, and paste, and, in the Roman period, of glass. Those in stone, faience, and paste were usually glazed blue or green. They were inscribed with religious or historical texts, with names of gods, kings, and other persons, and with magical legends and devices which are impossible of clear explanation. It is doubtful whether they were ever intended to be read. They may most conveniently be classified, according to their purpose, as funereal, ornamental, and historical. Funereal scarabs were placed on the fingers or over the heart of the dead, and in the latter case the RITUAL OF THE DEAD (*q. v.*) prescribed that certain words should be inscribed on a scarab of green jasper and put in the place of the heart. When buried with the mummy they bore a variety of names or of magical emblems that were to serve for the protection of the dead. Ornamental scarabs were an adoption by the living of the trappings of the dead, and were apparently employed principally as charms. They were strung together lengthwise as necklaces, or used singly as rings or seals, and were inscribed with the name of the reigning sovereign, or some national hero, or with magical or ornamental designs. Historical scarabs comprise all those bearing royal names or historical texts or data. The number of the former is very great, and nearly every king from Menes, the first Egyptian king, to the Roman Antoninus is represented in extant specimens. The favorite names, if frequency and number may

form the test, were those of Thothmes III., Amenophis III., and Ramses II. Curiously enough a large proportion of these scarabs date from periods other than that of the Pharaoh in question. From the reign of Amenophis III. come four scarabs which contain actual historical texts, relating to his prowess as a lion-hunter, to the limits of his kingdom (from Nubia to Mesopotamia), to the arrival of his Semitic bride, and to the construction of a sacred lake in his eleventh year, which has intimate connection with the introduction of the solar monotheism of the "heretic" king of the succeeding reign, Amenophis IV., or Khunaten. When Egyptian influence extended to the East, the Phœnicians and others borrowed this design and produced objects to which the name *scaraboids* is usually applied. The design, and in part the symbolism, were also adopted by the Gnostics, and upon their gems they inscribed appropriate legends. The manufacture of forged scarabs is pursued to a large extent in Egypt, to meet the demand of travelers, some of the specimens being made with such skill as to deceive the unwary or even experts. See Birch, *Catalogue of Egyptian Antiquities at Alnwick Castle* (London, 1880); Loftie, *Essay of Scarabs* (London, 1884); Budge, *Catalogue of the Egyptian Collection of the Harrow School Museum* (Harrow, 1887); *The Mummy* (pp. 281 ff., London, 1893), and *Catalogue of the Fitzwilliam Collection* (London, 1894); Murray and Smith, *Catalogue of Gems* (London, 1888); Petrie, *Historical Scarabs* (London, 1889), and his various works, such as *Illahun* (London, 1891), *Hawara* (1899), and *Kahun* (1890); Meyer, *Scarabs* (New York, 1894). CHARLES R. GILLET.

Scarborough [O. Eng. *Skardeburge*, fortified hill]: town; in Yorkshire, England; 43 miles N. E. of York and 54 miles N. of Hull (see map of England, ref. 5-J). It rises like an amphitheater from a sandy bay, and is protected on the N. by a promontory which is crowned by an historical castle dating from 1136 and rebuilt by Henry II. Scarborough is one of the principal watering-places of England; it has an aquarium, a museum, a market-hall, a spa, with mineral springs discovered in 1820, and a promenade three quarters of a mile long opened in 1890. The harbor is inclosed by three piers, and has a floating dock and a lighthouse. Jet is manufactured and there is a considerable fishing-trade. Scarborough returns one member to Parliament. Pop. (1891) 38,776. R. A. R.

Scar'f-skin: See EPIDERMIS.

Scar'ridæ [Mod. Lat., named from *Scar'rus*, the typical genus, from Lat. *scar'rus* = Gr. *σκαρρος*, a kind of sea-fish (*S. cretensis*): a family of teleocephalous fishes known as parrot-fishes, from some resemblance of their mandibles to the bill of a parrot. The body is oblong and compressed; the scales large and cycloid; the jaws well exposed, and with the teeth soldered to them, so that they form a cutting edge, but with imbricated series of older worn teeth; dorsal single, with a longer anterior spinous part (containing nine spines), and a shorter posterior portion (with ten articulated rays); anal fin corresponding to the posterior half of the dorsal, and provided with two spines and eight soft rays; pectorals with branched rays; ventrals thoracic, with one spine and five soft rays; the lower pharyngeal bones are ossified together in a solid mass. The species are confined to the tropical regions, and in these latitudes are everywhere to be found on coral-reefs and among the groves of coral. They are reported to browse upon the coral, which they cut by means of their strong trenchant jaws, in order to obtain the living polyps.

A species of the family (*Scarus cretensis*) was known to the Greeks and Romans, and was the subject of several fables. In the reign of Claudius, according to Pliny, Optatus Porcius introduced it into the Italian sea between Ostia and Campania, where it became abundant. It was regarded, at least for a time, as being the very first of fishes.

Revised by F. A. LUCAS.

Scarlati'na, or Scarlet Fever [*scarlatina* is Mod. Lat. from Ital. *scarlattina*, liter., dimin. of *scarlatto*, scarlet]: one of the acute eruptive or exanthematous fevers. It is chiefly a disease of childhood, with immunity for adults, increasing as the period beyond puberty lengthens. It is an infectious disease, propagated often by close aggregation of children, as in schools, asylums, or at play; but the contagion retains vitality with great persistence, and may be conveyed by clothing, letters, food, etc. The disease occurs sometimes as local epidemics; at other times with a graver type and great mortality, involving whole communities. In different individual cases, as well as different seasons and epidemics, it

medium variable degree, from a trivial disorder to a malignant and hemiplegic one. Physicians recognize three clinical varieties: (A) *Scarlatina angulosa*, simple scarlet fever, in which the rash as eruption is fairly developed, the patient comfortable, and complications do not exist; (B) *S. angulosa*, where are unusual soreness of the throat, with formation of pseudomembranes resembling that of diphtheria, is present; (C) *S. latens* or *mitigata*, a latent form, where the eruption does not appear or is doubtful, but grave injury is done by the secreted poison in the blood to the nerve-centers or the kidneys. Like other contagious diseases, scarlatina has degrees of assimilation or development: first to six days after exposure between exposure and the consequent attack. The fever develops suddenly, and without prodromata, or more often in connection with vomiting, nervous excitement, convulsions, or exhaustion indicative of a powerful reaction on the nerve-centers. The temperature may be 104° or 107° F. higher in fatal cases. The throat is usually found and tender, the tongue studded with sensitive red papillae. At the end of twenty-four hours of fever the eruption appears—an efflorescence composed of first of small red points upon a flushed surface, and later of a uniform, vesicular form. It develops upon the body and neck before the face, but the face, arms, and lower extremities are less involved, and the outline, destroyed by the high temperature of the surface, may begin to fall by the fifth day. This process of desquamation varies. In mild cases, when sponging or bathing has been employed in allay fever, no flaking or peeling of the cuticle is seen. In others it may slowly separate in shreds and patches. Still again, the cuticle covering fingers and toes may exfoliate intact, in the form of scales. During and following this desquamation danger is greatest of acute inflammation of the kidneys, the desquamation symptoms constituting the most serious complication of scarlet fever. The mortality is very variable, from 1 in 5 to 1 in 20, according to class of patients and type of epidemic. The chief causes of death are early convulsions, severe throat complications, and uraemic poison and dropsy, from complication of the kidneys. Deafness often results from severe attacks of *S. angulosa*.

Treatment is chiefly directed (1) to confining the temperature within limits by the use of acetate, diaphoretic drinks, leeching, frequent sponging, or even the wet pack; in very marked cases the use of a cool bath is absolutely essential, but may completely modify the nature of the disease, as is done also with typhoid fever; (2) to favoring the action of the kidneys by digitalis and effluents alkaline drinks, as Ringer's and soda; the friction of lard, practiced by the Germans, and of butter of cacao, protects the skin and guards the kidneys from congestion; (3) to maintaining the patient's strength and counteracting the poison of the disease. Quinine and tincture of iron are chiefly indicated, in the wet frequent doses. The patient should have liberal liquid diet throughout, and mild alcoholic stimulus when indicated. Local antiseptic and antiseptic applications to the throat are useful to prevent the anginous form of the disease from developing and to prevent spread of the inflammation to adjoining mucous surfaces. Secondary kidney disease—dropsy and scanty urine—calls for dry cups over the kidneys, the hot-air bath, eluterium as a purge, digitalis, and alkaline diuretics. Revised by WILLIAM PERREN.

Scarlatti, Alessandro, composer; b. at Trapani, Sicily, in 1685; composed his first opera in 1690 in Rome, in the house of Queen Christina of Sweden; lived afterward alternately in Rome and Naples as chapel-master; composed 115 operas, of which only the titles of twenty are known, 200 songs, nine oratorios, more than 500 cantatas, and thousands of minor pieces. D. in Naples, Oct. 24, 1757. He was the originator of the *opera buffa*, and the first composer who gave to musical accompaniment an air of separate design. His son, Domenico Scarlatti, b. 1685, d. 1757, was considered the greatest pianist of his time, held positions in Madrid and Lisbon as court-pianist, and composed operas and many pieces for the piano and harpsichord.

Revised by DUDLEY RUCK.

Scarlatti, Pietro, see SCARLATINI.

Scarpa, Francesco, anatomist; b. at Castello-Motta, Friuli, Nov. 19, 1741; studied medicine at Padua; traveled extensively; was appointed Professor of Anatomy at Padua in 1772, and in 1793 at Pavia, where he died Oct. 31, 1807. He was one of the greatest anatomists of his time, and wrote a number of works: *Anatomica Disquisitiones de Arteria Offensa* (1780); *Tubula Neurologica ad Illu-*

strandam Historiam Cerebrum Nervorum (1794); *De Anatomia et Pathologia Thalami* (1807); *Sull' Anatomia* (1804); and *Sull' Nerve* (1807).

Scarpanto, or Car'pathos, island; one of the Sporades, belonging to Turkey, nearly equidistant between Rhodes and Crete; a mass of naked rocks, some of which rise nearly 4,000 feet; the reputed birthplace of the mythologic Tithonus. Pop. 2,500. K. A. G.

Scarron, Jean-Paul, writer of burlesque; b. in Paris, France, in 1610; was destined for the Church, but spent his youth in the grossest dissipation, and was in 1637 overtaken by paralysis, which deprived him of the use of his legs. He then took up literature as a means of subsistence, and developed a brilliant talent for burlesque, which owed largely to him the vogue it enjoyed in France in the middle of the seventeenth century. His comedies and poems are forgotten, but his *L'Enfide Truculent* (1648), *Mucrocinade* (1649), which during the war of the Fronde he wrote in opposition to the powerful minister Mazarin, and which cost him the person Anne of Austria had bestowed upon him, and especially his *Roman comique* (1651), translated into English by Oliver Goldsmith (1775), became literary types, and are still read with interest. In 1652 he married Françoise d'Aubigné, afterward Madame de Maintenon, and she, as well as the irresistible humor of her husband, made their home a rendezvous for all the Parisian wits. D. in Paris in 1660. A complete edition of his works, in 10 vols., was published by Bruzen de la Martinière (1737).

Revised by A. G. CLESTER.

Season: another name for ebullientness. See LAMBE METEOR.

Scepter (via O. Fr. from Lat. *scipitru* = Gr. *σκήπτρον*, staff, scepter, deriv. of *σκέπτεσθαι*, prop. against, lean on); a rod or truncheon borne by kings and other magnates as an emblem of authority. It has been employed as part of the regalia of almost all monarchies of which there is any record. The English scepter now in use dates from Charles II.'s time; it is cruciform. The scepter for Scotland dates from the time of James V.

Scepticism, or Skepticism [from Gr. *σέπτεσις*, the Sceptical, a school of philosophers, liter., plur. of *σέπτεσις*, thoughtful, inquiring, deriv. of *σέπτεσθαι*, consider]; the doctrine which sets up, as its highest principle, doubt or suspense of judgment in view of the contradictory nature of phenomena. It endeavors to establish the subjectivity of all cognitions, and to show their incompatibility with each other; it infers, as a consequence, the impossibility of knowing truth, and takes its stand simply and solely upon its own individuality. Scepticism therefore deepens and intensifies mental independence, and is regarded as a necessary clearing up preparatory to philosophic thinking. At least since the time of Descartes this has been the case, and some writers—as Herbert, for example—insist upon the point that all beginning in philosophy is sceptical, and, on the other hand, that all scepticism is elementary philosophy. It is most important to note that all scepticism is based upon the observation of method, and in this respect is a higher activity of the mind than the mere dogmatism which it attacks. All modern philosophy is a struggle to found itself upon method, and thus to place its structure above the assaults arising from scepticism. Sceptical arguments emanate neither from the stage of sense-perception nor from that of simple reflection—i. e. neither from the first nor second intention of the mind, so called, but from a third, or rather a fourth, intention, a perception not of external objects, nor of species or genera, but a perception of the activity or process of reflection itself. Hence simple common sense, alike with the deepest speculative insight, may be attacked and undermined by scepticism, but sceptical arguments can have no weight except for those minds that abandon other points of view and give attention to the method of cognition.

The ancient scepticism is directed against sense-perception, and usually counts Pyrrho of Elis as its founder. Gorgias, the Sophist, had reached the doctrine of nihilism; nothing exists; nothing can be known if it does exist. Socrates had asserted that he knew only that he knew nothing. The Megarian Stilpo had shown the contradictions in sense-perception involved in predication universals of individual objects. The scepticism of the second and third schools of the Middle Academy, founded respectively by Arcesilaus and Carneades, was of a modified type. But Pyrrho, who seems to have learned much from Stilpo, de-

veloped scepticism as a system of philosophy, and made universal doubt the highest principle, and *εὔρεσις* (suspension of judgment) and *ἡρεσεία* (tranquillity of mind, imperturbability) the practical objects to be attained. With Pyrrho, Timon the Sillograph and Ænesidemus are reckoned as the representatives of the old sceptics. The last named collected Pyrrho's arguments in the form of ten tropes, as follows: Knowledge of truth is uncertain, because of the difference (1) in the organization in animals resulting in different modes of knowledge (how can we decide?); (2) in the human constitution in tastes, feelings, desires, capacities, etc.; (3) in the structure of the organs of sense, the same object being white to the eye, sweet to the taste, rough to the touch, etc.; (4) in the mental and physical conditions at different times; (5) in the position, distances, and intervals of objects; (6) in the appearance of objects by reason of their complication with each other; (7) in the appearance of objects owing to their variation in quantity, size of parts, etc.; (8) in objects on account of the general relativity of things known; (9) in the frequency with which objects are observed; (10) in regard to education, all customs, habits, laws, ideas, faith, and theories being derived from it. The later school of sceptics includes Agrippa, Favorinus, Sextus Empiricus, and others. Agrippa reduced the tropes to five: (1) The discordance of opinions renders all uncertain; (2) every proof rests upon grounds which again need proof, and so *ad infinitum*; (3) all our ideas are relative; (4) all systems rest upon hypotheses; (5) the vicious circle, demonstrating the grounds on which the proof rests by that which is proved by them. Sextus Empiricus has left us a complete account of ancient scepticism, and himself sums up the whole as follows: Nothing is certain in itself, as is proved by the diversity of opinion, and nothing can be made certain by proof, since it derives no certainty from itself, and, if based on other proof, leads us either to the *regressus ad infinitum* or to a vicious circle.

Among famous sceptics of later times are Algazel the Arabian, Duns Scotus the Schoolman, Agrippa of Nettesheim, Glanvill, Nicolaus Cusanus, and Hirnhaym, who reject science in the interest of faith. Montaigne, Charron, Sanchez, and Le Vayer revive the ancient scepticism. Hume is the greatest modern sceptic. He saps all dogmatism by making habit or "invariable sequence" the origin of the idea of causality, and thus occasions by way of reaction the rise of the Kantian system and its derived schools, which "criticise the faculty of cognition" and build their structures upon insight into method, and thus eliminate scepticism by making its partial view (of method) a complete one.

WILLIAM T. HARRIS.

Scerodite: See SINTERS.

Schabzieger Cheese: See CHEESE.

Schack, shaak, ADOLF FRIEDRICH, Graf von: poet; b. at Schwerin, Mecklenburg, Germany, Aug. 2, 1815; studied law at Bonn, Heidelberg, and Berlin, devoting much of his time to the study of Oriental and European languages; traveled in Italy, Egypt, Syria, Turkey, Greece, and Spain, where he made extensive researches into the history of the Spanish drama; was called to Munich by King Maximilian of Bavaria where he resided up to the time of his death, Apr. 14, 1894. He published *Epische Dichtungen aus dem Persischen des Firdusi* (1853); *Stimmen vom Ganges* (1856); *Gedichte* (1866); *Nächte des Orients* (1874); *Weihgesänge* (1878); *Lotusblätter* (1883); *Memnon* (1885); and a number of epic and dramatic poems. Like Rückert, with whom he may be compared in many respects, he was a master of the poetic form, not only in his translations from Oriental literatures, but also in his original productions, which, moreover, are distinguished by their deep philosophic thought.

JULIUS GOEBEL.

Scha'dow, FRIEDRICH WILHELM, von: painter; b. in Berlin, Sept. 6, 1789. He was a son of J. G. Schadow, the sculptor, and was thoroughly taught. In 1810 he went to Rome with his brother Rudolph, the sculptor, and there was influenced by Cornelius and Overbeck; became a Roman Catholic and a member of the religious and somewhat mystical school which those painters had brought together. In 1819 he returned from Italy to Berlin, and was made professor in the Academy of Fine Arts. In 1826 he was made director of the Düsseldorf Academy. D. at Düsseldorf, Mar. 19, 1862. In the Berlin National Gallery are his picture *Christ at Emmaus* and a *Portrait Group* of his father and brother with the sculptor Thorwaldsen. At the Stadel Institute at Frankfurt is the picture of the *Wise and Fool-*

ish Virgins; at the old Pinakothek at Munich is a *Holy Family*; and at the Cathedral of Anspach is a *Christ*. His last work was an allegorical painting founded upon Dante's *Divina Commedia*.

RUSSELL STURGIS.

Schadow, JOHANN GOTTFRIED: sculptor; b. in Berlin, May 20, 1764; studied drawing and sculpture in his native city and at Rome 1785-87, and was appointed professor at the Academy of Art in Berlin in 1788. His life was spent chiefly at Berlin from this time on, but he traveled much, especially in Italy. His style is founded upon classical traditions. His principal works are statues of Frederick the Great, in Stettin; Leopold of Dessau, in Zietzen, and the Count de la Marck, in Berlin; Luther, in Wittenberg; the monument of Marshal Blücher, at Rostock; and a number of busts, some of which are in the Walhalla on the Danube near Ratisbon, etc. He also modeled the quadriga over the Brandenburg gate of Berlin, and a frieze on the outside of the mint in that city. D. in Berlin, Jan. 27, 1850.

Revised by RUSSELL STURGIS.

Schadow, RUDOLPH, called also Zeno Ridolfo: sculptor; b. in Rome, July 9, 1786; was the oldest son of Johann G. Schadow. He studied with Thorwaldsen and Canova, and became famous at an early age. He was much employed, and perhaps too constant application caused his early death, at Rome, Jan. 31, 1822. Among his works are the bas-reliefs of the *Daughters of Leucippe, Socrates and Theodora*, and that of the tomb of the Marquis of Lansdowne; the statues of St. John the Baptist, Diana, and a Bacchus; a group of the Virgin and Child; and his last work, *Achilles defending the Body of Penthesilea*.

RUSSELL STURGIS.

Schaeffer, shä'fer, CHARLES FREDERICK, D. D.: theologian; b. at Germantown, Pa., Sept. 8, 1807; graduated at the University of Pennsylvania; studied theology privately; pastor at Carlisle, Pa., Hagerstown, Md., Lancaster, O., Red Hook, N. Y., and Easton, Pa.; professor of theology, Columbus, O., 1840-45, Gettysburg, Pa., 1857-64, and Philadelphia, Pa., 1864-79. D. in Philadelphia, Pa., Nov. 24, 1879. Among his more important works are the translation of *Lechler on Arts* in the English edition of Lange's *Commentary*, the translation of Kurtz's *Sacred History*, a revised translation of Arndt's *True Christianity*, and a *Commentary on Matthew*. Dr. Schaeffer was a prominent advocate of confessional Lutheranism, and his articles in *The Evangelical Review* of Gettysburg contributed powerfully to the movement that resulted in the establishment of the General Council.

H. E. JACOBS.

Schaeffer, CHARLES WILLIAM, D. D., LL. D.: theologian; nephew of Rev. Charles Frederick Schaeffer; b. at Hagerstown, Md., May 5, 1813; graduated at University of Pennsylvania, and Theological Seminary at Gettysburg, Pa.; pastor at Barren Hill, Pa., 1835-40, Harrisburg, Pa., 1840-49, Germantown, Pa., 1849-74; professor in the Lutheran Theological Seminary, Philadelphia, 1864-94, when, on his resignation of the chair of Church History, he was elected professor emeritus. Dr. Schaeffer was for many years president of the Lutheran Ministerium of Pennsylvania, has been president of the General Synod and the General Council, and has served the University of Pennsylvania as a trustee since 1850. He has published *Early History of the Lutheran Church in America* (1857), *Family Prayers*, and one volume of a translation of the *Halle Reports* (Reading, Pa., 1882).

H. E. JACOBS.

Schaeffer, DAVID FREDERICK, D. D.: Lutheran pastor and theologian; b. at Carlisle, Pa., July 22, 1787; graduated at the University of Pennsylvania 1807; studied theology privately; pastor at Frederick, Md., 1808, until within a year or two before his death. He conducted a private theological seminary, and directed the studies of a number of most useful pastors. He was one of the most active founders of the Theological Seminary at Gettysburg, and of the General Synod, of which body he was secretary for a number of years from its founding. He edited *The Lutheran Intelligencer*, the first English periodical in the Lutheran Church of America. D. at Frederick, Md., May 5, 1837. H. E. JACOBS.

Schaff, PHILIP, S. T. D., LL. D.: b. at Coire, Switzerland, Jan. 1, 1819; studied at Coire, Stuttgart, Tübingen, Halle, and Berlin; took the degree of B. D. and passed the examination for a professorship in Berlin 1841; traveled as tutor of a Prussian nobleman through several European countries; returned to Berlin and lectured in the university on exegesis and church history 1842-44; was called to a professorship in the theological seminary of the German Reformed Church

of the U. S. at Harrisburg, Pa. He moved to New York during the next year, Dec., 1891, was secretary of the New York Sabbath school committee 1904-09, and delivered lectures on sacred history in theological seminaries at Andover, Hartford, and New York. He was Professor of Sacred Literature in Union Theological Seminary, New York, from 1870 to 1887, when he became Professor of Church History. He received the honorary degree of D. D. from the University of Berlin, 1884, the University of St. Andrews 1887, and the University of the City of New York 1893; the degree of LL. D. from Amherst College, 1876; was elected member of the Leipzig Historical, the Netherlands, and other literary societies in Europe and America. He was one of the founders and honorary secretaries of the American branch of the Evangelical Alliance, and was sent in 1869, 1872, and 1876 as representative to Europe to make arrangements for the general conference of the Alliance, which, after a second postponement in consequence of the Franco-German war, was held in New York City, 1875. He was also one of the Alliance delegates to the Emperor of Russia in 1871, to interfere with him in behalf of the religious liberty of his subjects in the Baltic provinces. He took part in the founding of the Presbyterian Alliance in London 1876, and was prominent in the first Presbytery council at Edinburgh 1877, in the second at Philadelphia 1880, in the third at Belfast 1884, and in the fourth in London 1888. He visited Bible lands in 1877. He was president of the American Bible revision committee, which he organized in 1871 at the request of the English committee, and he went to England in 1875 to negotiate with the British scholars and university press about the terms of co-operation and publication of the Anglo-American revision, and attended repeatedly the meetings of the English revisers in December Chamber (the last time in 1884). He was also sent as delegate to the fifth centennial of the University of Basel 1886, and to the eighth centennial of the University of Bologna 1889. In 1892 he celebrated the semi-centennial of his professorship. See *Berlin 1892 to New York 1897*; *Semecentennial of Philip Schaff*, privately printed New York, 1900. He died in New York, Oct. 20, 1893.

His Schaff's books are mostly historical and exegetical. He wrote *History of the Apostolic Church* (New York, 1853; Edinburgh, 1855; Leipzig, 1904, etc.); *History of the Christian Church* (English and German; New York and Leipzig, 1857; revised more than doubled, New York and Edinburgh, 2d ed. 1889-93, 7 vols.); *Creeds of Christendom* (New York and London, 1876, in 3 vols.; 4th ed., rev. and enlarged, 1885). He edited the Anglo-American reproduction and selection of Lange's *Critical, Theological, and Dogmatical Commentary on the Bible* (1864-80, 25 vols.); an *International Reading Commentary*, with illustrations and maps (New York and Edinburgh, 1879-80, 4 vols.); a *German Encyclopedia*, based on Herzog (New York and Newburgh, 1880-81, 11 vols.; 3d ed., rev., 1891, 4 vols., including *Encyclopedia of Living Divines* and the *Nine and Five Names Library of the Fathers* (New York and Oxford, 1888, etc.). In addition he wrote a great number of minor treatises, including *The Principles of Pneumatology* (1845); *Practical Edition of the Heidelberg Catechism*, with its history to the tercentenary celebration (1863; rev. ed. 1866); *John Bunyan* (New York, 1875); *Literature and Poetry* (1879). His last work was *Theological Propædæa: a General Introduction to the Study of Theology, Exegetical, Historical, Systematic, and Practical* (New York, 1893). Several of his works have been republished in Germany, England, and Scotland, and translated into French, Italian, Dutch, Greek, Hungarian, Arabic, Chinese, Hindustani, and Japanese.

Revised by S. M. JACKSON.

Schaffhausen, shaf-haw-sen: the northernmost canton of Switzerland, bounded N. by the grand duchy of Baden and S. by the Rhine, Area, 114 sq. miles. It consists mostly of a number of valleys, which slope toward the Rhine and are very fertile. Wheat and other kinds of grain, fruit and wine of superior quality, hemp and flax are extensively cultivated; the rearing of cattle and the manufacture of wool and silk are important. Pop. (1888) 37,788.

Schaffhausen: capital of the canton of Schaffhausen, Switzerland; on the Rhine, 8 miles above the celebrated fall (see map of Switzerland, ref. 2-G). It is an old, curious little town, with some manufactures of ironware and silk goods. Pop. (1888) 12,402.

Scharf, shärf: ARNOLD EUGENIUS FAIRBANKS: political economist; b. at Nuremberg, Württemberg, Feb. 24, 1811; studied theology at Tübingen, where he became Professor

of Political Economy in 1861. He took an active part in politics, sitting in the Württemberg Landtag from 1862 to 1868, and holding the office of Minister of Commerce in Austria for a short time in 1871. On the downfall of the ministry in the same year he went back to Stuttgart, and devoted himself to economic studies. His works prove him to belong to the historical school of economists who have broken with the traditions of Adam Smith and the exponents of laissez faire. His chief writings are *Die Nationalökonomie* (1861), 2d ed., published under the title *Das gesellschaftliche System der menschlichen Wirtschaft* (1872); *Kapitalismus und Sozialismus* (1876); *Ursprung des Sozialismus* (1874; Eng. trans. 1900); and *Die Ausbeutung der Sozialdemokratie* (1902). F. M. COLBY.

Schamyl, sham'il, warrior and prophet of the tribes of the Caucasus; of Tartar origin; b. in Daghestan in 1797. From 1824 to 1831 he took an ardent part in the holy war which Kadi Mullah proclaimed against Russia. A self, he claimed to be the messiah, or elect envoy of God. Twice coming to life when apparently dead, exceedingly safe and thoroughly sincere, he made the Circassians recognize his pretensions. So from 1837, during twenty-two years, he was their sagacious and generally successful leader in their resistance to Russia. In 1859, hemmed in on all sides and cut off from escape, he was made prisoner and carried to Russia. There he remained ten years, being treated with great honor and kindness. In 1870 he went on a pilgrimage to Mecca, and died at Medina in 1871. A marvellously handsome man, daring, eloquent, always master of himself, an economical and judicious administrator, he maintained an absolute supremacy over his lawless followers, who feared him as a wizard and revered him as a saint. K. A. G.

Schandorph, shän'dörf, SOREN KRISTIAN FREDERIK: poet and novelist; b. at Ringsted, Denmark, May 8, 1804. Originally an idealist, he soon adopted the literary methods of the new school. As a delineator of the life of the Danish peasantry and lower middle class, he is, perhaps, without an equal. To great power of observation he adds a keen humor, which sometimes borders on cynicism. His most ambitious work is a novel dealing with Danish peasant conditions, *Thomas Frø's Historie* (two parts, 1851). Among his other publications may be mentioned *Fru Proceus*, *Førstefinger og Skæder* (From the Provinces, Tales and Sketches, 1877); *Uden midtpunkt* (Without Center, 1878); *Skræfede Børn* (The Forester's Children, 1884); *Det gamle Apotek* (The Old Drugstore, 1885); *Fra Isle de France og fra Sørd Amt* (From L'Isle de France and from Sørd District, four tales, 1888); *Stillebejv-Folk* (Quiet Folk, 1889); *Past og Junker* (Past and Cavalier, 1902). D. K. D.

Scharnhorst, GERHARD JOHANN DAVID VON: general; the organizer of the Prussian military service; b. at Herdman, Hanover, Nov. 12, 1756; entered the Hanoverian army in 1776; became a lieutenant of artillery in 1780, and soon afterward teacher in the school of artillery in Hanover. He served with the allies in the Netherlands 1793-95. Having attracted much attention by his military writings, he was invited to enter the Prussian service, and became in 1801 director of the military academy of Berlin. His lectures here became quite celebrated, but his ideas called forth a strong opposition from the older military men, and in 1803 he was removed to the staff, where he advanced to the rank of general. After the Peace of Tilsit, in 1807, he took charge of the whole administration of military affairs in Prussia until 1810, when he was compelled to retire at the request of Napoleon. He continued to exercise a decided influence, and it was chiefly due to his energy and his ideas that Prussia in 1813 was able to place a large and effective army in the field. He was wounded at Grouchy'schen, and died at Prague June 28, 1815, on his way to Vienna to persuade Austria to join the allies against Napoleon. See *Life*, by Lehmann (Leipzig, 1898-97), and von Boyen's *Erinnerungen* (1891). F. M. COLBY.

Scharwenka, shäer-ren'ka, PHILIP: composer and teacher; b. at Samter, Posen, Prussia, Feb. 16, 1847. In 1865 his family moved to Berlin, and Philip began study in Kullak's New Academy, and on completing his studies he remained with the academy as a teacher. He is a fine pianist, and has composed largely for his instrument. D. E. H.

Scharwenka, XATRA: composer and teacher; a younger brother of Philip Scharwenka; b. at Samter, Prussia, Jan. 6, 1850; also studied at Kullak's New Academy. He made his first appearance in Berlin as a pianist in 1869, and re-

mained there as a teacher till 1873. In 1877 he produced his first piano concerto. Since then he has composed largely for the piano and for orchestra, and also has written an opera, *Mataswintha*. In 1890 he visited the U. S. on a concert tour, and the next year he settled in New York, where he established a conservatory of music. D. E. H.

Schauffler, showf'fler, WILLIAM GOTTLIEB, D. D., LL. D.: missionary; b. at Stuttgart, Germany, Aug. 22, 1798; resided in Russia during his youth; studied theology, and went to Turkey as an independent missionary 1825, but having soon convinced himself that he needed more thorough training, removed to the U. S. in 1827; graduated at Andover Theological Seminary 1830; was ordained Nov. 14, 1831; was missionary to the Jews in Constantinople, Turkey, 1831-55, and after that to the Moslems; he translated the entire Bible into Hebrew-Spanish and into Turkish, the New Testament, the Pentateuch, and Isaiah in the latter language having been printed in Germany under his supervision; and published an *Essay on the Right Use of Property* (1832). He was also author of a work entitled *Meditations on the Last Days of Christ*. D. in New York, Jan. 26, 1883.

Schaumburg-Lippe, showm'boorch-lip'pe: a principality and state of the German empire, between Hanover and Westphalia. Area, 131 sq. miles; pop. (1890) 39,183. The southern part is hilly and well wooded; the northern is flat, and here is found lake Steinhudermeer, occupying an area of 22,000 acres. The actual revenue in 1892-93 was 1,096,516 marks; the public debt in 1891 was 510,000 marks. Capital, Bückeburg; pop. (1890) 5,186.

Schedone, skā-dō'nā, BARTOLOMEO (called also SCHIDONE): painter; b. at Modena, Italy, in the latter part of the sixteenth century. He was supposed to have been a pupil of the Caracci, but his paintings seem to show a deep study of Correggio and Raphael. He worked in the palace and in the cathedral of his native city. His chief works are a *Madonna di Field*, at the Academy of Parma, the *Birth of Christ*, and a *Madonna*, at Loreto. His pictures at Capo di Monte, Naples, were painted for his generous patron, Duke Ranuccio of Parma. He is also well represented in the Louvre. He distinguished himself as a portrait-painter. He died at Parma in 1615 of grief at having lost a large sum of money through gambling. W. J. STILLMAN.

Scheele, shā'le, KARL WILHELM: chemist; b. at Stralsund, Pomerania, at that time a Swedish possession, Dec. 19, 1742; studied chemistry in Stockholm and Upsala, and settled in 1777 as apothecary at Köping, near Stockholm, where he died May 21, 1786. By his comprehensive chemical analyses he discovered tartaric acid, manganese, chlorine, baryta, glycerin, the pigment called Scheele's green, and the coloring-matter of Prussian blue. His papers were collected and published in French, English, German, and Latin (*Mémoires de Chimie*, 2 vols., Paris, 1785-88). In his *Chemical Observations and Experiments on Air and Fire* (Leipzig, 1777; translated into English, London, 1780) he described oxygen, unaware of its previous discovery by Priestley.

Scheele, KNUT HENNING GEZELIUS, von, D. D.: bishop; b. at Stockholm, Sweden, May 31, 1838; educated at Upsala, where he became Professor of Theology in 1879, whence he was appointed Bishop of Gotland, with residence at Visby, in 1885. He visited the U. S. in 1893 as special representative of the King of Sweden at the tercentenary of the Decree of Upsala, celebrated by the Swedish Augustana Synod. Among the more important of Bishop von Scheele's works is a work on symbolics, published in both Swedish and German, and an outline of the same subject in Zöckler's *Handbuch der Theologischen Wissenschaften*. H. E. J.

Scheele's (sheelz) Green, or **Swedish Green**: name given to the arsenite of copper. Scheele prepared it by slowly pouring a hot solution of 11 parts of arsenious oxide in 32 of potash into a hot solution of 32 parts of blue vitriol, with constant stirring. Sharples says the best results are obtained when a solution of 2 parts arsenious oxide and 8 parts cryst. carb. soda is mixed with a solution of 6 parts blue vitriol. The product is a yellowish-green powder, consisting essentially, according to Sharples, of $\text{Cu}_2\text{As}_2\text{O}_5 \cdot 2\text{H}_2\text{O}$, or CuO , 51.49; As_2O_3 , 41.93; H_2O , 7.93. It may or may not contain basic sulphate and carbonate of copper, according to the proportions and degree of dilution of the materials. *Parrot green*, *pickel green*, and many varieties of *Brunswick*, *Newwed*, and *mineral green* and *blue*, consist of Scheele's

green with more or less hydrate, basic sulphate, or basic carbonate of copper, and sometimes considerable gypsum. Scheele's green is little used in the U. S., being replaced by the more brilliant SCHWEINFURTH GREEN (q. v.).

Revised by IRA REMSEN.

Scheffel, JOSEPH VIKTOR, von: poet and novelist; b. at Karlsruhe, Germany, Feb. 16, 1826; studied law and German philology at the Universities of Heidelberg, Munich, and Berlin; practiced law for several years; traveled in Italy; and after his return, devoted himself entirely to literary pursuits. In 1854 he published his famous *Trompeter von Säckingen*, an epic poem of great poetic charm, and in 1858 his great historical novel *Ekkehard*, a story of the tenth century. Both of these works were little noticed at first, until the great events of contemporary German history and the subsequent establishment of the empire gave rise to a renaissance of German antiquity. Scheffel's artistic description of German life of the past, his delightful humor, and true patriotic feeling, then led to his being imitated by a host of followers, and for a long time the historical novel was the literary fashion of Germany. He became equally popular as a lyric poet, especially by his *Gaudeamus* (1868), a collection of lyrics of quaint and exquisite humor, many of which became favorite student songs. His *Bergpalmen* (1870), a later collection of poems, is less popular, though it probably contains his best lyric productions. D. Apr. 9, 1886. JULIUS GOEBEL.

Scheffer, ARY: historical and portrait painter; b. at Dordrecht, Holland, Feb. 10, 1797; son of Johann Baptist Scheffer, historical painter (1773-1809); pupil of Guérin in Paris; officer Legion of Honor 1825. He was not in sympathy with either the academic or classic style of painting taught by his master, nor with that of the new school of romanticists led by Delacroix and Géricault, and he formed a style of his own, more sentimental than vigorous and healthy. He was a devoted adherent of the Orleans family, and accompanied the Duc d'Orléans to the siege of Antwerp. After returning to Paris, he painted pictures of military scenes for the Versailles Museum, and when the Revolution of 1848 broke out he assisted the king and his family to escape from Paris, and retired to Holland. He went to England later, and returned to Paris after the *coup d'état* of 1851, but kept aloof from politics. D. at Argenteuil, France, June 15, 1858. One of his most noted pictures, *The Sultane Woman* (1827), is in the Louvre. Other works are in the museums at Versailles, Nantes, Marseilles, Montpellier, and Amsterdam, and in the National Galleries in London and Berlin. WILLIAM A. COFFIN.

Scheldt, skelt (anc. *Scaldia*, Fr. *Escaut*): the most important river of Belgium. It has its rise in a small lake in the department of Aisne, France, and by a circuitous passage enters Belgium near Tournay; thence flows N. N. W. past Tournay, province of Hainault, at Hérisson becomes the boundary of this province and East Flanders, and at Escamaffles becomes the common boundary between West and East Flanders; thence N. N. E., past Oudenarde to Ghent, where it receives the Lys on the left; thence E. S. E. to Dendermonde and N. N. E. to Antwerp, at which point it becomes a noble stream, with a fine harbor sufficient for the largest ships. Leaving Antwerp, its course is N. W. The island of South Beveland divides it into two arms; the left, or south, known as The Hond or West Scheldt, and the most important, enters the North Sea near Flushing. The right, or north, called the East Scheldt arm, is divided again by the island of North Beveland before it flows into the sea. It has an entire length of 210 miles, and is navigable to Condé, near its source. Among its numerous affluents, the Scarpe, Lys, and Darne, from the left, and the Dender and Rupel, from the right, are the most important. A system of canals connects this stream with the principal cities of Belgium. The entrance to the river is rendered somewhat difficult for large vessels by sandbanks which form at its mouths. These mouths are almost opposite that of the Thames, thus increasing its commercial and naval importance. Revised by M. W. HARRINGTON.

Schelling, shelling, FRIEDRICH WILHELM JOSEPH, von: philosopher; b. at Leonberg, a village near Stuttgart, Württemberg, Jan. 27, 1775; d. at the baths of Ragatz, Switzerland, Aug. 20, 1854. His father, distinguished as an Orientalist, was a country clergyman who became prelate at Maulbronn; he directed his son's education. In his sixteenth year young Schelling entered the theological seminary at Tübingen, and studied theology in connection with philosophy and

philosophy. In his seventeenth year (1792) he wrote a thesis on the degree of matter of philosophy, taking as his theme the origin of evil as set forth in Gen. III. As early as 1799, he has come to an ethical historical sense, and philosophizes of antiquity, whose mission it appears to outline his own important theory, developed to later life. In the spring of 1799 he went to Leipzig, and there remained for two years. He had already published his essay *On the Age as Transition of Philosophy*, in which he had repudiated the Kantian doctrine, and pointed out the common source of the two main theoretical and practical, subjective and objective, as well as the theory of a faculty of knowing which could grasp the unconditional ground of these two sides—a faculty or activity which he called "intellectual intuition." At Leipzig he pursued studies in mathematics and natural science, and paid special attention to medicine. His attitude toward Fichte's system was at first that of an expectant, afterwards that of a critic. He put forth his ideas in the *Philosophy of Nature* (1797) and *Concerning the World Soul* (1799), indicating his departure from his standpoint. The *Science of Knowledge*, by Fichte, had made the ego all in all and nature a mere subordinate affair. Consciousness being regarded as the essential principle, and the end as the highest, ethical science was the sole outcome, and the natural sciences, as well as all partially unconscious activity of man as displayed in art, religion, poetry, and the metaphysics, was ignored. Schelling's function was to call attention to this unconscious evolution of Reason—the side of the absolute ego which Fichte had slighted. Schelling, however, went so far in this new direction as to make Nature a perpetual pole of the absolute, with Mind as the other, apparently influenced in this by Spinoza, who had made "thought and extension" the two poles of his "substance." Accordingly, the union of the ideal with the real, of mind with matter, was the ultimate principle with Schelling's system. In whatever art this union was to be found. The beautiful is the highest realization of the Absolute, and the "history" which the whole creation moves." This standpoint was criticised subsequently by Hegel, who reduced the supernatural realization of the highest principle to the human soul as above its mere incarnation, which then sinks into a subordinate phase of spiritual life as a mere preliminary stage thereof, a step in its progressive development. If the beautiful is the highest principle, human life, a soul divorced from body, becomes a mere abstraction, and with this God, as supernatural, loses consciousness and perfection. Schelling remained almost entirely silent from 1802 to 1803, during the period of the activity of Hegel, whose system was that of Schelling, with the essential modification of substituting religion for art as the highest activity, and indeed preferring conscious thought as based on theology or speculative philosophy to all other forms. He seems to have felt this defect in his system, and after the death of Hegel (1831) to have developed his system from this amended basis. He calls, therefore, his earlier system, which lays so much emphasis on nature-philosophy and art, his negative system, and his later one, in which he endeavored to make freedom the highest ideal, his positive system. From Leipzig he was called to Jena (1799), partly through the interest of Goethe, who was attracted toward the philosophy of nature. At this time he came into contact with and exercised a powerful influence upon the romantic school, becoming intimate with the Schlegels, Novalis, Pries, and others.

If Fichte may be regarded as building his system chiefly on Kant's *Critique of Practical Reason*, Schelling certainly builds upon the *Critique of Judgment* and the *Metaphysical Principles of Natural Science*. Kant's use of the forces of attraction and repulsion for the construction of matter suggested an entire system of philosophy in his fertile mind. Matter became the principle of matter and of mind as well. In 1804-05 he edited *The Journal of Speculative Science*, and set forth the doctrines of this fundamental conception, showing how the giant mind of the world descends from its sleep in nature to consciousness in man. In 1806 appeared his dialogue, *Demos*, or *On the Natural and Human Principles of Things*, in which the theory of freedom and divine providence in the style of the Platonic *Timaeus*. In the same year he associated himself with Hegel for the publication of *The Critical Journal of Philosophy* (Tübingen, 1806-08), the latter furnishing the greater part of the material for it. In his *Lectures on the Method of Academic Study*, delivered in 1802 and published the next year, he gave the outline of his entire system in a popular form.

The tendency toward mysticism here makes its appearance, and is quite marked in his works written during the next few years. In his *Philosophy and Religion* (1804) he makes substance and materiality to be the result of a lapse from the Absolute, to recover from which lapse is the object and goal of human history. Theosophical doctrines appear in his essays *On the Philosophy of Nature* (1806) and *On the Relation of the Human Arts to Nature* (1807). The influence of Franz Baader upon Schelling belongs to this period, and is manifested in the noteworthy treatise, *Philosophical Inquiry into the Nature of Human Freedom* (1809), in which he seems to follow Jacob Böhm in his theological distinctions. In this treatise also, which does not strictly accord with his system of transcendental idealism already given, the stress that he lays upon freedom and personality indicates the first appearance of his latest system, which he called his "positive philosophy." He defended his system against the charges of naturalism, Spinozism, and atheism in a controversial work against Jacobi in 1812. In 1808 he had gone to Munich as secretary of the Academy of Arts and Design. When in 1826 the University of Munich was founded, after the removal of that at Landshut, Schelling became professor, and for a time formed the chief attraction of the university. At Erlangen in 1820 he wrote the *Philosophy of Mythology* and the *Philosophy of Revelation*, mythology, according to his view, being an imperfect revelation. In 1834, upon the occasion of the publication of Hubert Decker's translation of Cousin's estimate of French and German philosophy, Schelling wrote a preface for it, and criticized the Hegelian philosophy as being merely negative, and as substituting logical abstractions for the living and real. The dialectic of Hegel he regarded as a fiction of hypostatization, whereby self-movement is ascribed to the idea. In his lectures on the history of modern philosophy, delivered at Munich, he unfolded this critical view more fully. Ten years after Hegel's death, Schelling became his successor at the University of Berlin, and in his opening lecture (1841) endeavored to unite his earlier and later systems, pronouncing the system of Identity to be the necessary negative phase of his entire philosophy, and needing only to be supplemented by his philosophy of mythology and revelation, which he regarded as the positive phase. The publication (1842) of the substance of his lectures at Berlin, from notes taken by Paulus and Fraunstaedt, showed very clearly that the work on freedom already mentioned lay at the basis of his later views. He distinguished in God, after the fashion of Böhm, (1) a blindly necessary or unpremeditated Being—the primordial "abyss" of the divine nature; (2) the three potencies of the essence of God; (3) unconscious will, the cause *materialis* of creation; (4) conscious will, the cause *efficiens*; (5) *causa finalis*, the union of the two—that by which all things are made that are made; (6) the three Persons, who proceed from the three potencies by overcoming the first or unconscious phase by means of the theogenic process. These Persons are the Father, Son, and Spirit—the possibility, the power, and the completed deed of overcoming that "primordial abyss of unconsciousness." In nature only potencies are at work; in man, personalities. Both Schelling and Fichte laid great stress on the distinction between Pauline and Johannine Christianity. Schelling makes three periods of Christianity: (a) Petrine, or Catholicism; (b) Pauline, or Protestantism; (c) Johannine, or the Church of the future.

The two sons of Schelling (Karl, P. A. and Hermann) published a complete collection of his writings (Stuttgart and Augsburg, 1856-61) in 14 vols., of which the first division, in 10 vols., contains the works published during his life, arranged in their chronological order, while the second division, in 4 vols., gives what had remained unpublished, and is chiefly the exposition of his later system. Schelling's works have not been, to any great extent, translated into other languages. His introductions to the *Sketch of a System of Nature-Philosophy* and to the *System of Transcendental Idealism* (1799), and the famous *Method of Academic Study*, however, have been translated and published in *The Journal of Speculative Philosophy*. His *Life* was written by Phil G. vols. 1867-71). WILLIAM T. HARRIS.

Scheltopu'sie, or **Scheltopu'sik**: a lizard (*Pseudopus palasi*) inhabiting Sicily and parts of Southern Europe, devoid of external limbs and clothed, except for a space on either side of the body, in a complete armor of small bony plates. It reaches a length of nearly 3 feet, and feeds on insects, birds, and small quadrupeds. F. A. L.

Schem, shem, ALEXANDER JACOB: author; b. at Wiedenbrück, Germany, Mar. 16, 1826; studied at the gymnasium of Paderborn 1839-43; at the university of Bonn 1843-45, and at that of Tübingen 1845-46; edited Westphalian newspapers 1849-51; removed to the U. S. 1851; was Professor of Hebrew and of Modern Languages at Dickinson College, Carlisle, Pa., 1854-60, after which he devoted himself to literature in New York, chiefly in the departments of geography and statistics; edited ecclesiastical almanacs for 1860 and 1868-69; wrote for religious and political newspapers; aided Rev. George R. Crooks in the preparation of his *Latin-English School Lexicon*; was one of the editors of *The Methodist* and of *The Methodist Quarterly Review*; was a contributor to Appletons', McClintock & Strong's, and Johnson's *Cyclopedias*, and prepared a revised American edition of a *Conversations-Lexicon* in the German language (12 vols., 1869, seq.). D. at West Hoboken, N. J., May 21, 1881.

Revised by A. OSBORN.

Schemnitz, shem'nits: a large mining-town in Hont county, Northern Hungary; on the Schemnitz; 65 miles N. by W. of Budapest, at an elevation of 1,300 feet above the sea (see map of Austria-Hungary, ref. 5-G). It has a celebrated mining-school with chemical laboratories and a fine collection of minerals. The mines, which yield gold, silver, copper, and iron, extend below the city. Pop. 15,265.

Schenck, skenk, ROBERT CUMMING: diplomat; b. at Franklin, O., Oct. 7, 1809; graduated at Miami University in 1827; studied law and was admitted to the bar, beginning practice at Dayton; member of State Legislature 1841 and 1842, and member of Congress 1843-51; U. S. minister to Brazil, and employed on diplomatic missions to Buenos Ayres, Montevideo, and Paraguay 1851-54. Appointed brigadier-general of volunteers on the outbreak of the civil war in the U. S., he commanded a brigade at the battle of Bull Run July 21, subsequently in Western and Northern Virginia; engaged at the battle of Cross Keys Apr., 1862. At the second battle of Bull Run he was severely wounded and incapacitated until December, when, having meanwhile been promoted to be major-general from Aug. 30, he was placed in command of the Eighth Army-corps and Middle department. He resigned from the army Dec., 1863, and resumed his seat in Congress, having been re-elected, serving at the head of the committee on military affairs and that of ways and means; appointed minister to Great Britain Dec. 22, 1870; resigned 1876, and resumed the practice of law in Washington, D. C., where he died Mar. 23, 1890.

Schenck, WILLIAM EDWARD, D. D.: clergyman; b. at Princeton, N. J., Mar. 29, 1819; was educated at Princeton College and Seminary with one year in the study of law between the two courses; pastor at Manchester, N. J., 1842-45; Hammond Street church, New York, 1845-48; First church, Princeton, N. J., 1848-52; superintendent of church extension in the Presbytery of Philadelphia 1852-54; secretary, 1854-86, and editor, 1862-70, of the Presbyterian board of publication; permanent clerk of the General Assembly (Old School) 1862-70; and vice-president of the American Colonization Society since 1877. Dr. Schenck has published many minor works and several books, including *Children in Heaven*; *Historical Account of the First Presbyterian Church of Princeton, N. J.* (Princeton, 1851); *God our Guide*; *The Fountain for Sin* (1867-68; translated into German); *Church Extension in Cities*; *General Catalogue of Princeton Theological Seminary* (1881); and *Necrological Reports of Princeton Theological Seminary* (1874-84).

C. K. HORT.

Schenectady: city; capital of Schenectady co., N. Y.; on the Mohawk river, the Del. and Hudson and the N. Y. Cent. and Hud. River railways, and the Erie Canal; 17 miles W. of Albany (for location, see map of New York, ref. 4-J). It has connection with the West Shore Railroad at South Schenectady and with the Fitchburg at Scotia, on the opposite side of the river, and local roads connect it with Saratoga and Troy. The city is located in one of the most beautiful portions of the renowned Mohawk valley. The older parts are along the river-bank, the modern are on the heights which surround the valley here. The supply of water is by the Holly system. The city has gas and electric lights and an electric street-railway.

Public Buildings.—Among the notable public buildings are the Ellis Hospital, Children's Home, Home of the Friendless, Free Public Library, the Van Curler opera-house, and a State armory.

Churches and Schools.—Schenectady has 21 churches and

4 missions, the former divided as follows: Methodist Episcopal, 3; Roman Catholic, 3; Baptist, German, Presbyterian, Protestant Episcopal, and Reformed, each 2; and African, Congregational, English Lutheran, German Lutheran, and Jewish, each 1. There is a Y. M. C. A., with a commodious building. The city is the seat of UNION COLLEGE (q. v.), the academical department of Union University, and of Union Classical Institute, a preparatory school. The public-school system comprises graded schools, occupying six modern buildings, having about 2,500 pupils, and costing annually about \$41,000. There are two parochial schools, a business college, and several private schools.

Finances and Banking.—The city receipts for the year ending Feb. 28, 1894, were \$444,114, and expenditures \$415,977; the debt was \$470,569, and the property valuation \$9,399,186. In 1895 there were two national banks with combined capital of \$200,000, a State bank with capital of \$100,000, and a savings-bank with deposits of \$1,500,000.

Business Interests.—The manufacturing industries are numerous and extensive, and include the main plant of the Edison General Electric Company, the Schenectady Locomotive-works, Westinghouse Agricultural Works, car-works, copper and sheet-iron works, foundries, 3 knitting-mills, mica-insulator works, shawl-factory, women's underwear mill, shirt-factory, planing-mills, boat-yards, and carriage, varnish, and sash and blind factories. There are 3 dailies and 4 weekly newspapers.

History.—Schenectady is one of the oldest cities in the State. It was settled by Arent Van Curler in 1661; patented in 1684; burned by the French and Indians, who massacred all but sixty of its inhabitants in 1690; created a borough in 1765; incorporated as a city in 1798; and had almost its entire business portion burned in 1819. Pop. (1880) 13,655; (1890) 19,902; (1895) estimated, 24,000.

EDITOR OF "DAILY GAZETTE."

Schenkel, DANIEL: theologian; b. at Dögerlin, Zurich, Switzerland, Dec. 21, 1813; studied theology in Basel under de Wette and Hagenbach, afterward in Göttingen; was appointed pastor at Schaffhausen in 1841; Professor of Theology at Basel in 1849, and in 1851 at Heidelberg. He became professor emeritus in 1884. He edited *Allgemeine Kirchenzeitung* (1852-59) and *Allgemeine Kirchliche Zeitschrift* (1859-72), and *Bibel-Lexicon* (1869-75, 5 vols.); wrote *Das Wesen des Protestantismus aus den Quellen des Reformationszeitalters beleuchtet* (3 vols., 1846-51; 2d ed. 1 vol., 1862), which defended the thesis that Protestantism had for its end rather to found a new community of believers than a new theology or polity. This idea he again developed in his *Das Prinzip des Protestantismus* (1852). Up to this time he was orthodox, but with his *Christliche Dogmatik vom Standpunkte des Gewissens* (2 vols., 1858-59) he came out on the liberal side, and this altered position is yet more plain in his *Das Charakterbild Jesu* (1864; translated into English by W. H. Furness, 1866), which represents Jesus as a mere man without miraculous power. He was the founder of the German Protestant Union. D. at Heidelberg, May 21, 1885.

Schenckendorf, MAX, von: poet; b. at Tilsit, Germany, Dec. 11, 1783; studied law at the University of Königsberg; practiced his profession until the breaking out of the wars of liberation in 1813, when he entered the Prussian army. Though unable to fight on the battle-field, on account of the lameness of his right arm, he inspired his comrades by his excellent war-songs. Many of these songs, which appeared in the collection of his *Gedichte* (1815), possess the true ring of popular poetry, and, like the war lyrics of Körner and Arndt, they were a powerful help in arousing German patriotism against the tyranny of Napoleon. See A. Hagen, *M. von Schenckendorf* (1863). JULIUS GOEBEL.

Scherer, she-rär, EDMOND HENRI ADOLPHE: critic; b. at Paris, Apr. 8, 1815; was educated in the Collège Bourbon, Paris; studied theology at Oxford, England, and Strasbourg, and was in 1845 appointed Professor of Exegesis at Geneva. His views of the inspiration of the Bible having undergone some modification, he resigned his chair in 1852 and settled in Paris, where he became one of the leaders of the liberal movement within the Protestant Church. For many years he wrote literary and political articles for *Le Temps*. Elected a member of the Legislative Assembly in 1871, he took an active part in politics. D. at Versailles, Mar. 16, 1889. His principal theological works are *De l'état actuel de l'Eglise Réformée en France* (1844); *La Critique et la Foi* (1850); *Alexandre Vinet, sa vie et ses*

Amis (1892); *Mélanges de littérature religieuse* (1899), often reprinted. He also published *Études religieuses ant. et hist.* (1899) (London, 1900).

Schayer, Isidor (WILHELM); philologist; b. at Hildesheim, August 26, 1841; studied Germanic philology at Vienna under Franz Pfeiffer, and later at Berlin under Jacob Grimm and Karl Brüllhoff; was Professor of German Language and Literature at Vienna 1868-72, at Bonn 1872-77, at Berlin 1877-96, D. Aug. 6, 1896. While a student he was made by Müllenhoff coeditor of the famous *Deutsch-amerikanische Prosa- und Poesie aus den VIII.-XII. Jahrhunderten*, and by his masterly treatment of the difficult questions of text criticism and philological interpretation in this work he at once attracted the attention of German philologists. In 1868 he published *Zur Geschichte der deutschen Sprache*, in which he made use of the results of comparative philology far more extensively and successfully than had hitherto been done in this field, and opened new fields for numerous researches by the application of advanced methods borrowed from the natural sciences. A number of studies in the history of German literature, *Deutsche Studien* (1870), *Monumente der D. Dichtung im 11 und 12 Jahrhundert* (1875), *Wissenschaftliche Studien der deutschen Gegenwart* (1875), *Die Anfänge des Romanismus* (1877), *Das Goethes Erbe* (1879), etc., gave evidence of the thoroughness with which he applied himself also to the investigation of the history of German literature. The results of these studies he embodied in his famous *Geschichte der deutschen Literatur* (1880), a masterpiece which has been translated into English. His essays on Goethe were published under the title *Aufsätze zum Goethe* (1890), and his minor writings were collected in the *Goethe-Schriften* (1896), with an excellent preface by Rudolf Dittber. See W. Dittber, *W. Schayer in Deutsche Literaturgesch.* (1880); Johannes Schmidt, *Goethe-Jahrbuch* (1887); W. Schayer (1887); L. Schmidt, *Goethe-Jahrbuch* (1888); *Lehrbuch der deutschen Literatur* (1887). J. G.

Schere, Johannes; historian; b. at Hohenhausen, Württemberg, Dec. 2, 1817; studied philosophy and history at Tübingen; was appointed Professor of History at the Polytechnische School at Zurich in 1860. He was a very precise writer, who indulged in strange oddities of diction and style, and as a critic was for a time very influential in German literature. His principal works are *Geschichte der deutschen Literatur* (3d ed., Leipzig, 1854); *Geschichte der englischen Literatur* (Leipzig, 1854; 3d ed. 1883); *Schiller und seine Zeit* (Leipzig, 1859, several editions); *Geschichte der deutschen Prosa* (Leipzig, 1860; 4th ed. 2 vols., 1874); *Wörter, ihre Art und sein Leben* (Leipzig, 3 vols., 1860-65); 4th ed. 1867. D. Nov. 21, 1886.

Revised by J. GOSCHL.

Schörrer, Johann, Karl, von; sailor and traveler; b. at Vienna, Austria, May 1, 1821. In company with Dr. Rudolf Wagner he made a scientific journey through North and Central America and the West Indies 1852-55, and on his return published (with Wagner) *Reisen in Nordamerika* (Leipzig, 1856), *Die Republik Costarica, and Wanderungen durch die Mittelamerikanischen Freistaaten*. He was one of the members of the Novara expedition round the world 1857-59, and wrote the narrative *Beschreibender Theil der Reise der österreichischen Fregatte Novara* (3 vols., 1861-62, and numerous editions) and *Naturlich-kommerzieller Theil der Novara-Expedition*. From green-leaves which he brought from America was first prepared. Schörrer was knighted and was commissioned to edit the commercial statistics of the Austrian empire. In 1869-70 he was chief of an Austrian scientific expedition to Eastern Asia, of which he published a narrative. Besides the works mentioned he is the author of many scientific papers, and a volume of commercial statistics, *Wirtschaftsstatistik* (1880). He edited (in German) *Novara's history of Guatemala*. H. H. S.

Schepareff, Aleksandr (ALEXANDER VIKTOROVICH); astronomer; b. at Navigliano, Piedmont, Italy, Mar. 4, 1835; studied at Turin, Berlin, and Pulkova; became director of the observatory at Milan, 1869, and is best known for his remarkable discovery of the relation between the orbits of comets and meteors. His observations on the surface of the planets Mars are also of much note, as well as his conclusions, not yet fully established, that the planets Venus and Mars, in their relation around the sun, always present the same face to it, as the moon does to the earth. He is the author of *Astronomical Theory of Shooting Stars* (1867). *The Phenomena of Copernicus in Antiquity*; and of numerous scientific works. S. NEWCOMB.

Schiedon, Bartholomew; See SCHIEDON, BARTHOLOMEW.

Schiedam, schied-dam; town of the Netherlands, province of South Holland, on the Scheldt, 24 miles W. of Rotterdam (see map of Holland and Belgium, vol. 6-12). It is a neat and well-built place, and has fine buildings, among which the town-hall and exchange are the most remarkable. Its principal industry is gin-manufacturing, for which it has many distilleries and malt-works. Large herds of cattle and swine are fed from the refuse of the distilleries, and an extensive trade is carried on. Pop. (1891) 25,960.

Schiff, Moyses, M. D.; professor of physiology; b. at Frankfurt-on-the-Main, Germany, Jan. 28, 1833; educated in the same city; demonstrator of ornithology in the University of Frankfurt till 1852; Professor of Comparative Anatomy in the University of Bern 1852-62; Professor of Zoology in the Instituto di Perfezionamento at Florence 1862-70; Professor of Physiology in same institute 1870-78; then took the chair of Physiology in the University of Geneva. His principal works are *Muskel und Nervensystem* (Leipzig, 1856); *Untersuchungen zur Physiologie des Nervensystems* (Frankfurt, 1858); *Untersuchungen über Zerkleinerung* (Würzburg, 1860); *Lezioni di Fisiologia sperimentale* (Florence, 1865; 2d ed. 1870); *Leçons sur la Physiologie de la Digestion* (2 vols., Turin, 1867); besides various papers on physiology, translated into French (5 vols., vol. 5, 1890).

Schiller, Hermann, Ph. D.; professor of pedagogy; b. at Weithelm, Baden, Nov. 7, 1829; studied at gymnasium, Weithelm, and at the Universities of Heidelberg and Kelten; gymnasial professor at Weithelm, 1852-68; Karlsruhe 1868-72; gymnasial director at Constant 1872-76; director of gymnasium and of the seminary, and professor in the university, Giessen, since 1876. Schiller ranks among the foremost leaders of the new educational movements in Germany. His pedagogical writings and the practical application of his theories in his training-school, connected with the Giessen gymnasium, have been largely instrumental in shaping the methods for the professional preparation of teachers for the higher schools of Prussia. In literary activity and in devotion to the solution of problems pertaining to the secondary schools he may be classed with Dr. G. Frick (d. at Halle, 1893); to these two practical school-men are due in large measure the new life and scientific spirit of the German gymnasia. His principal works are: 1. Historical, *Geschichte des christlichen Kaiserreichs unter der Regierung des Nero* (1872); *Geschichte des röm. Kaiserreichs* (2 vols., 1880-88); *Handbuch der röm. Staats u. Kriegsalterthümer* (2d ed. 1892); *Lehrbuch des griech. u. röm. Geschichte* (1891). 2. Pedagogical, *Didaktischen Vermächtnis des Herodot* (3d ed. 1892); *Handbuch der praktischen Pädagogik* (3d ed. 1894); *Lehrbuch der Geschichte der Pädagogik* (3d ed. 1894); *Die einheitliche Gestaltung u. Vereinfachung des Gymnasialunterrichts* (1890); *Pädagogische Seminarium für das höhere Lehramt* (1890); *Haushalt und Schularbeit* (1891); *Vorträge über Schulgesundheitspflege* (1893). Since 1870 Schiller has been a frequent contributor to the leading educational journals. J. E. RUSSSEL.

Schiller, Johann Christoph Friedrich, von; poet; b. in the town of Marbach, in Württemberg, Germany, Nov. 10, 1759. His father was a military surgeon, who was made captain in the army for his services in the Netherlands and Bohemia. His mother, Elizabeth Kodweis, was a baker's daughter, with some natural taste for music. As a boy, Schiller exhibited signs of a highly imaginative and spiritual nature, and his ambition was to become a clergyman. But Duke Karl of Württemberg insisted, against the wish of the parents, on having the boy educated in a new academy—the Karl's School—which he had founded according to the most approved plan of military discipline. Theology was not taught in this academy; Schiller, therefore, entering at the age of fourteen, first selected law, but afterward changed to medicine, in which branch he graduated in his twenty-first year. There can be no doubt that the rigid, soulless discipline to which he was subjected for seven years was one cause of the reckless, rebellious spirit which breathes through his earliest works. Even before leaving the academy he had written his play of *The Robbers*, and after his graduation and appointment as military surgeon to a regiment in Stuttgart, he published it at his own expense. The impression it made was immediate and universal; the time was ripe for a revolt in literature against the French classicism which had governed the intellectual tastes of Europe for a century. Baron Dürberg, then di-

rector of the theater at Mannheim, announced *The Robbers* for representation on the stage, and Schiller, being refused leave of absence, went to Mannheim without it, and witnessed the first successful performance of the play Jan. 18, 1783. On his return to Stuttgart he was arrested and temporarily imprisoned; the duke endeavored to exact a pledge from him that he would write no more poetry, and the probability of sterner measures being taken induced Schiller to take refuge in flight. In September of the same year, under an assumed name, in company with a musician named Streicher, he left Stuttgart, and for nearly a year afterward remained in concealment on an estate belonging to the noble family of Wolzogen, near Meiningen. During this time he completed his plays of *Fiesco* and *Intrigue and Love*. The first of these, rejected by Dalberg, was finally produced at Mannheim, and became so popular that the author was offered the post of dramatic poet to the theater there, with a meager salary. He accepted the position, undertook also the editing of a new dramatic periodical, *Thalia*, and remained in Mannheim until the spring of 1785, when an invitation from Körner (the father of the famous poet, Theodore Körner) drew him to Leipzig. Soon afterward he followed Körner to Dresden, and was supported in the most generous manner by that faithful friend during two years while writing his tragedy of *Don Carlos*, his historical sketch *The Revolt of the Netherlands*, the romantic fragment *The Ghost-seer*, and a number of lyrical poems. In the summer of 1787 Schiller visited Weimar for the first time, and made the acquaintance of the authors Wieland and Herder. He also met his future wife, Charlotte von Lengefeld, whom he returned to see the following summer, and in the garden of the Lengefeld family at Rudolstadt first met Goethe. The interview has a special interest from the fact that these poets, destined to be such friends and collaborators, disliked each other at first sight. Nevertheless, it was through Goethe's influence that Schiller early in 1789 was offered the place of Professor of History at the University of Jena. He at first hesitated to accept on account of want of preparation, but he was tired of his homeless life, and saw in the appointment the possibility of marriage. His opening lectures were remarkably popular. He married Charlotte von Lengefeld early in 1790, and devoted himself to a life of study and creative activity. But during the following year he was brought to the verge of the grave by an inflammation of the lungs; the report of his death was circulated, and he was already so well known beyond the boundaries of Germany that two Danish noblemen, the Prince of Augustenburg and Count von Schimmelmarmann, sent him the sum of 1,000 thalers annually for three years, in order that he might rest and recover his strength. His *History of the Thirty Years' War* was published in 1793, and in the autumn of that year he returned to Würtemberg, with his family, and remained until the following spring, his visit being wisely ignored by the duke. Through consultation with the publisher Cotta a literary periodical called *The Hours* was projected, and this led to the most important crisis of his life. Goethe's co-operation was too important to be overlooked; the two poets discovered unexpected points of sympathy, and soon became united in a personal and literary friendship as noble as it is rare in history. Schiller soon freed himself from the influence of Kant, which had for a time interrupted his poetical activity, but which had also been of great influence on his artistic development; stimulated by Goethe, he wrote his finest ballads and lyrics, and was greatly encouraged by the success of his periodical, *The Hours*. His plan for a great drama based on the history of Wallenstein was resumed, and the completion of the work as a trilogy or triple drama in the year 1799 placed him at once in the first rank of authors. His ill health, however, made it more and more difficult for him to discharge the duties of his professorship at Jena; a closer intercourse with Goethe became an intellectual necessity, and in the year 1800, after the grant of a liberal pension by the duke, Karl August, he removed to Weimar. His friendship with Goethe drew upon both the bitter hostility of most of the secondary authors of Germany, and many attempts were made to estrange the two great friends. The splendid rhythm, rhetoric, and artistic completeness of form of Schiller's *Song of the Bell*, *The Diver*, and his classical ballads bore down all narrow criticism, and secured his fame as a poet in the universal judgment of the German people. His *Wallenstein* was a great success upon the stage; not less so his *Maria Stuart*, which appeared in 1800, and the *The Maid of Orleans*, in 1801. In the year 1802

Schiller was ennobled by the emperor, Francis II. His next work, *The Bride of Messina* (1803), was an attempt to unite the stately formalism of the antique Greek chorus with the free romantic element of modern dramatic art. Notwithstanding passages of rare lyrical beauty, the experiment can not be considered successful, although the play is occasionally given on the German boards. *William Tell*, which appeared in 1804, although poetically inferior to *Wallenstein*, was Schiller's greatest dramatic success. He visited Leipzig and Berlin when it was produced, and was received with the greatest popular enthusiasm. There was a chance of his obtaining the post of director of the royal theater in Berlin, but the duke doubled his pension in order to retain him, and Schiller was also unwilling to relinquish his intercourse with Goethe. He began a new play, *Demetrius*, and was well advanced in the work when, in the spring of 1805, his failing vital power reached its limit. A simple cold apparently turned the balance, and on May 9, he died. A dissection showed that under no circumstances could his life have been prolonged for more than six months more. His remains were exhumed in 1826, placed in a granite sarcophagus, and transferred to the vault of the grand ducal family, where they now repose beside those of Goethe. While as a poet Schiller holds one of the most prominent places in German literature, ranking next to Goethe, his influence as a philosopher and critic must not be overlooked. Quite early in his literary career we discover a pronounced talent for philosophy, a talent which he afterward, by the careful study of Kant's system, developed to so great an extent that he ranks among Germany's greatest thinkers. His philosophic studies were, however, not directed to the logical operations of the human mind, but rather to ethics and aesthetics, and a number of essays (*Ueber Anmuth und Würde*, 1793; *Ueber das Erhabene*, 1793; *Briefe über die ästhetische Erziehung des Menschen*, 1795, etc.) give evidence of the profoundness with which Schiller grasped and solved the most difficult problems. In these brilliantly written essays the rigidity of Kant's ethics and the one-sidedness of his aesthetics are overcome, and the innermost thoughts of the great classical period of German literature, which culminate in the advancing of a modern ideal of humanity superior to that of the Greeks, find their powerful philosophic expression. The results of his philosophic studies Schiller with a remarkable skill undertook to turn into poetry in his famous philosophic poems (*Das Glück*, *Der Genius*, *Das Ideal und das Leben*, etc.), the like of which no other literature possesses. The influence of philosophy on Schiller's critical activity is also quite evident. He stands next to Lessing as a critic of German literature. While the former carefully established the subtle formal distinctions between the various branches of poetry, and laid down the laws which govern poetic production accordingly, Schiller discusses chiefly the nature of poetry and its different branches, inquiring besides into the psychological operations of the poet's mind. To him we owe the best critical estimate of Goethe's genius (*Correspondence with Goethe*), and his famous essay on *Nature and Sentimental Poetry* has influenced literary criticism to the present time.

In Schiller the interest belonging to individual character is associated with his genius, and lends to it the magnetism which accompanies universal popularity. On the hundredth anniversary of his birth, in 1859, a "Schiller fund," amounting to several hundred thousand dollars, was created in Germany, and the annual income is devoted to the assistance of needy authors, some fifteen or twenty of whom are now wholly or partially supported from this source. All the principal cities of Germany have erected statues in his honor. The unselfish devotion of his life to his art is recognized with a fervor which takes no note of his early irregularities; and without ever having made the slightest profession of democracy he is everywhere celebrated in Germany as the poet of the people. The explanation of this fact must be sought for in the sincerity of his nature, no less than in the persecution of which he was temporarily the object. Carlyle finely says of him: "He was a high ministering servant at truth's altar, and bore him worthily in the office he held."

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RAYARD TAYLOR.

Revised by Julius Gougeon.

Schilling, Johannes sculptor; b. at Mittweida, Saxony, June 22, 1839; studied sculpture in Dresden, Berlin, and Rome; settled in 1856 at Dresden, and was appointed professor of the academy in 1868. The first work which attracted attention was *Amor and Psyche*. Among his later works are the Schiller monument in Vienna, the war monument in Hamburg, the monument of the Archduke Maximilian at Trieste and the great national monument on the site of the Niederwald overlooking the Rhine, which was erected by Emperor William I. in 1893.

Schisma (v. fr. from Lat. *schisma* = fr. *exigere*, a pull, schism, dovry of *exister*, to split): a division in the Church on points of worship and discipline. A schismatic is one who separates himself, or improperly cuts off others from the Church. The New Testament word refers to differences rather than divisions. Some of the chief divisions, either voluntary or forced, are the Eusebians (second and third centuries), Novatian (251 A. D.), Millenian (386), Donatists (411), Arian (first under Damasus 353; second under Marcellus 361), Nestorian (431), Monophysites (453). The great schism between the East and West (about 884) arose from sacerdotal rivalry, the conflict concerning courts of appeal between Pope Nicholas I. and Photius, Patriarch of Constantinople, limits of jurisdiction, doctrines, and rites. Their mutual excommunication dates 1054. The papal schisms concerning the election of popes were 963, 1159, 1164, 1169, 1271, and the great schism, with rival courts at Rome and Avignon, 1378-1429. With discussions and eruptions for and against, some fanatical, some reforming, but in their separation from the Church differences of doctrine were unbridled, and generally they were called heretics.

Schist. *Das Überwältigende Schistose und Boule*.

Schilke, C. 2007. *Das Tierreich*.

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Stethopoda (Gr. *stethos*, with chest; *poda*, claws, and a foot, *stethi*, foot); an order of crustaceans (see Malacostraca), the members of which are small and shrimp-like, and differ from the true shrimps (Decapoda) in having six pairs of locomotor appendages, and, besides, two pairs of accessory jaws which are pediform. All these feet are two-segmented. The present tendency is to dismember the group, distributing its members between the mysids and the euphausiidae forms. The species of *Mysis* are remarkable, from the fact that the auditory organs are in the tail. On the sides of the body and abdomen of the euphausiids are series of eye-like organs, which have recently been shown to be photophorescent. The species, nearly a hundred in number, are almost entirely marine, but one species has been found in the lakes of Sweden as well as in Lakes Michigan and Huron.

J. S. ROBERT.

J. S. QUINLEY

Schlagintweit, also **Schlagintweit**: the name of several travelers and authors: **HARNO HERMANN VON Schlagintweit**, b. Mar. 14, 1826, d. at Munich, Jan. 19, 1882; **ALBOL**, b. Jan. 4, 1828, studied at Kachgar, Turkestan, Aug. 26, 1857; **HONERT**, b. Mar. 10, 1831, d. at Gießen, June 6, 1885. They were the sons of an oculist in Munich; were early distinguished by their enthusiastic study of physical science, especially geology. Twice they explored the Alps, and communicated the results of their researches in *Untersuchungen über die physikalische Geographie der Alpen* (1850) and *Neue Untersuchungen* (1854), which attracted general attention. From 1851 to 1858 they undertook, supported by the King of Prussia and the British East India Company, comprehensive explorations of the Himalayas, Tibet, Hindustan, and Siam, the results of which were communicated in *Reise in die Himalaya, Nippon, in India und High Asia*, with an atlas of panoramas, views, and maps (1860-64), and *Reisen in Siam und Cochinchina* (1869-80), written by Hermann alone. Hebert also traveled extensively in North America, and wrote in 1870 *Die Pacific-Eisenbahn in Nordamerika*.

born in 1971 *Californicum, Land and Leuts*, and *The Miramones* (2d ed. 1979). —HARRISON, In 1924 received the honorary citizenship of SAKU, OREGON, because of his ascent of the Klamath Mountains. —A fourth brother, EARL, b. July 7, 1863, studied first law at Berlin, afterward Oriental languages and history, and published *Buddhismus in Tibet* (1903). —*Die Kulturgeschichte der Indier* (1906); *Die Könige von Tibet* (1906). —A fifth brother, KENNETH, b. Mar. 23, 1864, entered the Bavarian army, and fell in the battle of Königsberg, July 20, 1905. He published *Der Spanisch-mexikanische Krieg* (1905).
Revised by M. W. HARRINGTON.

Reviewed by M. W. HANSTON

Schlegel, AUGUST WILHELM (1792; studied philology under the famous Chr. G. Heyne at Göttingen; was private tutor at Amsterdam; lectured at Jena 1796-98; was appointed professor at Jena in 1798; went to Berlin in 1801, where he lectured on art and literature. He traveled for several years with Madame de Staël; was private secretary of the Crown Prince of Sweden during the wars of liberation. In 1810 he joined Madame de Staël at Paris, and remained with her until her death in 1817. In 1818 he was appointed Professor of Art and Literature at the University of Bonn, where he died May 12, 1845. Schlegel began his literary career as a critic and translator of English, Spanish, and Italian poets. Some of his reviews, as those on Schiller's *Königler* and Goethe's *Bernard and Dorothea*, may still be considered classic specimens of literary criticism. His translation of Shakespeare, which he began to publish in 1797, and which was continued and finished by L. Tieck and Wolf Haselstein, made the great English poet one of the German classics. In 1798 he founded with his brother Friedrich the *Athenäum*, a periodical which became the chief organ of the romantic school, the new literary movement started by a number of young writers in opposition to the extreme classicism of Goethe and Schiller. Though Schlegel was one of the principal leaders of this new movement, he never participated in the eccentricities of his brother in advocating the return to Catholicism and medieval feudalism. He was the representative of the sound elements in romanticism, and as such he exerted a great influence upon the development of the mental life in Germany. While his own poetic attempts, though perfect in regard to form, lack the true poetic spirit, his name is to be mentioned among the founders of the study of German antiquities, of Sanskrit and comparative philology. His best work, besides his masterly translations, is his *Vorlesungen über dramatische Kunst und Literatur* (1809), a book which places Schlegel as a critic very near to Lessing. See Haym, *Die Romantische Schule* (1870); Retzlir, *Die Romantische Schule* (1879); Bernays, *Zur Entstehungsgeschichte des Schlegelschen Shakespeares* (1872); L. Minor, *A. W. Schlegels Vorlesungen über schöne Literatur und Kunst* (1884); D. Fr. Strauss, *Kleine Schriften*.

Image Control

Schlegel, FRIEDRICH, von: poet and critic; b. at Hanover, Germany, Mar. 10, 1772; studied philology at Göttingen and Leipzig; lived in Berlin and Jena; lectured in Jena 1801, in Paris 1802; studied Oriental languages, and especially Sanskrit, in Paris; joined, with his wife, the Roman Catholic Church at Cologne in 1808; settled finally in Vienna, where he lived, lecturing and writing, to the end of his life. D. on a lecturing tour at Dresden, Jan. 11, 1829. In his early writings—*Ueber das Studium der griechischen Poesie* (1798); *Die Griechen und Römer* (1796)—Schlegel is still influenced by the critical writings of Schiller, especially by the latter's essay on *Nature and Sentimental Poetry*. He points to Greek art as the model of artistic perfection, and praises Goethe as the "dawn of true art and beauty." Soon afterward he became the chief theorist and organizer of the romantic school, which aimed at an entire reformation of German literature. For this purpose he founded and edited, with his brother August Wilhelm, the *Atenäum* (1798-1800), in which he advocated most zealously the doctrine of romanticism. As illustrations of his critical principles he wrote the drama *Atena* (1802), the indecent novel *Lucinde* (1799) and a great many poems, interesting documents for the study of romanticism, but without poetical value. He exerted far greater influence on the science of linguistics and the history of literature. His book *Ueber die Sprache und Wissenschaft der Indier* (1808) opened the way for the study of Sanskrit in Germany, and his *Vorlesungen über die Geschichte der alten und neuen Literatur* (1815) marks the beginning of the science of the history of literature in Germany. Like his brother he directed the attention

of his contemporaries to the beauties of Old Germanic poetry, and by his letters on art in the *Europa*, a periodical which he edited while in Paris, he caused a revival in the plastic arts of Germany. But he is also, especially during the last period of his life, the chief representative of the pernicious elements of romanticism. He advocated the re-establishment not only of the papal hierarchy, but also of mediæval feudalism, and the injurious effects of his and his associates' influence in this direction were only gradually overcome. See R. Haym, *Die romantische Schule* (1870); W. Dilthey, *Schleiermacher* (1870); I. Minor, *Fr. Schlegels prosaische Jugendschriften* (1882). JULIUS GOEBEL.

Schleicher, shli'cher, AUGUST: comparative philologist; b. at Meiningen, Germany, Feb. 19, 1821; studied theology and comparative philology at Leipzig, Tübingen, and Bonn 1840-46; privat docent in science of language at Bonn 1846-48; newspaper correspondent in Austria 1848-50; appointed Assistant Professor of Comparative Philology at Prague 1850; Professor of Science of Language and Teutonic Philology at Jena from 1857; died at Jena, Dec. 6, 1868. His residence at Prague directed his interest toward the Slavic languages, which, with the related Baltic languages, became from that time central in his scientific work and interest. Though his favorite thesis, that the science of language is to be classed among the natural sciences, has not been maintained, the influence of his views has been powerfully felt in checking arbitrary empiricism and establishing stricter methods of investigation. Chief works: *Die Sprachen Europas* (Bonn, 1850); *Formenlehre der kirchenslav. Sprache* (1853); *Handbuch der litauischen Sprache* (2 vols., Prague, 1856-67); *Die deutsche Sprache* (Stuttgart, 1860); *Compendium der vergl. Grammatik* (Weimar, 1862; 4th ed. 1876); *Laut- und Formenlehre der polabischen Sprache* (St. Petersburg, 1871). BENJ. IDE WHEELER.

Schleiden, MATTHIAS JAKOB: botanist; b. in Hamburg, Germany, Apr. 5, 1804; first studied law at Heidelberg, then medicine at Göttingen, and finally botany at Jena, where he was appointed professor in 1839. In 1862 he resigned his office, and after a short stay at Dorpat (1863-64) as Professor of Vegetable Chemistry, he settled at Dresden. His principal works are *Grundzüge der wissenschaftlichen Botanik* (2 vols., 1842-49), which attracted much attention and gave rise to many controversies; it was translated into English by Dr. Lankester (1849); *Die Pflanze und ihr Leben*, translated into English by Prof. Hentfrey (1848); *Baum und Wald* (1870); *Die Rose* (1873). D. at Frankfurt-on-the-Main, June 23, 1881.

Schleiermacher, shli'er-maäh-er, FRIEDRICH ERNST DANIEL: theologian and philosopher; b. at Breslau, Germany, Nov. 21, 1768; the son of a Reformed clergyman; was brought up in the community of Moravian Brethren, receiving a profound religious impulse from them. From 1783 to 1787 he attended the pædagogium at Niesky and the seminary of the United Brethren at Barby. He completed his theological course at Halle, and after filling the positions of private tutor, assistant preacher, etc., became in 1796 the chaplain of the Charity Hospital at Berlin; in 1802 court chaplain at Stolpe, and in 1804 Professor (*extraordinarius*) of Theology and Philosophy at Halle. In 1809 he preached at the Trinity church in Berlin, and the following year received appointment as Professor (*ordinarius*) of Theology at the new University of Berlin, which position he retained till his death. During the ten years previous to going to Berlin he had studied and criticised the Kantian philosophy, and was greatly attracted by Jacobi's exposition of Spinoza. He subsequently studied and translated Plato, and did much by his lectures to encourage the study of the remains of the early Greek philosophy. His activity knew no limits. He labored to effect a union of the Lutheran and Reformed Churches on the broad basis that demanded unity in the spirit of Protestantism and allowed diversity as to doctrines and modes of worship. His failure in this led to a misunderstanding with Minister von Altenstein, which lasted for some years. D. in Berlin, Feb. 12, 1834.

The fundamental point of view of Schleiermacher's system is this: Religion is not a knowing nor a doing, but a feeling—a feeling of the universal life of the Infinite, and of the dependence of the Ego upon it. Hence, with him, religion begins with the feeling of dependence. Reflection upon this feeling gives rise to descriptions of it, and hence the statement of religious principles and dogmas. All religions are historic and positive. Among these Christianity holds a unique place, inasmuch as in it is found the recon-

ciliation with the Infinite, hence the very essence of religion itself. Upon the same framework of antithetic ideas of the universal and particular (infinite and finite, common and special, God and the Ego) he builds his system of ethics. The organizing activity of reason in the realm of the common or universal, securing identity of common usage, is the first province of ethical action—that of interchange among men. The second is that of organization in the realm of particular individuality, the province of inalienable personality. The third and fourth provinces of ethical action are not those of organization, but of "symbolism," the third being that of symbolism with identity in the realm of thought and language, and the fourth the symbolism with individuality in the realm of feeling. Corresponding to these four provinces are the four institutions: (a) State, in which each is for the whole; (b) civil society, organized for the benefit of the individual; (c) school (college, etc.), for community of culture; (d) church, "for individual symbolic activity." The most important of Schleiermacher's writings are: (1) *Discourses on Religion* (Berlin, 1799); (2) *Monologues* (1800); (3) *Confidential Letters on F. Schlegel's Lucinde* (1800); (4-7) *Four Collections of Sermons* (1801-20); (8) *Outlines of a Critique of Previous Systems of Ethics* (1803); (9) *Translation of Plato's Works* (1804-28); (10) *The Christian Faith according to the Principles of the Evangelical Church* (1821-22); (11) *Theological Encyclopædia* (1811). After his death were published (1835) lectures on the history of philosophy, dialectics, psychology, ethics, politics, and pedagogics. The lectures on the life of Jesus, which appeared in 1864, made an epoch when first delivered. According to the authority of Zeller, Schleiermacher is the greatest theologian of the Protestant Church since the period of the Reformation—"a churchman whose liberal ideas will yet prevail in regard to the union of Protestant confessions, the constitution of the Church, and the rights of conscience and individuality in religion"—"a deep-working religious teacher, who formed the heart by the understanding and the understanding by the heart—a philosopher who scattered fruitful seeds, who introduced a new era in the knowledge of Greek philosophy, and who assisted in Germany's political regeneration." He investigated the nature of religion more profoundly than any before him. Physically, he was small of stature, slightly deformed, quick and animated in his movements, his countenance kind and sympathetic. His *Autobiography* (covering only the first twenty-six years of his life) was published in 1851. His *Correspondence with J. C. Gass* appeared the following year in 4 vols. His *Biography* has been written by K. Schwartz, D. Schenkel, W. Dilthey, and others. WILLIAM T. HARRIS.

Schleitz, shli:ts: town of Reuss (younger branch), Thuringia, Germany, and residence of the reigning family; 24 miles S. S. W. of Gera, terminus of a branch railroad from Schönberg; elevation, 1,407 feet (see map of German Empire, ref. 5-F). It is well kept, has beautiful streets, tanneries, a foundry, factories of lamps, whips, and lace; also a college and schools for teachers, for deaf mutes, and for wood-carving. Near by is the château of Heinrichsruh. Pop. (1890) 4,928. M. W. H.

Schleswig, shles'wich (i. e. Bay of the Schlei): district and town of the southern part of the Danish peninsula (see map of German Empire, ref. 2-E). The district was a Danish province until 1864, when it was taken by Prussia by conquest and united two years later with Holstein to form the province called Schleswig-Holstein. The town is at the end of a slender arm of the Baltic Sea, which penetrates nearly half-way across the peninsula and is called the Schlei. Schleswig is an ancient town, was known to the Arabian geographers, and by 800 was a place of considerable commercial importance. This continued during the Middle Ages, but eventually the removal of the ducal residence, the rivalry of Lübeck and Kiel, and the silting up of the mouth of the Schlei caused its trade to decline, and it remained only of strategic interest, which, however, was lost as a result of the war of 1864. Southwest from the town are the traces of the Danewerk, a line of intrenchments connecting the Schlei with the Treene, which flows westward and empties into the North Sea. It was thrown up in the ninth century, or earlier, and was intended for the defense of the peninsula. It was used for this purpose for ten centuries, and was repeatedly renewed and strengthened until it was abandoned in 1864 by the Danish army under Gen. de Mera without striking a blow. Pop. of town of Schleswig (1890), 15,123. MARK W. HARRINGTON.

Schleswig-Holstein, province of Prussia; bounded N. by Denmark, E. by the Elbe, which separates it from Hanover, S. by the Baltic, and W. by the North Sea. Area, 14,737 sq. miles. Several islands—Römö, Sylt, Föhr and others—in the North Sea. Towns and Flensburg in the Baltic—belong to the province. A slightly elevated ridge stretches through the center of the province, sandy, gravelly, and covered with heath in Schleswig—swampy, marshy, and covered with forests in Holstein. To the E. of this ridge the surface is dominated by hills, and the coast much indented by long, narrow bays. The soil affords excellent arable land, and forests of oak and beech are numerous. To the W. the surface is perfectly level, and the ground so low that in many places it must be protected against the North Sea by high dikes; but the soil is rich and affords excellent pasture. The chief occupations are agriculture in the eastern part, and cattle-breeding in the western. Wheat, hops and fruit are raised in great quantities and thousands of swine are annually sold in Hamburg and Lunden. The fisheries in the North Sea are considerable. The province is of great importance to Prussia, partly on account of the harbor of Kiel, the best, if not the only one available for naval purposes, on the coast of Germany, and partly because of the Prussia of the mountains for maritime occupations. Pop. (1890) 1,219,523. In Schleswig about 150,000 of the inhabitants speak Danish; the Frisian language is spoken in the western districts and on the islands of the North Sea; the rest of the inhabitants speak the Low German dialect.

Revised by M. W. HANSEN.

Schley, WILHELM A. SCHLEY: naval officer; b. in Frederick, Md., Oct. 9, 1850; midshipman Sept. 30, 1866. Was in all the engagements from May 16 to July 9, 1898, which led up to the capture of Port Arthur, Mar. 21, 1894, ordered to command the newly built ship, *Thetis*, Dec. 1, 1894, the ship having been generously presented for the purpose by the Danish Government, and accepted by the President in behalf of the people. The *Thetis* was by the fleet, and followed several days later by the *Albatross*, sailed from New York May 1, bound Greely and the remains of his party at Cape Sabine June 22, took them on board, and returning, reached Portsmouth N. H., Aug. 1. Author, with Prof. James R. Selig, of *The Rescue of Greely* (New York, 1899).

Schliemann, HENRIK, HENRIK, Ph. D., D. C. L.; archaeologist; b. at Neumark, Mecklenburg-Schwerin, Germany, Jan. 8, 1822. His enthusiasm for classical antiquity manifested itself at a very early age, and when only ten years of age he wrote a Latin essay on the Trojan war, with the idea of which his name was destined to become indelibly associated. Family misfortunes compelled him to leave the gymnasium, and after a five years' apprenticeship as a grocer's clerk in the village of Bütenberg he walked to Rostock, where he embarked as a cabin-boy on a vessel bound for Venezuela (Nov. 28, 1841). The ship was wrecked on the Dutch coast, but Schliemann was saved. He then went to Amsterdam and became an office-boy in a commercial house, where he acquired a knowledge of the principal modern languages. In 1846 his employers sent him as their agent to St. Petersburg. In the following year he founded a firm of his own. In 1850, during a trip to California, he accidentally became a citizen of the U. S., having been present on July 4 of that year, when California was received into the Union. In 1852 he founded a branch establishment at Moscow, and by 1858 had amassed a great fortune. He had acquired a knowledge of Greek in Russia, and after traversing over the European continent and around the world (1860), he settled in Paris, giving himself up entirely to archaeological study. He began his excavations in the Troia in Apr., 1870, on the hill of Hissarlik, which he believed to be the site of Troy (q. v.). These excavations were continued with interruptions till 1892, and brought to a close by Dr. Dörpfeld in 1892. Schliemann's childish credulity in the historical reality of the Homeric epic had to a certain extent been validated, although many of his inferences regarding details had to be abandoned or modified. These excavations were followed up by excavations at Mt. Athos (1876), at Mycenae (1876-88), Ithaca (1878), Tiryns and Mycenae (1880-81). The discoveries at Mycenae, in particular, were not only of great intrinsic value, but they substantiated the prevalent ideas of the prehistoric civilisation of Mycenae and threw a flood of light upon the rise and development of Greek art. The results of Schliemann's excavations were described in numerous works. His Trojan excavations, he commenced in Berlin, which honored him with

the freedom of the city. He died at Naples, Dec. 20, 1890, and is buried at Athens, near the Ilissos. The best survey of his achievements, together with an admirable topographical sketch, is to be found in Dr. C. Schuchard's *Schliemann's Excavations in Archaeological and Historical Study* (translated, with an introduction of W. Leaf, by Eugene Sellers, London, 1891).

ALFRED GIVENS.

Schlösser, FRIEDRICH CHRISTOPH: historian; b. at Dorpat, Oldenburg, Nov. 17, 1779; studied theology and philosophy at Göttingen; spent several years as a private tutor in various families and as librarian to the city of Frankfurt, and was appointed in 1810 Professor of History at the University of Heidelberg, where he died Sept. 22, 1861. His principal writings are *Geschichte des 16. Jahrhunderts* (1802), often reprinted, and translated into English by Davidson, London, 1848-50; *Weltgeschichte in zusammenhängender Erzählung* (1817-24); *Naturhistorische Übersicht der Geschichte der alten Welt und ihrer Kultur* (1826-34). Written rather from the ethical than from the scientific point of view, the works of Schlösser have taken a strong hold on the popular mind, and have been especially favored by the middle classes.

F. M. COLAR.

Schlözer, AUGUST LUDWIG, von: historical writer; b. at Gaggard, Wittenberg, July 3, 1763; studied theology at Wittenberg and Göttingen; lived from 1789 to 1799 at Stockholm as private tutor, and wrote here, in the Swedish language, a history of commerce; went to Russia in 1791 with the Russian court-historiographer, Müller, and was appointed Professor of Political Science in 1794 at Göttingen, where he died Sept. 9, 1808. His principal works are his *Allgemeine nordische Geschichte* (2 vols., 1772) and his translation of Neider's *Russian Chronicle* (3 vols., 1803-09).

Schlyter, KARL JONAS: legal writer; b. at Karlskrona, Sweden, Jan. 20, 1796. He became doctor in law at the University of Lund 1816, but in 1820 moved to Stockholm, and two years later was chosen, together with H. S. Collin, to bring out a complete critical edition of the ancient laws of Sweden. After visiting the principal libraries of Sweden and Denmark Schlyter entered upon his work in 1822, which after the death of his colleague in 1838 he performed alone. Some idea of the magnitude of the undertaking may be formed from the statement that about 800 separate MSS. were examined in connection with it, the text of each collection being based upon the oldest codex. The different parts appeared as follows: *Fästgötalagen* (1827); *Östgötalagen* (1829); *Uppländalagen* (1834); *Södermanstalagen* (1835); *Västmanstalagen* (1841); *Hälsingalagen*, etc. (1844); *Gästlandalagen* (1852); *Västby stadslagen* (1853); *Skånelagen* (1859); *Könung Magnus Erikssons landslag* (1862); *Oluf stadslagen* (1863); *Könung Kristoffers landslag* (1869); and finally *Ord-bok till samlingen af Sveriges gamla lagar* (1877), not the least valuable portion of the work. D. at Lund, Dec. 26, 1895.

D. K. DORR.

Schmal'kalden, or **Smal'cald**: town; in the province of Hesse-Nassau, Prussia; at the confluence of the Schmal'kalden and Sille; 19 miles S. W. of Gotha (see map of German Empire, ref. 5-8). It has salt-works, iron-forges and steel-forges, and manufactures of white lead and paper. The famous league of the German Protestant princes was formed here in 1531. Pop. (1890) 7,316.

Schmank, SHIMON, THEODORE EMANUEL; author; b. at Lancaster, Pa., May 30, 1860; graduated at University of Pennsylvania and the Theological Seminary in Philadelphia; pastor Lebanon, Pa., since 1884; literary editor of *The Lutheran*, Philadelphia, since 1889, and a frequent contributor to *The Sunday-school Times*. His chief work is on *The Negative Criticism* (Lebanon, 1894).

H. E. J.

Schmid, SHMIT, HANSZON: theologian; b. at Harburg, Bavaria, July 31, 1811; studied at Halle, Berlin, and Erlangen; professor extraordinary at Erlangen 1848; ordinary professor 1854-81. D. at Erlangen, Nov. 17, 1885. His chief distinction was as a successful compiler. He is best known by his *Dogmatik*, a compilation of the definitions of Lutheran dogmatists of the sixteenth and seventeenth centuries, first published at Erlangen in 1843, sixth edition at Frankfurt-on-the-Main in 1876, and translated into English by Hay and Jacobs, first edition, Philadelphia, 1875; second, 1899. He also published *Geschichte der synkretistischen Streitigkeiten* (1846); *Lehrbuch der Dogmengeschichte* (Nördlingen, 1890; 4th ed. 1897); *Geschichte des Protestantismus* (1890); and a *Handbuch der Kirchengeschichte* (2 vols., Erlangen, 1890-91).

H. E. JACOB.

Schmid, LEOPOLD: cleric; b. at Zurich, June 9, 1808; studied theology at Tübingen and Munich; became professor in the priest seminary at Limburg 1831, and Professor of Theology in 1839 at Giessen. Although a strict adherent of the Roman Catholic Church, his broader and more liberal views, acquired by an extensive study of philosophy, brought him into collision with the ultramontane party. In 1849 his election as Bishop of Mentz was not confirmed by Pope Pius IX., who, however, dared not place his book, *Der Geist des Katholicismus oder Grundlegung der christlichen Irenik* (2 vols., Giessen, 1848-50), in the *Index*. The papal action led him to leave the theological and enter the philosophical faculty at Giessen. His little pamphlet *Ultramontan oder katholisch?* (1867) indicated his renunciation of the Roman Catholic Church. D. at Giessen, Dec. 20, 1869.

Schmidt, schmit, FREDERICK AUGUSTUS: theologian; b. at Leutenberg, Thuringia, Jan. 3, 1837; emigrated to the U. S. in 1841; educated in Concordia College and Seminary, St. Louis, Mo.; pastor Erie co., N. Y., and St. Peter's English church, Baltimore, Md.; entered the service of the Norwegian Synod in 1861; professor at Decorah, Ia., 1862-73; professor in Theological Seminary, St. Louis, Mo., 1872-76, at Madison, Wis., 1876-86, Northfield, Minn., 1886-90, Minneapolis since 1890. Dr. Schmidt was a chief opponent of Dr. Walther in the controversy on the subject of predestination that agitated the Synodical Conference, establishing and editing for this purpose the *Altes und Neues* (1880-85). H. E. JACOBS.

Schmidt, HEINRICH JULIAN: journalist and author; b. at Marienwerder, Prussia, Mar. 17, 1818; studied philology and history at the University of Königsberg; settled in 1847 at Leipzig as editor, afterward in connection with Gustav Freytag as proprietor of the *Grenzboten*, which supported the Prussian interest in Germany; removed in 1861 to Berlin and edited the *Berliner Allgemeine Zeitung* 1861-63; d. in Berlin, Mar. 26, 1886. Author of *Geschichte der Romantik im Zeitalter der Reformation und Revolution* (2 vols., 1850); *Geschichte der deutschen Literatur seit Lessings Tod* (3 vols., 1858); *Geschichte des geistigen Lebens in Deutschland von Leibniz bis auf Lessings Tod* (2 vols., 1860-64); *Bilder aus dem geistigen Leben unserer Zeit* (1870); *Geschichte der deutschen Literatur von Leibniz bis auf unsere Zeit* (1886). He was a much-dreaded critic, hostile to morbid romantic tendencies, and advocated healthy realism in poetry. See G. Freytag's *Erinnerungen aus meinem Leben* (1886). J. G.

Schmidt, HENRY IMMANUEL, S. T. D.: educator; b. at Nazareth, Pa., Dec. 21, 1806, where he was educated, and afterward taught 1826-29; Lutheran pastor, Bergen co., N. J., 1831-33, Boston, Mass., 1836-38, Montgomery co., Pa., 1844; professor at Hartwick Seminary, New York, 1833-36, Pennsylvania College and Theological Seminary, Gettysburg, Pa., 1838-43; principal of Hartwick Seminary 1845-47; Professor of German Language and Literature in Columbia College, New York, 1848-80. D. in New York, Feb. 11, 1889. He published *History of Education* (New York, 1842); *The Lutheran Doctrine of the Lord's Supper* (1852); *Course of Ancient Geography* (1860). H. E. JACOBS.

Schmidt, JOHANNES: comparative philologist; b. at Prenzlau, Prussia, July 29, 1843; educated at the Marienstifts Gymnasium in Stettin and at the Universities of Bonn and Jena; docent in Comparative Philology at Bonn 1868; assistant professor in Bonn 1873; autumn of same year professor in Graz; since 1876 Professor of Comparative Philology in Berlin; member of the Royal Prussian Academy. Author of *Zur Geschichte des indogerm. Vocalismus* (1871-75); *Die Verwandtschaftsverhältnisse der indogerm. Sprachen* (1872); *Die Pluralbildungen der indogerm. Neutra* (1889); *Die Urheimath der Indogermanen und das europäische Zahlssystem* (1890); also important articles in *Kuhn's Zeitschrift für vergleichende Sprachforschung*, of which since 1875 he has been coeditor with E. Kuhn. In wide and accurate scientific acquaintance with the details of the grammatical structure of the Indo-European languages he is unexcelled by any living scholar. BENJ. IDE WHEELER.

Schmidt-Rimpler, HERMANN, M. D.: ophthalmologist; b. in Berlin, Prussia, Dec. 30, 1838; graduated M. D. at the University of Berlin in 1861; was a military surgeon for some years, and after 1871 was brigade-surgeon at the Frederick William Institute; at that time he was appointed Extraordinary and in 1873 Ordinary Professor of Ophthalmology at the University of Marburg; in 1891 he accepted

the same chair at the University of Göttingen. His chief work, *Augenheilkunde und Ophthalmoskopie für Aerzte und Studierende* (Brunswick, 1885), has passed through several editions and has been translated into several European languages. S. T. ARMSTRONG.

Schmucker, BEALE MELANCHTHON, D. D.: clergyman and author; son of Samuel S. Schmucker; b. at Gettysburg, Pa., Aug. 26, 1827; graduated at Pennsylvania College and Theological Seminary, Gettysburg, Pa.; pastor at Martinsburg, Va., 1845-51, Allentown, Pa., 1852-62, Easton 1862-67, Reading 1867-81, Pottstown 1881-88. D. at Pottstown, Oct. 18, 1888. He was especially distinguished as a liturgical scholar and writer, being unexcelled in this department in the U. S. *The Church Book* (1867, 1892) of the General Council and *The Common Service* (1888) of all English-speaking Lutherans owe more to his indefatigable labor and investigations than to any one else. The American edition of the *Hallesche Nachrichten* was edited by him, with Dr. Mann and Dr. Germann, and furnished with exhaustive historical notes. He was secretary of the General Council's committee on foreign missions 1869-88, and secretary of the board of directors of the Theological Seminary, Philadelphia, from its founding in 1864 until his death. H. E. JACOBS.

Schmucker, SAMUEL SIMON, D. D.: theologian; b. at Hagerstown, Md., Feb. 28, 1799; educated at the University of Pennsylvania and Princeton Theological Seminary; pastor at New Market, Va., 1820-26; professor in Theological Seminary, Gettysburg, Pa., 1826-64. D. at Gettysburg, Pa., July 26, 1873. Schmucker represented the American Lutheran type of theology, as he termed it, which was characterized by indifference to the distinctive doctrines of the Lutheran Church. He advocated this tendency in his *Elements of Popular Theology*, first published in 1834; *American Lutheran Church* (1851); *Lutheran Manual* (1855); *Lutheran Symbols, or American Lutheranism Vindicated* (1856); *Church of the Redeemer* (1867), besides in numerous articles in the reviews and church papers. He wrote *The Definite Synodical Platform* (1856), as an American recension of the Augsburg Confession to be adopted by the synods of the General Synod, in which the Lutheran doctrines of original sin and the sacraments were greatly modified. He also labored in the cause of Church union, and was one of the founders in 1846 of the Evangelical Alliance. H. E. J.

Schneider, JOHANN GOTTLIEB: classical scholar; b. at Collmen, near Wurzen, Saxony, Jan. 18, 1750; began his philological studies at Schulpforta, which he continued at Leipzig, and at Göttingen under Heyne, who recommended him to Brunnck at Strassburg to aid the latter in his edition of the Greek poets. Here he added to his classical studies that extensive and thorough acquaintance with anatomy, botany, and zoölogy which gave so great value to his editions of the ancient authors who treat of those subjects. In 1776 he was appointed Professor of Ancient Languages and Eloquence in the University of Frankfurt-on-the-Oder. When, in 1811, the university was removed to Breslau, he accompanied it, holding the same office, which he resigned in 1816 on his appointment as chief librarian. Of the many valuable editions published by him may be mentioned: *Scriptores Rei Rusticæ* (4 vols., 1794-95); *Vitruvius* (3 vols., 1807-08); *Aristotle's Historia de Animalibus* (4 vols., 1812); *Works of Theophrastus* (5 vols., 1818-21); *Ælian, De naturali animalium*; *Nicander's Alexipharmaca and Theriaca*; and *Orpheus's Argonautica*. On his large *Griechisch-Deutsches Wörterbuch* (2 vols., 1797-98; 3d ed., with supplement, 1819-21) Passow based his lexicon. D. at Breslau, Jan. 12, 1822. Revised by A. GUDEMANN.

Schneider, KARL ERNST CHRISTOPH: classical scholar; b. at Wiehe, Prussian Saxony, Nov. 16, 1786; studied theology and philology at the University of Leipzig; in 1816 appointed Professor of Ancient Literature in the University of Breslau; published *De Originibus Tragædiæ* (1818); edited, with a critical commentary, *Plato's Republic* (3 vols., 1830-33; supplement, 1854); German translation of same (*Platon's Staat*), of the *Timæus* (1847), and an edition of Proclus's *Commentarius in Platonis Timæum* (1851); *Cæsar's Commentarii de Bello Gallico* (2 vols., 1840-55), with elaborate commentary; edited a portion of the *Plato in Didot's Bibliotheca Græca* (Paris, 1846-53). D. at Breslau, May 16, 1856. Revised by A. GUDEMANN.

Schneidewin, FRIEDRICH WILHELM: classical scholar; b. at Helmstedt, Brunswick, June 6, 1810; entered the Uni-

University of Göttingen, 1800; appointed in 1801 teacher in the gymnasium at Brunswick; in 1806 instructor in the University of Göttingen; in 1807 professor extraordinary, and, in 1810, regular professor. His literary activity was very great. He published *Recherches Critiques sur Platon* (Paris, 1800); *Disquisitiones Philosophicae* (1800-05); *Martinii Regimen*, with critical commentary (2 vols., 1842); *Platonis Propædia* (2 vols., 1843, and frequently reissued since); *Platonis Agrippa*; *Simondini's Ciceronis Rhetorica* (1825); *Plinius* (2d ed., 1803); *Robinus* (3d ed., 1803); *Thomassin's Géométrie* (2 vols., 1800-01, in conjunction with Lacroix); and founded the *Philologus*, the well-known classical quarterly. D. at Göttingen, Jan. 10, 1856.

Revised by A. GUDMAN.

Schmidt, JEAN VICTOR, painter; b. at Versailles, France, May 13, 1787; studied painting under David, Regnault, and Gérard, and in Italy; began to exhibit in 1810; was director of the French Academy in Rome 1840-60. D. in Paris, Mar. 11, 1870. His most celebrated pictures are *The Gypsy and the Little Child* (1800); *The Smiling of Rome* (1813); *Christ and the Little Children* (1855); *The Capuchin Preaching* (1857).

Schmidler, EDUARD: See ENCYCLOPEDIA.

Schnorr von Carolsfeld, JEROME, painter; b. at Leipzig, Germany, Mar. 26, 1794; studied painting under his father, who was a painter himself, in Vienna and Italy; was appointed professor at the Academy of Munich in 1827, and director of the picture gallery at Dresden in 1840. D. at Dresden, May 24, 1879. His principal works are his pictures in the palace in Munich illustrating the *Nibelungen* and the history of Charlemagne, Barbarossa, and Rudolf of Habsburg; his *Luther at the Diet of Worms*, and *Bibel in children's collection of wood-cuts* giving the Bible history. 340 plates, with text. His celebrated *Nibelungen* pictures are in the Königsbau, a part of the royal palace. His *Luther at the Diet of Worms* has often been reproduced in the engraver's and photographer's arts and spread all over Europe.

Revised by ROBERT STUBBS.

Schulze, GEORGE HENRY, Ph. D.; educator; b. at Allentown, Pa., Apr. 10, 1851; graduated at Capital University, Columbus, O., 1873; studied theology at Columbus, O., Tillamook, and Leipzig; pastor Canal Winchester and Martin's Ferry, O.; professor in Capital University since 1880. He has published a translation of the *Book of Enoch* from the Coptic (London, 1882); has been on the editorial staff of *The Lutheran Standard* (Columbus, O.), and is a frequent contributor to *The Bibliotheca Sacra*, *The Independent*, etc. H. E. J.

Schulze, FR. JEAN, shôl'shâr, Vicenza; legislator and philosopher; b. in Paris, July 21, 1804; began early to take an active part in political discussion as a republican; resided in 1829, 1830, and 1840 in Mexico, the U. S., East and West Indies, Africa, and devoted himself to exposing the conditions of slavery in the works *De l'Esclavage des noirs et de la législation coloniale* (1833); *Abolition de l'esclavage* (1840); *Les Colonies françaises* (1842); *Les Colonies étrangères et Haiti* (1843); *Égypte en 1846* (1846); *Le problème de l'esclavage pendant les deux dernières années* (2 vols., 1847). He was a member of the Constituent and Legislative Assemblies 1848-51, where he championed the cause of emancipation; during the empire he lived in Geneva, where he published violent attacks against it; also a *Life of Handel* (1857); after the downfall of Napoleon III. he returned to Paris, and represented Martinique in the Legislative Assembly. In 1875 he was chosen senator for life. D. in Paris, Dec. 26, 1885.

Schofield, JOHN McALLISTER, soldier; b. in Chautauque Co., N. Y., Sept. 28, 1831; graduated at the U. S. Military Academy, and attained brevet second lieutenant of artillery Jan. 1, 1855; captain May 14, 1861. From 1855 to 1860 he was Assistant Professor of Natural and Experimental Philosophy at West Point, and at the outbreak of the civil war was Acting chair of Physics in Washington University, St. Louis, Mo. Appointed major First Missouri Volunteers Aug. 26, 1861, he served with Gen. Lyon as chief of staff in the operations in Missouri, participating in the battles of Lexington and Wilson's Creek. Commissioned brigadier-general of U. S. volunteers and of Missouri militia Nov., 1861, he commanded the State troops and the district of St. Louis, and in Dec., 1862, was placed in command of the Army of the Frontier, promoted to be major-general U. S. volunteers Nov. 20, 1863, he commanded the district and Department of Missouri until Jan., 1864, when appointed to

command the Army of the Ohio; was in immediate command of the Twenty-third Corps in Sherman's Georgia campaign, participating in the almost constant severe fighting ending with the capture of Atlanta Sept. 2, 1864. In Nov., 1864, he was placed in command of the forces detached from Gen. Sherman's army to strengthen Gen. Thomas at Nashville, being constantly engaged with Hood's army invading Tennessee, and defeated it at the battle of Franklin Nov. 30, 1864; joined Gen. Thomas the next day, and commanded the Twenty-third Corps at the battle of Nashville and subsequent pursuit of Hood's army. For his services at Franklin he was appointed brigadier-general in the regular army. Transferred with his command to North Carolina and placed in command of that department Feb. 9, 1865, he occupied Wilmington Feb. 22, fought the battle of Kinston Mar. 8-10, and joined Gen. Sherman at Goldsboro May 23, 1865. Upon the surrender of Gen. Johnston's army (Apr. 9) he was appointed to execute the terms of the convention; in command of the Department of North Carolina until June, 1865. He was on special duty in Europe from 1863 to Aug., 1866; in command of the first military district of Virginia 1866-67; Secretary of War *ad interim* May, 1869-Mar., 1869, when he was promoted to be major-general U. S. army, and assigned to command of department of Missouri. In May, 1870, he assumed command of the division of the Pacific; became superintendent of U. S. Military Academy at West Point July, 1870; in command of the military division of the Pacific 1880-82; of division of the Missouri 1882-86; of division of the Atlantic 1886-88; of army 1889. In Feb., 1893, he was appointed lieutenant-general, that grade having been revived.

Revised by JAMES MANION.

Scholasticism [from Lat. *scholasticismus*, scholasticism, deriv. of *scholasticus* = Gr. *σχολαστικός*, pertaining to leisure or school, deriv. of *σχολή* (whence Lat. *schola*, school, hearing, school): in a large sense, the science of Christian theology and philosophy as presented in the schools and universities of the Middle Ages, notably those of the thirteenth and subsequent centuries. Strictly speaking, it does not mean a doctrine, nor even a system, but a method, a style, a manner of handling certain truths, which contrasts strongly with their treatment in times previous or posterior to the period in which scholasticism flourished. This method is highly technical, dialectic, analytic, implying a severe and exact use of the reasoning faculties. It is strictly syllogistic, and tends to present the doctrines of Christian theology and philosophy in a complete methodical system, in which an even balance and a due proportion shall be everywhere observed. The modern emotional element, the "personal equation," and the individualistic tendency are utterly foreign to the nature of this method, which is constructive, architectonic, unitive in its spirit, and is as tangible an expression of the large unity of the life and ideals of the Middle Ages as their cathedrals, laws, and literatures.

Aristotelianism.—It has been made a reproach to the scholastic period that it examined with excessive subtlety, and was marked by an arid formalism, infinite prolixity of treatment, barbarous terminology, etc. The excess of subtlety in the mental investigations of medieval scholars is not to be laid at the door of their method or their system, whose chief element is the employment of philosophy or trained human reason in the service of religion. It was only in the decay of scholasticism that such refinements of doubt appeared, and even then they awoke the ire of all sensible theologians, to use the words of Melchior Canus. It is not entirely true that all the scholastics are distinguished by cold formalism of style. The style of Abelard and John of Salisbury is easy, familiar, and agreeable. Dante, one of the princes of scholasticism, is the glory of Italian literature, and the preaching of the Middle Ages, the hymns, sequences, and masses, are the products of men formed in the schools, and broken by hard dialectic exercise to exact, clear thought, and a certain power of terse and rugged expression. The scholastic style in St. Thomas and St. Bonaventure has somewhat of the severe charm of the early Gothic, where the lines, proportion, and balance of all alone awake admiration. The masters of medieval philosophy had a great task—viz., to endow with noble ideals, intelligible, tangible, and familiar, a generation just issued from barbarism, and for this end the categorical explication of principles and truths was the best means; it was left to future generations and to spontaneous action to present the same in a more charming garb. For them it was enough that they made known to the best of their ability truth, duty, life, nature, man, and God, as they were in themselves and

relatively to one another. It would be unjust to tax them with their shortcomings in history and the natural sciences; those elements of human learning they borrowed from their predecessors, and they were too busy as pioneers of a mighty intellectual movement, as the schoolmasters of the young nations, to devote attention to special and minor departments of the world of knowledge, even if their value were as clear to them as to us. To one of these schoolmen, Vincent of Beauvais, we owe the famous *Speculum*, forerunner of our modern encyclopædias, in which the divisions of human science and their respective claims are justly observed and recognized. Withal, Albert the Great and Roger Bacon recognized fully the bearings of the study of nature, and the great moral poem of Dante is a study in social and political questions of the highest order. The annalists, chroniclers, and historians of the time, themselves schoolmen or trained in the schools, show an ever-widening interest in human affairs, much shrewdness, a large extent of observation, and a well-developed political sense. It may also be noted that even in the schools during the latter half of the twelfth and in the thirteenth century the technical and oratorical styles were in a constant struggle for the mastery, a phase of this movement which is well illustrated by the contemporary Alexander of Hales and William of Paris, the former representing the didactic and the latter the larger, more rhetorical manner. A glance at the weighty philosophical problems which constantly attracted the attention of the schoolmen is sufficient to impress a frank, intelligent mind with respect. They were the relations of faith and reason; the nature and means of knowledge; the reality of observations, phenomena, experience; the personality of man; the nature of the universe, immortality, the future life; the rights and duties of the factors of society, the forms and functions of government, etc. And all this, not in a loose, inconsistent, contradictory manner, but with logical coherency, and a consciousness that they were contributing in a systematic way to the creation of a great whole in which faith and reason have each the share that is demanded by the peculiar nature and office of each. The most perfect specimen of this philosophic spirit is St. Thomas Aquinas, and the most admirable of the scholastic works is the *Summa Theologica* of that stupendous genius—"a vast encyclopædia of the moral sciences, in which whatever could be known of God and man and their relations was set down; a monument severely harmonious, magnificent in design, but yet unfinished, like so many other of the great mediæval undertakings." (*Ozanam*.)

Sources of Scholasticism.—Inasmuch as this term implies a rounded and consistent body of doctrines, it sums up all previous knowledge of a higher order, and draws upon all the fountains of human learning then known. In theology the written word of God, the decisions of councils and popes, the writings of the Fathers, Church history, canon law, the liturgy, and popular religious custom and feeling, furnish the materials of the scholastic writings. In philosophy Aristotle, as known to the Middle Ages, with Boethius and the pseudo-Areopagite, form the sources of their logic and metaphysics. The schoolmen accepted without question the teachings of the Church, and proceeded to co-ordinate them by means chiefly of the Aristotelian method and principles, to illustrate, explain, and defend, to reduce the propositions of theology to formal theses, against which they marshaled all possible objections, which were answered briefly and in order, but not before the theological truth in question had been defined and proved. Thus theology grew under their hands into a perfect science, with the aid of the dialectic method, and all the teachings of the Catholic Church were built up as into a vast edifice, which had its vestibule or preparation in natural theology, its framework in the revealed and defined truths of religion, its roof or completion in their orderly presentation by the schoolmen, and its decoration in the countless services rendered by human reason to the entire process.

The Processes of Scholasticism.—The doctors of the schools wrote usually on two distinct lines. Sometimes they composed independent, original writings, and thus arose their sums of theology, their controverted and so-called quodlibetal questions. Again, they wrote commentaries on some favorite work, like the Bible, the pseudo-Areopagite, Boethius, Peter Lombard, or Aristotle. In either case they usually divided their subject-matter into parts, which were in turn subdivided into questions and articles—the bulk of the doctrine being always given in the latter, and the outlines furnished by the titles or theses placed at the head of each division and subdivision. Each article opened with a series

of formal objections, after which the doctrine, theological or philosophical, was stated, and the sufficient grounds for it assigned, whereupon the answers to the objections followed. Clear statement, compressed sentences, close dialectic reasoning, frequent fine distinction, and a sharp insistence upon the point at issue mark these brief treatises of theology, which were as pleasing to the mediæval mind as the dialogue was to that of the Greek. There is in the writings of the best of the schoolmen a magnificent play of reason, which recoils before no difficulty, reminding us often of certain wonderful feats of skill that the contemporary architects successfully attempted. Before them there had been theologians without number, and scarcely a point in theology had been left untouched. But they created the science of theology; they impressed the most rational of philosophies into its service; they mapped out all the multiplex relations between God and man, and in all this they preserved a certain free and speculative spirit, with minds turned habitually toward investigation, and, within certain limits, filled with an insatiable curiosity.

History of Scholasticism.—The origins of this method or system are not to be found in a sudden discovery and adaptation of the philosophy of Aristotle; they are as old and as deep as those of other great phenomena of the time. The philosophy of Aristotle had been handed down through Boethius, and that of Plato through the pseudo-Areopagite. Ecclesiastical science had found numberless exponents, from Bede and Isidore of Seville down to the meager annalists and collectors of canons in the darkest years of the tenth century. The rational and scientific presentation of those logical truths had been happily performed by many writers long previous to the rise of what is known as scholasticism. Usually, however, its history is said to begin with St. Anselm of Canterbury (1033–1109), in whose *Monologium* the outlines of the scholastic dialectic method are distinctly visible. Abelard, William of Champeaux, Roscelin, Peter Lombard, the Blessed Albert the Great, St. Thomas Aquinas, St. Bonaventure, and Duns Scotus mark its progress to the end of the thirteenth century, which was its true apogee, and in which its highest exponents were the Blessed Albert the Great, St. Thomas, and St. Bonaventure. Their theological systems are at once complete and grand, and awaken forever the astonishment of dispassionate students, for the keen, searching analysis of details, the regular proportions of the parts, and the successful boldness with which they are fitted together, and resist all antagonizing forces. Other great doctors of this brilliant period were Alanus of Lisle, Alexander of Hales, Henry of Gant, Richard Middleton, Peter of Poitiers, William of Paris, etc. From an early date, however, divergent currents and tendencies, arising from various sources, made themselves visible. Thus the Dominicans and Franciscans represented opposing views in theology and philosophy, and again within each great body there were fresh clefts. The second period of scholasticism covers the fourteenth and fifteenth centuries, and is marked by a tendency on the one hand to free philosophy and the other sciences from their ancillary dependence on theology, and on the other to gather from the latter all possible benefit for the practical, ascetic, spiritual needs of the soul, as opposed to the purely scientific satisfaction of the intellect. Thus the differentiation of the sciences (Roger Bacon, Raymond Lull) and the growth of mystical theology as a specific branch (Master Eckhart, Tauler, Suso, Ruysbroeck, Thomas à Kempis, the "German Theology") divide with theology proper the interest of students in this second age. It was inevitable that the succession of men like St. Thomas and St. Bonaventure should fall upon weaker shoulders, and several other circumstances combined to hasten the decline of the great intellectual movement of the thirteenth century. The Western Schism, the Franciscan controversies, and the political changes drew men's minds more to practical immediate interests, and the cultivation of dogmatic philosophy and theology was neglected for moral and legal questions. It is the age of the moralists and jurists, of the commentators on the law of the Church, and the civil law. Durandus, Occam, Pierre d'Ailly, Gerson, Capreolus, Denys le Chartreux, Gabriel Biel, and Thomas of Strassburg represent this later and weaker stage of scholasticism, previous to the Reformation.

Neo-scholasticism.—As the theology and philosophy of the mediæval schools were not a sudden and foreign importation, but the natural outgrowth of the previous literary movement, so the true Catholic theology and philosophy of

today are the legitimate heirs of the best thinkers of the scholastic period, and represent, both in spirit and in method, what was most durable and efficient in the great productions of the scholastics. The basis of positive science and the external administration of the schools and universities of the Catholic world brought about deviations, changes, and modifications more or less novel and alien to the old tradition. But during the nineteenth century there has been a steady return to the father on the part of Catholic theologians and philosophers, culminating in the encyclical letter of Leo XIII., *Æternæ Patris*. This is known as *neoscholasticism*; and that it is different from the scholasticism that it takes account of all new and stable modern progress, and combines it with the fundamental and general teachings, and with the spirit, methods, and principles of the old scholasticism, as personified in St. Thomas Aquinas, the "angel of the schools." Its influence is felt daily more and more in all Catholic universities and schools, in textbooks, sermons, and newspapers, and in the great issues of political and social life, and it certainly stands for much in the improvement of the mutual relations between the Church and modern society. There are several associations and societies, notably at Rome and Louvain, devoted to the work of popularizing this movement, in which Leo XIII. has manifested more, perhaps, than any pope in the last six hundred years, and whose intellectual possibilities are visible in his own personal character, as well as in his energetic and polemical activity.

LITERATURE.—The entire works of the scholastics are not to be had in any complete collection. The most accessible is St. Thomas's scholastic works can be procured in many cheap and portable editions. Consult in general the histories of philosophy, and in particular Houtou, *Histoire de la Scholastique*; Schmidt, *Aristoteles und die Scholastik*; Talamon, *Le scholasticisme nella Scolastica*; Cousin, *Cours de l'Histoire de la Philosophie*; Stöckl, *Philosophie des Mittelalters*; Bracht, *Die Universitäten des Mittelalters*; Vaughan, *Life of St. Thomas Aquinas*; Goussier, *Haute et la Philosophie Catholique*; Weiser and Walin, *Kirchenscholastik*, art. *Scholastik*; Leo XIII., encyclical, *Æternæ Patris* (1879).

J. J. KEANE.

SCHÖLL, MAXIMILIEN JACQUES FRIEDRICH: historical writer; b. at Maastricht, Hesse-Nassau, May 5, 1796; studied at Bonn; travelled as tutor with a literary family (1788-90, in Italy, France, and Russia; attempted different occupations until in 1814 he received employment in the Prussian consular corps; was employed as secretary at various legations and congresses. D. in Paris, Aug. 6, 1853. His literary activity was very comprehensive; the most remarkable of his works are *Ouvrage d'Histoire* (46 vols., 1801-30); *Éléments politiques ou diplomatiques* (3 vols., 1818); *Pièces choisies des Chanciers de Vienne* (6 vols., 1816); *Pièces officielles destinées à déterminer les Français, etc.* (9 vols., 1814); *Œuvres de la Litt. grecque* (6 vols., 1824-25); *Hist. de la Litt. moderne* (4 vols., 1815).

SCHÖLLER, WILHELM JAV HENDRIK, D. D.: theologian; b. at Utrecht, near Utrecht, Netherlands, Aug. 17, 1811; studied theology and philosophy at the University of Utrecht; appointed Professor of Theology in 1843 at the University of Groningen, and became the founder and leader of a liberal movement in Dutch theology called "the modern theology," which attracted much attention, not only in the Netherlands, but also in Germany and France. It was briefly extreme rationalism. The supernatural was entirely rejected and Christ was considered a mere man. He retired on a pension in 1861, and died at Leyden, Apr. 19, 1885. His principal writings, mostly translated into German and French, are: *De het oer beginsel der kerk in hare grondbeginselen* (2 vols., 1849-50; 3d ed., 1861); *Geschiedenis der Godsdienst en wetenschappen* (1861); *De erfenis van Christus* (1862); *Het evangelie naar Johannes* (1864); *De oudste geschiedenis van de christenheid de schriften des Nieuwen Testaments* (1866); *Afhandeling van de oorsprong van het christendom* (1868), his retiring address, in which he presents his theological views; *Historisch-erfelijk Bijdragen aan de afleiding van de afzake Hypothese oorsprong van den Christus der eer Hoofdbeginselen* (1862).

SCHÖMANN, GISELA PARASKEVI: Greek scholar; b. at Constantinople, January, June 28, 1750; professor and librarian at the University of Göttingen from 1823 till his death there in 1879. His chief works are *Der attische Prozess* (2 vols., revised by Lipsius, 1865) and the *Griechische Altertümer* (3 vols.; 3d ed., 1870, translated into English by E. G.

Hardy and F. S. Marz, London, 1890, and into French by L. Goussier, 1892), both standard works on the subject; *Die Lehre von den Hethen bei den Alten* (1860); and editions of Iliad; Pictarch's *Agia et Chionensis*; Cicero, *De natura deorum*; Herodotus's *Thucydides*. His minor writings, distinguished no less for their brilliant Latin style than for their intrinsic value, are collected in his *Opera* (4 vols., 1871). See Houtou's *Biographisches Jahrbuch*, ix, pp. 7 ff. ALFRED GRIMMAN.

SCHÖNBURG, FREDERICK HERMAN, Duke of: soldier; b. at Heidelberg, Germany, about 1618; served in the army of the United Provinces, afterward in the French army, where he acquired a great reputation as a strategist and tactician; held important commands in Portugal during the war of liberation, and compelled Spain to recognize the independence of that country under the dynasty of Braganza (1668), for which he was made a grandee and received a handsome pension. He was again in the French service in Catalonia 1679, where he won the grade of marshal; was at Maastricht (1678) and Charleroi (1677); left France on the revocation of the Edict of Nantes 1685; and after rendering his services for a short time to the Elector of Brandenburg was appointed by William, Prince of Orange, his second in command in the expedition to England 1689; was made Duke of Schönburg in the English peerage, Knight of the Garter, and master of the ordnance 1693; received from Parliament a grant of £100,000; took a leading part in the expedition against Ireland, and was killed at the battle of the Boyne, July 12, 1690. His brother and son succeeded in his honors and estates, but the title became extinct in 1718.

P. M. CURRY.

SCHÖNBURG, SIR HENRY HERMAN, Ph. D.: traveler; b. at Prilburg-on-the-Neckar, Prussia, June 3, 1804; resided, engaged in mercantile pursuits, at Leipzig 1823, afterward in Virginia as partner in a tobacco-factory, in which business he experienced pecuniary losses; settled on the island of St. Thomas in the West Indies 1829, devoted himself to botany and natural history; made a scientific examination of Anguilla, one of the Virgin islands, 1830, on which he prepared a report which procured him the patronage of the Royal Geographical Society; spent four years in the exploration of British Guiana, where he discovered the great water-lily named by him *Victoria regia*; published a *Description of British Guiana, Geographical and Statistical* (1840), a series of *Vues de l'intérieur de Guiana* (1840), *Recherches en Guyane* (1840), and several reports to the Royal Geographical Society, for which he received the gold medal of that body 1850, and which were translated into German by his brother Otto, and published at Berlin with a preface by A. Humboldt (1841); was at the head of the commission for surveying the frontier between British Guiana and Brazil 1841-44; published the *Natural History of the Fishes of Guiana* (2 vols., 1841-43); was knighted 1845; published a *History of Barbados* (1847) and *The Discovery of the Empire of Guiana by Sir Walter Raleigh* (1848); was British consul and chargé d'affaires in the Dominican Republic 1848-57, and consul-general in Spain 1857-64. D. at Schönburg, near Berlin, Mar. 11, 1865.—His brother, MORITZ RICHARD, took part in the second exploration of Guiana, of which he published an account in German (3 vols., 1847-48); translated some of the works of Sir Robert into German; went to Australia 1849; and has been since 1865 director of the botanical garden at Adelaide. Revised by M. W. HARRINGTON.

SCHÖNBEIN, CHRISTIAN FRIEDRICH: chemist; b. at Metzingen, Württemberg, Oct. 15, 1799; studied natural sciences at Tübingen and Erlangen; was appointed Professor of Chemistry at Basel in 1828; discovered osmium in 1829; invented gunotton in 1845. D. at Baden-Baden, Aug. 29, 1868. His principal works are *Das Verhalten des Eisens zum Sauerstoff* (1807); *Beiträge zur physikalischen Chemie* (1844); *Ueber die Erzeugung des Ozons* (1844); *Ueber die langsame und rasche Verbrennung der Körper in atmosphärischer Luft* (1845). Hagenbach wrote his *Life* (1869).

Revised by IAN KENNEDY.

SCHÖNBUNN: an imperial palace situated a few miles from Vienna, on the river Wien, built in 1744 by Maria Theresa. It contains 1,441 rooms, among which are several magnificent state-rooms, and is surrounded with a large park, containing a botanical garden, a menagerie, etc. The palace is generally inhabited by the imperial family during parts of the summer. The Peace of Vienna was signed here Oct. 14, 1809.

Schönebeck: town; in the province of Saxony, Prussia; on the Elbe; 9 miles by rail S. of Magdeburg (see map of German Empire, ref. 4-F). It has large salt-works, breweries, and distilleries, and manufactures of powder, chemicals, soap, white lead, and vinegar. It suffered much from an inundation in Feb., 1876. Pop. (1890) 14,189.

Schönfeld, Edward: astronomer; b. at Hillburghausen, Saxe-Meiningen, Germany, Dec. 22, 1828; became an assistant to Argelander at the University of Bonn, where he took an active part in cataloguing all the stars of the northern hemisphere, down to the ninth magnitude. In 1875 he succeeded Argelander as director of the Bonn Observatory and Professor of Astronomy. In 1889 he received the Watson medal from the National Academy of Sciences at Washington for his work in cataloguing the stars. D. at Bonn, May 1, 1891. S. N.

Schoolcraft, Henry Rowe, LL. D.: ethnologist; b. at Watervliet (now Guilderland), N. Y., Mar. 28, 1793; studied at Union and Middlebury Colleges; devoted himself to a scientific study of the art of glass-making, his father being a manager of extensive glass-works; began the publication at Utica in 1817 of a work on *Vitreology*, which was left incomplete through lack of patronage; made a journey through the mineral regions of Southern Missouri and Arkansas in 1817-18, of which he published an account, *A View of the Lead-mines of Missouri* (New York, 1819); obtained from Secretary Calhoun in 1820 an appointment as geologist to an exploring expedition sent to the upper Mississippi and Lake Superior copper region, and published a *Journal* (1821); was in 1822 appointed Indian agent for the tribes of Lake Superior; was the principal founder of the Michigan Historical Society (1828) and of the Algic Society of Detroit (1831), an association for the investigation of Indian antiquities; was at the head of a scientific expedition which in 1832 explored for the first time Lake Itasca and the sources of the Mississippi; negotiated in 1836 a treaty by which the U. S. purchased from the Chippewas a tract of 16,000,000 acres on the upper lakes, after which he became superintendent of Indian affairs for the northern department, and in 1839 chief disbursing agent for the same department; published *Algic Researches* (2 vols., 1839), a collection of Indian tales and legends; removed to New York 1841; issued the prospectus of an *Indian Cyclopædia* (1842), afterward carried into effect in another form; superintended at Washington the publication of a series of reports on all the Indian tribes of the U. S. (6 vols., illustrated, Philadelphia, 1851-57), containing material of great value, but unsatisfactory as a whole from lack of systematic arrangement and from unwarranted theorizing. D. at Washington, D. C., Dec. 10, 1864. Among his numerous publications were a *Narrative of an Expedition to Itasca Lake, the Actual Source of the Mississippi* (1834; reissued in 1853, along with the account of the earlier exploration of 1820); *Oneota, or Characteristics of the Red Race of America* (New York, 1844); *Notes on the Iroquois* (Albany, 1848); *Personal Memoirs of a Residence of Thirty Years with the Indian Tribes* (Philadelphia, 1851); and *Scenes and Adventures in the Semi-Alpine Regions of the Ozark Mountains* (1853).

Revised by J. W. POWELL.

Schoolmen: those philosophers of the Middle Ages whose labors were directed chiefly to adjusting the relations of the Christian religion to philosophy. See **PHILOSOPHY** (*History of Philosophy*), **NOMINALISTS**, **REALISM**, and **SCHOLASTICISM**.

Schools: collections of persons brought together and duly organized for the purpose of imparting and receiving instruction. The word school is commonly applied to an organization intended to provide elementary, secondary, or professional instruction, and not to an institution designed to offer exclusively non-professional studies of college or university grade. Thus we have elementary schools, secondary schools, normal schools, trade schools, theological schools, law schools, and medical schools, each group of which is treated below. See also **AGRICULTURAL COLLEGE**, **COLLEGE**, **COMMON SCHOOLS**, **KINDERGARTEN**, **MANUAL TRAINING**, **MILITARY ACADEMIES**, **UNIVERSITY**, etc.

I. HISTORICAL DEVELOPMENT OF SCHOOLS.

The Orient.—In India schools for the instruction of boys have existed from time immemorial. These were held in the open country, under the shade of trees, or, in case of bad weather, under primitive roofs. Exercises were first performed on the sand, then on palm-leaves with a stylus, and finally with ink. Among the Israelites great care was taken to instruct

the children, but until the Christian era, so far as is known, such instruction was limited to the family. In the year 64 A. D., however, the high priest Gamala decreed that each town should support a school under pain of excommunication. As given in the Talmud, if the number of children did not exceed 25, the school should be conducted by one teacher; if more than 25 and less than 40, there should be an assistant; if more than 40, there should be two masters. The Talmud describes in detail the duties of the teacher and the obligations of the pupil, showing conclusively that great reliance was placed by the Jews upon the effects of the training effected by the schools. Corporal punishment was inflicted only for children above the age of eleven. "After the age of six receive the child and load him like an ox." "Children should be punished with one hand and caressed with two." In case of disobedience the pupil might be deprived of food and even "struck with a strap of shoe-leather." In China the necessity of the most thorough provision for schools was inculcated by Confucius. The philosophy of the country demanded the most complete knowledge possible of the methods and characteristics of the fathers. To this end the provisions for education were systematic and universal. Huc, the famous missionary and traveler, declares that of all countries it is in China that primary instruction is most widely diffused, and another missionary asserts that "there is not a village so miserable, nor a hamlet so unpretending, as not to be provided with a school." When Japan adopted Chinese civilization, it adopted the Chinese school system, which continued until the opening of the country to European and American influences. In 1872 a law was passed providing for an elementary school for every 600 of the population. This law has been very generally carried out, and the benefits derived from it have been very great. In Egypt intellectual culture reached a very high point, but education was confined almost exclusively to the priestly caste, which guarded jealously all the sources of knowledge. Here, therefore, as in the other contemporaneous nations, schools were only imperfectly developed.

Greece.—The necessity of education in the most comprehensive sense was universally recognized among the Greeks, but schools were private and not subject to governmental supervision. The Athenian lad was put under a pedagogue (a conductor of boys, usually a slave), who took him at an early age to a *palestra* or primary school. Here the boy was taught gymnastics, reading, writing, mythology, and especially music. Homer was universally the boy's reading-book. From the *palestra* the pedagogue took his pupil to the gymnasium or secondary school. Here, as in the *palestra*, special attention was given to music, as a means of inspiring the soul with a love of harmony and order. Grammar and rhetoric were also taught. From the gymnasium the pupil either betook himself to their several vocations or, in case of special ambitions, continued their studies in the schools of the sophists or under personal private instruction. It was to such pupils that Socrates, Plato, and Aristotle gave instruction. In the *Republic* and the *Laws* of Plato and the *Politics* of Aristotle the Greek ideas of education are set forth. The prevailing thought was the harmonious development of all the powers of the pupil, physical, mental, and moral. In Sparta education was regarded as equally important, but here special stress was placed upon the training of men physically for military duty.

Rome.—With the Romans education manifested two somewhat distinct types. During the republic it inclined to the Spartan, during the empire to the Athenian. Before the second Punic war no provision was made for schools, but education was limited to the care of the family. Under the empire a severe family discipline, coupled with the Roman ideals as to the civic and military virtues, succeeded in developing a remarkable race of men. With the introduction of a taste for Greek arts and literature in the third century B. C. the era of severe simplicity gradually gave way to new ideals. Schools of philosophers and rhetoricians came into existence, and the younger children were intrusted, as at Athens, to the care of pedagogues. But even under the empire education was not taken up as an affair of the state; each teacher followed his own method. Varro wrote of grammar, rhetoric, history, and geometry, and his works had much influence for several generations. Of more importance were the *Institutes of Oratory* by Quintilian, who gives a detailed account of the ideal education of an orator from the earliest childhood to manhood.

Middle Ages.—During the period of the invasions the [re-

railing turbulence made the establishment of schools impossible. Even the Christian Fathers were divided in their opinions as to the influence of a comprehensive education. Tertullian rejected all pagan learning, and St. Augustine, after his conversion, renounced his taste for classical poetry and eloquence. St. Basil, on the other hand, recommended that young Christians become familiar with the orators, poets, and historians of antiquity; and St. Jerome wrote a treatise on the education of girls which has elicited warm commendation. But the ideas of the time were monastic in their nature, and early monasticism was unfavorable to the establishment of schools of any kind. Here and there groups of young Christians, aspiring to the priesthood, gathered around the priest for instruction, but these were scarcely worthy the name of schools. Sidonius Apollinaris, writing in the fifth century, says: "Teachers no longer have pupils, and learning languishes and dies." It was not till the age of Charlemagne that an attempt was made to provide for systematic instruction. This great ruler not only established a kind of itinerant school, which followed the king on his travels, with Alcuin at its head, but he decreed the establishment of schools in various parts of his domain. Nothing gives a more depressing picture of the intellectual feebleness of the time than the description of the methods of instruction contained in Einhard's *Vita Caroli Magni*. (See Guizot, *History of Civilization in France*, lect. xxii.) Thus, notwithstanding the enlightened efforts of Alcuin, who has aptly been called the first minister of education in France, neither the clergy nor the people by their intelligence or their appreciation responded to the efforts that were put forth. No one of Charlemagne's successors took up his thought, and the Council of Aix-la-Chapelle, in 817, decided that no more day-pupils should be admitted to the conventual schools. It was not till the twelfth century that SCHOLASTICISM (*q. v.*), by the introduction of the Aristotelian processes of reasoning, awakened some intellectual activity. But even this was chiefly a mental gymnastic, and gave distorted views of all the affairs and relations of life. The fact that Abelard by the renown of his eloquence could gather about him in Paris thousands of students shows that there was an interest in learning, which, under wise, inspiring, and systematic guidance, might perhaps have accomplished important results. But no such guidance was at hand. It is not till that general awakening called the Renaissance that schools of any considerable importance were established. There were, it is true, ecclesiastical schools for the education of priests, but their methods were crude and their results narrow and distorted. In 1363 choirs and benches were forbidden, because they encouraged pride. The rod was freely used. "Day and night," wrote an abbot to Anselm, "we do not cease to chastise the children, but they grow worse and worse." "In the fifteenth century," says Montei, in describing the schools, "the rods are twice as long as those in the fourteenth." But it would be erroneous to suppose that the conditions generally prevalent in Europe were universal. On the contrary, after the rise of Mohammedanism in the seventh century, schools were established in all the principal cities in the East as well as in the West. The most celebrated were at Bagdad, Damascus, Cordova, Salamanca, and Toledo. Here grammar, philosophy, chemistry, medicine, and the various branches of mathematics were studied with great success. They gave algebra and trigonometry their modern forms, determined the size of the earth by measuring a degree, made a catalogue of stars, invented the pendulum clock, and discovered alcohol, as well as nitric and sulphuric acids. Their schools were largely attended by the most enterprising and aspiring youth of the other countries of Europe, and their influence was considerable in awakening the thought which led to the Renaissance.

The Revival of Learning.—It is of importance to note that the first general intellectual movement of modern Europe was through the universities. Cambridge, Oxford, Bologna, Salerno, Naples, Paris, Prague, Vienna, and Heidelberg were established before the beginning of the fifteenth century. The moral and intellectual tone of the universities was low, but their influence in behalf of learning soon made itself felt. Students had special halls or colleges in which they lodged and boarded under official superintendence. At first the universities were free associations, but they were soon recognized as elements of power by the Church and the rulers, and soon received special privileges. Before the end of the twelfth century contemporary authorities assert that at the University of Bologna there were 12,000 students and

a little later that at Paris there were 20,000. These were grouped into four faculties—those of theology, philosophy, law, and medicine, the classification which is still prevalent in Germany. During this period schools were greatly assisted by the writings of the most enlightened teachers. Besides Abelard (1079–1142), Gerson, chancellor of the University of Paris (1363–1429), Vittorino da Feltre of Padua (1379–1446), and Æneas Silvius, afterward Pope Pius II. (1458–64), contributed greatly to improve the methods and spirit of instruction. In the secondary schools, which were mostly conventual, "the seven liberal arts"—viz., Latin, grammar, dialectics, rhetoric, music, arithmetic, geometry, and astronomy—were regularly, though not very efficiently, taught.

The Reformation.—The great religious upheaval of the sixteenth century was heralded by a number of eminent teachers and patrons of learning. Manuel Chrysoloras collected a vast number of Greek MSS. and introduced them into Italy. Pope Nicholas V. founded the Vatican Library and made Rome the center of learning. Agricola not only transplanted the spirit of letters from Italy to Germany, but gave most valuable advice to those engaged in establishing schools. To the authorities at Antwerp inquiring for a head master, he wrote: "Take neither a theologian nor a rhetorician, but one who knows how to teach, to speak, and to act at the same time. If you know such a man get him at any price." Reuchlin created great enthusiasm for the study of Hebrew, and Erasmus performed a still higher service in behalf of Greek and of polite learning in general. The impulse thus given was carried on by Luther, whose doctrine of justification by faith alone transferred from the Church to the individual the responsibility of saving knowledge. The logical result was a great movement in behalf of the means by which individual knowledge could be increased. Luther not only advocated the establishment of schools everywhere, but he gave important advice in regard to their organization and improvement. His teachings wrought a veritable revolution. He pushed forward the art of giving instruction, and provided for special instruction of the best scholars to fit them for the work of teachers. While he put great stress on the study of theology, and gave a very prominent place to studies in Greek, Latin, and Hebrew, he recommended mathematics and history. He made the support of the schools a charge upon the public treasury, and placed upon the parents the moral obligation to send their children to school. Perhaps the most important of all was the fact that he insisted upon an absolute emancipation from the old spirit of exclusiveness, for it was in this emancipation that the revolution really consisted. The gist of his teachings in this respect was contained in these words: "The monks have imprisoned young men like birds in a cage. It is dangerous to isolate the young. It is necessary, on the contrary, to allow young people to hear, see, and learn all sorts of things, while all the time observing the restraints and the rules of honor." This new spirit became the fundamental idea of education in Germany, and it exerted a vast influence in giving German schools of all grades the pre-eminence they have ever since maintained. These fundamental propositions were given definiteness of form two generations later by the great father of educational organization, Comenius. Michelet calls him "the first evangelist of modern pedagogy—Pestalozzi being the second." His particular service was in giving exactness to different grades of instruction, in defining the most important laws in the art of teaching, in determining how elementary instruction should be conducted, and in applying to all grades of teaching the laws of modern logic. The classification of studies outlined in his different works, of which there were twenty volumes, was essentially the same as that generally adopted at the present day by the best schools of Europe and America. While the work of Comenius was going on in Germany, England, and Sweden, other efforts were put forth in different parts of Europe. In Geneva the ecclesiastical policy of Calvin provided for the establishment of schools and teachers. Melancthon drew up the "Saxony plan," which was long the basis of organization in many parts of Germany. In Strassburg the school of John Sturm became so famous that it was sought by pupils from all parts of Europe. In all Roman Catholic countries schools were organized in the most thorough manner under the direction of the Jesuits. The foundation of all the Jesuit schools was the study of the classics, but they taught also philosophy, ethics, mathematics, and history. At the beginning

of the eighteenth century the fame of the Jesuits as teachers had become so great that they had been called upon to establish schools in every part of the world. In 1710 they were reported to have 612 colleges, 157 schools for the education of teachers, and twenty-four universities. The system proposed by Loyola in 1588, with the exception of some slight modification made in 1832, has remained unchanged to the present day. Thus far the organization of schools since the Reformation has been largely shaped either by individual teachers or by general religious considerations.

Germany.—From the time of Comenius until the nineteenth century the schools of Germany were multiplied, but there was no very radical change in the plan of organization. In 1715 A. H. Francke founded the first *Pedagogium*, or normal school for the training of teachers, and his organizing and inspiring power was such as to bring together more than 4,000 teachers and pupils in the institutions under his control. Methods were still further improved by Basedow and Rochow, and both Frederick the Great and Maria Theresa gave practical encouragement to the schools by declaring them entitled to the protection and care of the state. Even the eccentric Frederick William I. of Prussia published an edict of compulsory education. But notwithstanding all these efforts, the elementary schools remained in wretched condition throughout the eighteenth century. It was not till after the Napoleonic wars had shattered Prussia (see NAPOLEON I., *Jena Campaign*) that thoroughgoing reform took place. The methods recommended by PESTALOZZI and FROEBEL (q. v.) were then generally applied in the elementary schools, and all grades of instruction were subjected to the most systematic and rigid revision, as well as state control and state superintendence. In a most solemn address to the German people, Frederick William III. recognized the great part that education must play if the nation was to be developed in internal power and splendor. Educational affairs of all grades were intrusted to a department of education, consisting of four of the most eminent professors of Germany, at the head of whom was Wilhelm von Humboldt. Order was soon evolved out of the chaotic conditions that formerly prevailed. After tentative orders in 1811 and 1812, a general statute was promulgated in 1816 constituting the fundamental school law of Prussia. Although this great ordinance was in some of its parts modified by the Prussian Code of 1854, and again by the Falk Laws of 1872, its general characteristics were those which have made the schools of Prussia the most famous in the world during nearly the whole of the nineteenth century. The organization may be briefly described as follows: Schools were classified in four general groups—primary schools, secondary schools, universities, and technical schools. In the fourth class the normal schools were to occupy the place of foremost importance. No teacher was to be employed who had not, after a severe course of pedagogical training, passed a rigid examination, not only in the matter to be taught, but also in the art of giving instruction. Pensions were provided for teachers honorably retired. The hours of instruction for pupils in the lowest grades are twenty-two per week; in the highest, thirty-two. In the elementary and secondary schools the work is strictly prescribed; in the universities there is absolute freedom. By the Falk Law of 1872 the middle school was specially adapted to commercial requirements. In Prussia, which may be regarded as the model, all the schools are under the immediate supervision of thirty-six district boards or committees. The laws compel an attendance of pupils from six to fourteen years of age, and in case of deficiency even a longer time. In Prussia, Saxony, and Bavaria, small fees may be exacted of each pupil, but in the other states elementary instruction is free. In all the German states the laws requiring compulsory attendance are enforced with rigor, and consequently the percentage of illiteracy is everywhere very small. The proportion of pupils who advance to the higher grades is very large. In Berlin, during the decade from 1881 to 1891, of the average of about 160,000 scholars in the public schools, about 9,000 were in the gymnasias, about 5,600 in the realschools of the first class, about 10,000 in the various trade and technical schools, and about 133,000 in the common schools. In Saxony, of 600,000 pupils, more than 11,000 were in schools of gymnasium grade. In all the states of Germany trade schools (see below) and schools of agriculture (see AGRICULTURAL COLLEGE) occupy a prominent place, and are generously supported.

France.—Before the Revolution the schools of France

were for the most part under the direct or indirect control of the clergy. Napoleon saw the necessity of thorough and comprehensive reorganization. His method (see *Reforms during the Consulate* under NAPOLEON I.) was not fortunate. The organization of an educational hierarchy with the university at Paris as its head proved to be so unwieldy that the primary and secondary schools never acquired life or efficiency. While the Germans were demonstrating the success of local boards of control acting under a wisely framed general law, the French, on the contrary, were showing the inherent weakness of a system that took all power out of the hands of those who were most interested in success. The war of 1870 proved even to the French themselves the superiority of the German system. The law of 1881 provided for a thorough reorganization. The schools were classified under the terms superior, secondary, and primary, and all were placed under the supervision of a Minister of Instruction. Professors in the universities are paid by the state, as are also in part those of the *lycées*. The *collèges* are supported by departments or municipalities, with occasional endowment of chairs by the Government. The normal schools are mainly supported by the central Government, the primary schools mainly by local taxation; but in case of necessity a "supplementary subsidy" is furnished by the general Government for the better payment of teachers. In all the public schools primary education is gratuitous. Of the 4,520,928 children in school in 1891, 3,453,071 were in public schools, and 1,067,857 in schools under private management, but subject to governmental inspection. The system of technical and trade schools is very elaborate, and extends to nearly every vocation. Since 1881 the system of schools of all grades has been made one of the most thorough in Europe, though the French methods of instruction have not yet become equal to those of Germany.

Great Britain.—The schools of Great Britain have had a peculiar history. Before the Reformation there were few schools except those connected with monasteries and cathedrals. At the beginning of the sixteenth century sixteen grammar schools had been founded, and this number was increased by as many more during the reign of Henry VII., by 63 during the reign of Henry VIII., by 138 in the time of Elizabeth, and by 142 in the reign of the Stuarts. These schools, established under private endowments, were not subject to general governmental control. In the eighteenth century a considerable number of charity schools were founded, largely for the purpose of giving religious instruction. While the charity schools were open to both boys and girls, the grammar schools were open to boys alone. The wretched condition of the English schools in the eighteenth century is amply revealed by the writings of Joseph Lancaster and Andrew Bell. In 1808 the Royal Lancasterian Society and in 1811 the British and Foreign School Society were organized, but they accomplished little except to demonstrate the need of governmental assistance. In 1816 a select committee on the condition of schools was appointed, with Henry Brougham at its head; but its achievements were mostly limited to the dissemination of knowledge. It was not till 1832 that Parliament made its first appropriation of £20,000 for the erection of school-buildings. In 1835 and 1838 committees of inquiry were appointed, and in 1839 a committee of the privy council on education was established. The first fruits of this committee were the establishment of model schools and the appointment of inspectors of all aided schools. The system thus entered upon was rapidly developed, and in 1858, when the annual grants amounted to £830,000, a member of the privy council was raised virtually to the position of minister of education. The result was a revised code in 1862, which swept away many of the worst features and made the distribution of funds depend on the efficiency and standing of individual schools. In 1867 the royal commissioners reported that of 3,000 endowed schools, 782 had been designated in the articles of endowment as grammar schools and the others as charity schools. This law was violently opposed as too radical, but it was followed by the much more radical Education Acts of 1870 and 1871, with which the name of the Right Hon. William E. Forster is inseparably connected.

These memorable acts, which may be regarded as the corner-stone of the present English system of elementary education, may be summarized under the following heads: (1) That either by voluntary organization and effort, or by the compulsory establishment of school boards, the supply of elementary schools should be made sufficient for all the school districts in the kingdom. (2) That every such ele-

master should be taught by properly qualified teachers, should conform to the general school laws, and should be subject to official inspection. (3) That in all public elementary schools whatever religious instruction is given must be either at the beginning or at the end of school time, so that the secular instruction may be uninterrupted. (4) That a free-table seating forth the books at which instruction is to be given in each subject shall be displayed in each classroom. (5) That in schools managed by public boards no sectarian or other denominational creed shall be taught. (6) That the governmental inspectors are to inspect and report on all the schools receiving governmental aid.

Some of the most eminent of English men of letters have occupied the position of inspectors, and their reports are of great educational value.

In the period of the Reformation John Knox advocated in Scotland a school for every parish, a college in every county town, and the establishment of three universities. The outcome of the movement then begun was a school law in 1580 which, with those men following it, was the last of the system of parish schools that prevailed in Scotland until the law of 1870-71 was applied in Scotland in 1871. The parish schools were generally taught by schoolmaster and were among the most efficient schools in the kingdom, taking the pupils from the most elementary stages through those necessary for admission to the university. In 1873 the parish schools became board schools, and subject to inspection as such.

In the other states of Europe the methods of Germany, France, and Great Britain have generally prevailed, with more or less important modifications.

The United States.—Education in the U. S. had its beginning in New England. Harvard College was founded in 1636, and in 1647 a school law was enacted by Massachusetts which provided for the systematic establishment of primary and secondary schools. This earliest example of provision for education at public expense was soon imitated in other colonies. The Huguenots, the Dutch, the Cavaliers as well as the Puritans, each in their own way, made provision for the education of their children. The first public school was established in New Amsterdam in 1614, followed in 1674. During the colonial period schools were everywhere developed by the individual colonies, and, accordingly, when the Federal Constitution came to be adopted in 1789 the care of educational affairs was retained by the individual State governments. Massachusetts, in its constitution of 1780, proclaimed it as the "duty of magistrates and legislators to cherish the interests of public schools, common schools, colleges, and universities," and the establishment, even before the adoption of the Federal Constitution, was very generally imitated by other States. When in 1803 the ordinance for the organization of the Northwest Territory was adopted it contained the injunction, "Religion, morality, and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged." Though the general Government under the Constitution is not charged with the care of education, Congress has uniformly been actuated by the sentiment embodied in this declaration. In 1787 provision was made for giving each State the sixteenth section (1 sq. mile) of every township for common-school purposes, and two sections (32 sq. miles) for the purposes of a university. In 1861, in 1861 sixteen of the newer States received each 30,000 acres of land for education; and in 1848 the thirty-sixth section was added to the sixteenth for common schools. In 1820, 1830, and 1840 large tracts of the public domains, amounting to 82,428,415 acres, were given to Alabama, Arkansas, California, Florida, Illinois, Indiana, Iowa, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, and Wisconsin. In 1862 Congress gave to each State 30,000 acres for each of its members of Congress for the purpose of promoting industrial education, and supplementary acts were passed in 1869 and 1890. The amount of land given by Congress for educational purposes has amounted to about 150,000,000 acres.

While Congress has thus encouraged education with a cash grant, the details of educational organization and management have been provided for by the individual States. They are in every method, though there is general similarity. In New York a board of regents was established in 1784 to have general superintendence of the educational interests of the State, but until the adoption of the constitution of 1846 the efficiency of the board was crippled in various

ways. In most of the States there is a superintendent of public instruction, whose duties are more or less comprehensive as defined by constitutional or legislative provisions. In all the States a tax is levied for the support of the elementary schools. In some of the States a portion of the fund so received goes to the free high schools, but in all cases it is distributed in proportion either to the number of pupils in attendance, or to the number attending provisionally.

The following table furnishes the most important statistics of public, private, and parochial schools in 1890:

SCHOOL STATISTICS IN THE UNITED STATES AND TERRITORIES, AS GATHERED BY THE CENSUS OF 1890.

STATE, TERRITORY, OR POSSESSION	Number of schools	Number of pupils	Number of teachers	Value of school property	Value of school furniture
U. S.	1890	1890	1890	1890	1890
The United States	10,728,480	750,940	127,182	30,325	10,842
North Atlantic Division	4,679,253	319,000	52,000	11,071	30,351
Maine	140,000	8,000	1,000	21,123	20,244
New Brunswick	70,000	4,000	500	10,000	10,000
New Hampshire	70,000	4,000	500	10,000	10,000
Vermont	80,000	4,000	500	10,000	10,000
Massachusetts	200,000	10,000	1,000	10,000	10,000
Rhode Island	20,000	1,000	100	10,000	10,000
Connecticut	170,000	8,000	1,000	10,000	10,000
New York	1,040,000	50,000	6,000	10,000	10,000
New Jersey	200,000	10,000	1,000	10,000	10,000
Pennsylvania	970,000	47,000	5,000	10,000	10,000
South Atlantic Division	1,700,000	100,000	15,000	10,000	10,000
Delaware	10,000	1,000	100	10,000	10,000
Maryland	100,000	5,000	500	10,000	10,000
District of Columbia	10,000	1,000	100	10,000	10,000
Virginia	100,000	5,000	500	10,000	10,000
West Virginia	100,000	5,000	500	10,000	10,000
North Carolina	200,000	10,000	1,000	10,000	10,000
South Carolina	100,000	5,000	500	10,000	10,000
Georgia	100,000	5,000	500	10,000	10,000
Florida	10,000	1,000	100	10,000	10,000
North Central Division	3,000,000	150,000	20,000	10,000	10,000
Ohio	1,000,000	50,000	6,000	10,000	10,000
Indiana	1,000,000	50,000	6,000	10,000	10,000
Illinois	1,000,000	50,000	6,000	10,000	10,000
Michigan	1,000,000	50,000	6,000	10,000	10,000
Wisconsin	1,000,000	50,000	6,000	10,000	10,000
Minnesota	1,000,000	50,000	6,000	10,000	10,000
Iowa	1,000,000	50,000	6,000	10,000	10,000
Missouri	1,000,000	50,000	6,000	10,000	10,000
North Dakota	10,000	1,000	100	10,000	10,000
South Dakota	10,000	1,000	100	10,000	10,000
Nebraska	10,000	1,000	100	10,000	10,000
Kansas	10,000	1,000	100	10,000	10,000
South Central Division	2,000,000	100,000	15,000	10,000	10,000
Kentucky	100,000	5,000	500	10,000	10,000
Tennessee	100,000	5,000	500	10,000	10,000
Alabama	100,000	5,000	500	10,000	10,000
Mississippi	100,000	5,000	500	10,000	10,000
Louisiana	100,000	5,000	500	10,000	10,000
Texas	100,000	5,000	500	10,000	10,000
Oklahoma	10,000	1,000	100	10,000	10,000
Arkansas	10,000	1,000	100	10,000	10,000
Western Division	1,000,000	50,000	6,000	10,000	10,000
Montana	10,000	1,000	100	10,000	10,000
Wyoming	10,000	1,000	100	10,000	10,000
Colorado	10,000	1,000	100	10,000	10,000
New Mexico	10,000	1,000	100	10,000	10,000
Arizona	10,000	1,000	100	10,000	10,000
Utah	10,000	1,000	100	10,000	10,000
Nevada	10,000	1,000	100	10,000	10,000
Idaho	10,000	1,000	100	10,000	10,000
Alaska	10,000	1,000	100	10,000	10,000
Washington	10,000	1,000	100	10,000	10,000
Oregon	10,000	1,000	100	10,000	10,000
California	10,000	1,000	100	10,000	10,000

The most noteworthy feature of the above table is the fact that in all the older States the percentage of attendance in 1890 was considerably less than it had been in 1880. While in the older States of the East and North this tendency seems generally manifest, in the South, on the other hand, there has been a marked improvement.

Authorities.—Schmidt, *Geschichte der Pädagogik* (4 vols., 1872-76); Dittes, *Geschichte der Erziehung und des Unterrichts* (4th ed. 1876); Fritz, *Republique d'un système complet d'instruction et d'éducation et de leur histoire* (3 vols., 1847); Hauser, *Geschichte der Pädagogik*, 4 vols. (published in translation in *Barnard's Journal of Education*); Cramer, *Geschichte der Erziehung*; Barnard, *National Education*; Wiese, *Verordnungen und Gesetze für die höheren Schulen in Preussen*; Théry, *Histoire de l'Éducation en France*; Oréar, *La législation de l'instruction primaire en France depuis 1789 jusqu'à nos jours* (3 vols., 1874); Shuttleworth, *Public Education*; Royal Commissioners' Report on the Management of Certain Colleges and Schools (1864); Stanton, *The Greek Schools of England*; Lavigne, *L'Instruction du Peuple aux États-Unis*; Bippau, *L'Instruction publique*.

aux États-Unis; Arnold, *Higher Schools and Universities in Germany*; Painter, *History of Education*; Boone, *Education in the United States*; Klem, *European Schools*; Quick, *Educational Reformers*; Barnard, *Superior Instruction in Different Countries*; Grant, *History of the Burgh Schools of Scotland*; Arnold, *Reports on Elementary Schools*; Arnold, *Middle-class Education and the State*, to which is added *Schools and Universities in France*; Hoyt, *Education in Europe and America*. C. K. ADAMS.

II. PRIMARY SCHOOLS.

This term is here applied to those schools which are planned to furnish the elementary education necessary for citizenship and for the ordinary duties of life. Such schools are now almost universally supported by the state. In point of time, they occupy the children from about the sixth to the fourteenth year, or during the first eight years of a course of study, the kindergarten not being included. Where schools are graded this period is frequently divided in the U. S. into primary, intermediate, and grammar departments. The obligation of the state to provide instruction for all its children is a modern conception. In ante-Christian society education was largely a state concern, but it was confined exclusively to the more wealthy classes. From the time of Christ practically to the beginning of the nineteenth century, all elementary education was controlled by the Church. Occasionally the state intervened when a ruler more enlightened than his fellows took some step in advance. But the great achievements in this field have all been accomplished in the nineteenth century.

In Great Britain.—Until well into the nineteenth century primary or elementary education in England was practically left entirely to the care of the clergy of the Established Church. Parliament in 1832 for the first time voted money to aid in the building of schools. In 1846 money was first given for increasing the salaries of teachers; in 1853 grants began to be made according to the number of pupils in attendance; while in 1862 these grants were made to depend on the successful passing of examinations. The Elementary Education Act of 1870 as subsequently amended regulates elementary education in England and Wales, while the act of 1872 extended the system to Scotland. The central authority is a committee of council on education, the acting chief being the vice-president, who is a member of the cabinet. The local administrative unit is the district, to form which boroughs and parishes are grouped together. Each district has a school board, which may compel parents to send their children to school. Under this law, sufficient school accommodations must be provided in every district for all children between the ages of five and fourteen. The obligatory subjects of instruction are reading, writing, arithmetic, drawing for boys, and needlework for girls. Optional subjects are singing, geography, sciences, algebra, modern languages, cookery, and some others. Religious instruction is given. There are seven grades, and each pupil should pass one grade each year. After passing the fourth grade, the children may, if twelve years of age, leave school. This education became practically free only in 1891. The system of paying for results, or, in other words, giving grants in proportion to the number of examinations passed, still prevails, and with all its faults seems to have a strong hold. The schools are local or denominational institutions. The state aids them, but does not manage them. The managers of any schools may cut loose from the governmental connection at any time, the state's rights to supervision being based solely on its contributions to financial resources. The business of inspectors is solely to ascertain and report on the efficiency of the schools. Probably in no country is there so large local independence and power to adapt the school to the needs of the country as in Great Britain.

The schools of Scotland have long been famous. Here from 1695 to 1872 elementary education was regulated by the act of James VI., which ordained that every parish should have a school supported by revenues derived from the land, the teachers being appointed by the heritors and the presbytery of the Established Church. By the Elementary Education Act of 1872 the Scotch education department was instituted, and each borough and parish, or group of parishes, was required to have a school board to administer both elementary and secondary education and to enforce the attendance of children from five to fourteen years of age. In Ireland, since 1845, elementary education has been under the superintendence of the commissioners of national education in Ireland. Of these national schools

there were in 1893 8,459, having on their rolls 832,545 of the 939,694 children of school age.

In Germany.—The school laws of Prussia are, with slight modifications, the standard in all the German states. Thorough organization of the school system dates from the prostration of Prussia after her crushing defeat by Napoleon. The reform in education undertaken under the leadership of von Humboldt began first with the university, then extended to the secondary schools, and presently primary schools felt the same impulse. Since 1816 Prussian common schools have been usually considered the best in the world. The attendance on the schools is compulsory. The law of 1888 provided for making instruction free. About 18 per cent. of the cost of the schools is borne by the state and the rest by the community. The minister of ecclesiastical, educational, and medical affairs, a member of the cabinet, is the head of all the educational institutions of the kingdom. The course of study is prescribed in general outlines by the central Government, and the appointment of teachers must be approved by the Government. The course of study in the elementary schools includes religion, reading, writing, arithmetic, geography, singing, drawing, natural history, and history of man. Needlework and household economy is taught to the girls. Instruction in natural history, natural science, and history of man is entirely oral. Physical exercises are prescribed, and every school is provided with suitable apparatus. Industrial education for girls consists of knitting, crocheting, embroidering, sewing, darning, cutting, fitting, and patching, and is found in every school. The study of arithmetic is less extensive than in the U. S. Vocal music is continued through the entire course. The school hours are usually six a day. Schoolrooms are apt to be small and overcrowded. The school year consists of forty-five weeks, with six or seven weeks of vacation. Legal holidays are more frequent than in the U. S. Lessons usually last from forty to fifty minutes. Examinations are comparatively rare, are usually oral, and are conducted in the presence of parents and friends. In Germany, students who are to take a secondary course, as a rule leave the common schools and enter the secondary schools at the age of nine or ten.

In France.—The educational reorganization of France dates from the Franco-German war. School management is completely centralized. This was done originally by Napoleon in constituting the University of France. Since 1850 the central school organization has not been officially called university, though in common usage it still is. Previous to 1870 only one important effort had been made looking toward the education of the people. This was the passage in 1833 of Guizot's laws which imposed upon the commune the obligation of establishing primary schools. The law was not well executed. Jules Simon declared that it was the German schoolmaster that conquered at Sedan. As in Prussia after Jena, so in France in 1871 it began to be felt that the school was to be the instrument of national regeneration. The law of 1878 created a fund of 23,000,000 francs for the purpose of establishing necessary schoolhouses. The law of June 16, 1881, made instruction obligatory, that of Mar. 28, 1882, made it gratuitous, and that of Oct. 30, 1886, reorganized education, and declared that within a certain period all public schools should be under the charge of laymen. In 1857 France devoted to primary instruction the sum of 16,523,969 francs; in 1891, 173,372,524 francs, and in no modern country has the advancement in educational lines been so great and so rapid. The course of study for primary schools prescribed by the law of Mar., 1882, comprises moral and civic instruction, reading, writing, the elements of arithmetic and the metric system, history and geography, especially of France, object-lessons and the first notions of science, elements of design, of singing, manual work, needlework in the school for girls, gymnastic exercises, and in the school for boys military training. In the superior primary schools this course is much extended.

In the United States.—The school organization of the U. S. shows a general adherence to a certain type, with infinite variety in details. The great local differences work more to the disadvantage of the pupil than they would in Europe, since the people of the U. S. are proverbially migratory, and change of schools, with consequent loss of time, is very common. The success of primary schools is determined by (a) the intensity of public interest, (b) the thoroughness and comprehensiveness of organization and supervision, and (c) the aptitude and training of teachers. There is a general disposition on the part of the people to appro-

could mobilize freely for the support of the common schools. The instruction is everywhere gratuitous, the teachers are salaried or rewarded, and progress is making in the direction of compulsory attendance; more or less satisfactory laws of this character already exist in over half the States and Territories, the most common one for required attendance being from eight to fourteen. Fairly successful efforts have been put forth, especially in the West, to introduce science teaching in the elementary schools. Opportunities for professional training for teachers are still sadly inadequate. Superintendents and administrative officers are political in their nature, seeking frequent change in office in most localities. There are also, as a rule, too few supervisory officers. Many experienced observers are of the opinion that the children in the schools of the U. S. are in attainments behind those of the same age in the leading countries of Europe. A comparison of the school work in Great Britain, France, and Germany, as given above, with the system in the U. S. will show where lie the differences. As the general government leaves control over the schools, the U. S. Bureau of Education being charged solely with the function of collecting and disseminating information, the school system of each State must be studied by itself. The differences that appear in such a study are very great.

C. H. TURNER.

III. SECONDARY SCHOOLS.

Meaning.—In the U. S., what is known as secondary instruction technically means the ninth to the twelfth years of the course of study, inclusive, or from about the fourteenth to the eighteenth years of life. The classification into primary, secondary, and higher education has been distinctly recognized only in the nineteenth century, but as early as 500 B. C. the Greeks had divisions in the education of their youth which corresponded fairly well to the three classes of modern times. As a term of general application, then, secondary education covers the intermediate of the three periods in the complete educational plan. In the countries of the Old World the range has been fixed with tolerable definiteness, but in the U. S. the limits look of higher and of primary education are constantly shifting, thus making the secondary school rather indefinite. The U. S. Bureau of Education has selected from the forty or more studies taught in different secondary schools in the U. S. the following as typical secondary-school studies: Latin, Greek, French, German, Spanish, geometry, trigonometry, physics, chemistry, history, science, etc. (U. S.), history, English literature, and geology.

In Germany.—With the exception of Great Britain, and in almost every France, all the European countries have modeled their course largely after the German pattern. The typical German institution of secondary education is the gymnasium. This name came into use as early as the sixteenth century, and in 1810 a ministerial decree ordered that all school institutions, such as the lyceum, pedagogium, collegium, Latin schools, etc., should henceforth be called by that name. It has properly six classes, counted upward from the sixth, the lowest, and called sexta, quinta, quarta, tertia, secunda, and prima. In each of the three lower classes the course is one year; in each of the three upper it covers two years, making the entire course nine years. There are two terms, or semesters, and generally two corresponding sections in each class, one section comprising the scholars who enter at Easter, and the other those who enter at Michaelmas. The class-system, as opposed to the system of instruction in each subject by specialists (*Fachlehrer*), prevails generally. The course is thorough, and the attainments of the students at graduation correspond in a general way to the attainments of American students at the beginning of the junior year in the best colleges. In 1902 a new programme was adopted for these schools, which is here given:

PROGRAMME OF GERMAN GYMNASIUM.

Subject/Year	1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	11th	12th
1. German (continuous)	2	2	2	2	2	2	2	2	2	2	2	2
2. Latin	2	2	2	2	2	2	2	2	2	2	2	2
3. Greek	0	0	0	0	0	0	0	0	0	0	0	0
4. French	0	0	0	0	0	0	0	0	0	0	0	0
5. English	0	0	0	0	0	0	0	0	0	0	0	0
6. History	1	1	1	1	1	1	1	1	1	1	1	1
7. Geography	1	1	1	1	1	1	1	1	1	1	1	1
8. Mathematics	1	1	1	1	1	1	1	1	1	1	1	1
9. Science	0	0	0	0	0	0	0	0	0	0	0	0
10. Physical Education	0	0	0	0	0	0	0	0	0	0	0	0
11. Art	0	0	0	0	0	0	0	0	0	0	0	0
12. Music	0	0	0	0	0	0	0	0	0	0	0	0
Total	10	10	10	10	10	10	10	10	10	10	10	10

Attention is called to the provision for religious instruction in Germany, and to the great number of periods—thirty in the upper classes—required of students. Side by side with the gymnasium exist the realgymnasium and real-school, the former having Latin and no Greek, and the latter neither Greek nor Latin. These three institutions are equal in plan and purpose fairly well in the classical, Latin-scientific, and English courses which are found in the U. S. side by side in the same high school. The way to any high position in the army, in the Government service, and in all professional lines in Prussia is through some one of the higher schools. The right to one year voluntary military service, instead of the three years required of the conscripted, is one which belongs to every German youth who completes six years of the course in any one of the three higher schools. Graduates of the gymnasium are admitted to the universities, and to the study of any of the liberal professions, as well as to the practice of teaching in all its branches. Graduates of the realgymnasium are excluded from the liberal professions, and may study only with the philosophical faculty of the university, and may become teachers only in mathematics and modern languages, and are then eligible for positions only in realschools. The realschools qualify for admission to the technical high schools. Teachers in the gymnasium must be graduates of a gymnasium, who have attended a university three years, passed a severe Government examination, and taught then on trial for two years. There is an ascending salary-scale for length of service. At the age of sixty-five, teachers are entitled to a pension.

In France.—In France the system of education has been entirely reorganized since the disaster of 1870-71. Secondary education is cared for by the *lycees* and communal colleges. Of these the representative establishments are the *lycees*. Pupils enter at eight years of age, and are expected to spend a year in each class, completing their course at eighteen. The discipline is rigid and rather mechanical. Both communal colleges and *lycees* have boarding-departments. The scope of the instruction given is not materially different from the German standard.

In Great Britain.—In Great Britain there is no secondary education at the expense of the state, and for the great mass of children who go through the elementary schools there is no further opportunity, except in the numerous grammar schools and academies, both endowed and private, which are found there, but over which the Government has no direct control. The great public schools of England correspond to the best and most expensive private endowed schools in the U. S. All are boarding-schools, with their own traditions and customs. Nine of these schools have been distinguished by special recognition as particularly the public schools, although there are forty or more. Two of these nine are day schools. The others, which are incontestably public schools, are, with the dates of their foundation—Winchester, 1087; Eton, 1440; Shrewsbury, 1551; Westminster, 1560; Rugby, 1567; Harrow, 1571; Charterhouse, 1609. These schools are for the most part well endowed. Eton, for example, has an annual income of some £70,000.

In the United States.—The earliest representative of the secondary schools in the U. S. was the academy, which flourished in New England and New York. At the close of the eighteenth century New York had nineteen of these schools and Massachusetts about an equal number. They were to be found in almost every State, and were the characteristic educational agency of the period. Their course, not planned solely with reference to preparing for college, was frequently followed by a college education, but more often not. Of these schools the Boston Latin School, founded in 1635, was the earliest. Other notable ones are the Hopkins Grammar Schools at Hartford and New Haven, Conn., 1657; Germantown Academy, Germantown, Pa., 1760; Dunbar School, Byfield, Mass., 1763; Phillips Academy, Andover, Mass., 1778; Phillips, Exeter, N. H., 1781; and Flatbush Academy, New York, 1781. There soon developed two distinct types of secondary schools—public high schools and the private endowed schools or academies. The public high schools seem to have succeeded in large measure to the work of the old New England academies, which sought not so much to train for college as to give the best possible education for life to those who came within their influence. The academies which sprang up in connection with the early colleges as preparatory departments in the same have, in the Eastern States at least, nearly disappeared and been succeeded by the private endowed schools, which aim mainly to fit their

pupils for the different colleges, though they are managed in entire independence of these colleges. In Massachusetts, as early as 1797, the academies were virtually incorporated into the system of public schools by receiving endowments of land from the State. In 1834, by an act of the New York Legislature, the regents of the university were required to apply the surplus income of the literature fund beyond the sum of \$12,000 to the education of common-school teachers by distributing it to such academies as should undertake their instruction. Philadelphia organized a high school in 1837, the first of the kind in the U. S. outside of Massachusetts. Baltimore followed in 1839, Cincinnati in 1850, Chicago in 1856. The New York Free Academy was organized in 1849. Courses of study in the different high schools vary, as the schools themselves are subject to local influences. Private endowed schools also have different courses shaped mainly by the influence of the college to which the majority of their graduates are sent. Most public high schools receive and educate both sexes in the same class-rooms and under the same teachers. In a very few of the larger cities there are separate high schools for girls and boys. The following statistics on secondary education in the U. S. as to students and teachers in public high schools and private academies are taken from the report of the commissioner of education for 1890-91:

PUPILS, ETC.	Public high schools.	Private academies.	Total.
Students	211,000	99,000	310,000
Preparing for college	25,058	20,907	45,965
Sex—male	85,000	51,000	136,000
female	126,000	48,000	174,000
Teachers *	8,270	6,281	14,551
Male	3,745	3,041	6,786
Female	4,525	3,180	7,715

* Incomplete; there are probably at least 20,000 teachers in secondary schools in the U. S.

The constitutions of at least twenty-two States specify high schools as the object of legislative and general interest. The newer States universally recognize the high schools as part of the State system of education. In the East, Massachusetts has gone so far as to compel the offering of high-

school advantages to all her children. As high schools can not be established within easy reach of every one, the State pays for carrying children from sparsely settled districts to the nearest village or city high school. The public high schools are relatively best and strongest in the Western States; the private and endowed academies in the Eastern States. The question of introducing military drill and tactics in public schools is beginning to be agitated. In most high schools participation in military drill is yet optional.

Provisions for the preparation of secondary teachers are meager as compared with such provisions in the foremost European countries. The best secondary teachers are college graduates, who, however, rarely have been able to obtain any special professional training. Colleges and universities are beginning to establish chairs in pedagogy to supply this professional training in some measure. A unique contrivance to meet a special want is the summer school for teachers, a feature in many leading universities. These schools are attended largely by secondary teachers, who find opportunity not only for studying their own specialties, but also in most cases for taking work in psychology and pedagogy.

No account of secondary schools would be complete without mention of the work of the committee on secondary-school studies appointed by the National Educational Association July 9, 1892. This committee consisted of ten prominent educators. It appointed nine sub-committees or conferences, each numbering ten, on the various subjects comprising the secondary curriculum. These sub-committees met in Dec., 1892, and prepared elaborate reports, which were transmitted to the central committee as material for their work. The report of the main committee, with the reports of the conferences as an appendix, was published by the U. S. Bureau of Education in Jan., 1894, and has since been the center of educational discussion in the U. S. The committee prepared four model programmes for secondary schools, which are inserted below. No school is known to be actually following any one of these; but since the report appeared a number of schools have modified their programmes to conform closely to these model programmes, and it is certain they will form for some years to come the standard toward which a large number of schools will more and more closely approach.

C. H. THURBER.

MODEL SECONDARY PROGRAMMES.

YEAR.	CLASSICAL. Three foreign languages (one modern).	LATIN-SCIENTIFIC. Two foreign languages (one modern).	MODERN LANGUAGES. Two foreign languages (both modern).	ENGLISH. One foreign language (ancient or modern).
I.	Latin 5 p. English 4 p. Algebra 4 p. History 4 p. Physical geography 3 p. 20 p.	Latin 5 p. English 4 p. Algebra 4 p. History 4 p. Physical geography 3 p. 20 p.	French (or German) begun. 5 p. English 4 p. Algebra 4 p. History 4 p. Physical geography 3 p. 20 p.	Latin, or German, or French 5 p. English 4 p. Algebra 4 p. History 4 p. Physical geography 3 p. 20 p.
II.	Latin 5 p. English 2 p. German * (or French) begun 4 p. Geometry 3 p. Physics 3 p. History 3 p. 20 p.	Latin 5 p. English 2 p. German (or French) begun 4 p. Geometry 3 p. Physics 3 p. Botany or zoölogy 3 p. 20 p.	French (or German) 4 p. English 2 p. German (or French) begun 5 p. Geometry 3 p. Physics 3 p. Botany or zoölogy 3 p. 20 p.	Latin, or Ger., or French 5 or 4 p. English 3 or 4 p. Geometry 3 p. Physics 3 p. History 3 p. Botany or zoölogy 3 p. 20 p.
III.	Latin 4 p. Greek * 5 p. English 3 p. German (or French) 4 p. Mathematics } algebra 2 } } geometry 2 } 20 p.	Latin 4 p. English 3 p. German (or French) 4 p. Mathematics } algebra 2 } } geometry 2 } Astron. & yr., meteorol. & yr. 3 p. History 2 p. 20 p.	French (or German) 4 p. English 3 p. German (or French) 4 p. Mathematics } algebra 2 } } geometry 2 } Astron. & yr., meteorol. & yr. 3 p. History 2 p. 20 p.	Latin, or German, or French 4 p. English } as in others 3 } } additional 2 } 5 p. Mathematics } algebra 2 } } geometry 2 } 4 p. Astron. & yr., meteorol. & yr. 3 p. History } as in Latin-scienc. 2 } } additional 2 } 4 p. 20 p.
IV.	Latin 4 p. Greek 5 p. English 2 p. German (or French) 3 p. Chemistry 3 p. Trig. and higher algebra } } or } 3 p. History 2 p. 20 p.	Latin 4 p. English } as in classical 2 } } additional 2 } 4 p. German (or French) 3 p. Chemistry 3 p. Trig. and higher algebra } } or } 3 p. History 2 p. Geol. or physiography & yr. } } and } 3 p. Anat., physiol., hyg. & yr. } 20 p.	French (or German) 3 p. English } as in classical 2 } } additional 2 } 4 p. German (or French) 3 p. Chemistry 3 p. Trig. and higher algebra } } or } 3 p. History 2 p. Geol. or physiography & yr. } } and } 3 p. Anat., physiol., hyg. & yr. } 20 p.	Latin, or German, or French 4 p. English } as in classical 2 } } additional 2 } 4 p. Chemistry 3 p. Trig. and higher algebra 3 p. History 3 p. Geol. or physiography & yr. } } and } 3 p. Anat., physiol., hyg. & yr. } 20 p.

* In any school in which Greek can be better taught than a modern language, or in which local public opinion or the history of the school makes it desirable to teach Greek in an ample way, Greek may be substituted for German or French in the second year of the classical programme.

IV. Normal Schools.

A normal school is an institution for the training of teachers, and is usually supported by the state. As a general rule such schools confer their honors on the preparation of teachers for the elementary schools. There are in France two normal universities, the Superior Normal School at Paris (created 1808) for women, and that at St. Cloud for men. These schools devote themselves to the preparation of the teachers for the lower normal schools. Nothing of this kind exists in the U. S. or Germany, though the State Normal School at Albany, N. Y., gives a higher grade of professional instruction than that found in other schools. It is designed for those who have completed college or ordinary normal school courses. By the common practice of the world, therefore, the scope of the normal school is confined to the training of elementary teachers. Beyond the indispensable purpose of training teachers for the elementary schools the function of the normal school has not been accurately defined in the U. S., the work of each school being adjusted local or according local needs and conditions. In the early years of their development in the U. S. it was held to be the chief purpose of these schools to furnish a limited amount of scientific academic instruction to candidates for the teaching certificate. In some schools this is still the sole idea. Later it was held to be their chief function to furnish only professional instruction in methods of teaching and school management, the domain of scientific instruction to be borne by the secondary or high schools. Nor has it always been clear that normal schools have any inherent right to exist. There may be an abundance of incidental grounds of expediency for their existence, such as the absence of sufficient scientific instruction in high schools, or the scarcity of well-trained teachers, or the great cost of their services, without there being any peculiar function for the normal school to perform. Were there college-bred teachers enough to supply the needs of the schools and at prices within the reach of the financial abilities of the community, would there be any need of normal schools? Would there be any need of those could the academic and high schools furnish enough teachers well trained in academic branches? If these questions are not to be answered in the negative and there is any real inherent function for the normal school, it must be different from those two types of culture.

The university and college rightly pride themselves upon the breadth and depth of the knowledge they impart and upon the rigorous scientific character of the methods they pursue. But rigorous scientific method for adults is the best unfolding of relatively perfect systems of completed knowledge, or is a difficult extension into new realms of hitherto unexplored. The young, however, are most susceptible of perceiving either of these processes successfully. The logical unfolding of a department of acquired and systematic knowledge is not a proper guide for instructing it to children, since this course does not coincide with the psychological laws of learning in the young. The first of apprehension demand that new knowledge shall be imparted in view of the interpreting experience that the child has already acquired. University knowledge is therefore of scant account until it has been analyzed and readjusted in accordance with the psychological principles governing the child's mental assimilation. On the other hand, schools in academic and high schools acquire in an elementary, noncollective manner the knowledge imparted. They are so much engrossed in absorbing that they are unconscious of the manner of assimilation, nor do they pursue the higher studies long enough to see their interpreting value for the more elementary knowledge. It is evident that to a still greater degree there must here be a lack of psychological insight as to the proper way to select, arrange, and impart knowledge, since there is a lack both of the knowledge that the necessity exists and the broad liberalizing outlook that is requisite.

The function of the normal school, therefore, is to pass the whole light of knowledge, whether acquired in the high school alone or in that and the college combined, through the prism of that psychology which reveals the elementary processes of learning. The machinery of the best normal schools is all adjusted to this end. Academic knowledge is imparted not in the rigid scientific method of the university, or in the half-conscious manner of the academy, but rather according to methods that reflect the psychological conditions under which it can be imparted to children so as to secure their greatest interest and promote their most rapid

understanding. The purpose of the practice or training school, in which normal-school students do practice teaching, is a practical device for securing still greater conformity to the psychological adjustment of the matter of education to the mind of the child. The strictly professional aspect of normal schools pertains to theoretical instruction on psychology and the general theory of the educative processes. There are, therefore, in most normal schools these three factors: (1) Academic knowledge from the teacher's standpoint; (2) professional instruction in psychology and theory of teaching; (3) training-schools where candidates for teaching may impart knowledge to children in accordance with the educational doctrine they have learned.

Rise and Growth.—Normal schools had their beginning in the eighteenth century in France and Germany, but their development as important factors in public education is confined to the nineteenth century.

In Germany the beginnings of normal-school instruction were instituted by August Hermann Franke in connection with his orphan school at Halle in 1697. In 1704 he founded his *Seminarium Præparandum*, or teachers' seminary, which a little later grew into the *Pädagogium*, or normal school, and is still in active operation. A state normal school was founded at Stettin in 1735, one in Potsdam in 1748, and one at Breslau in 1765. After this time the establishment and maintenance of normal schools were greatly stimulated by the demand for popular education incident to the period of the French Revolution and the educational reforms brought about through such men as Pestalozzi. The cause was especially promoted by the effort to free Germany from the rule of Napoleon through the development of the intelligence of the people. The Revolution of 1848 was followed by a reaction in which the normal schools suffered greatly, not so much in diminution of numbers as from the control of the clergy. The three noted Prussian regulations of 1804 crushed all effort to develop independence of character, reducing instruction mostly to memoriter exercises and the inculcation of religious dogma. At the close of the Franco-German war these regulations were repealed, and the number of scholars increased until practically the whole demand for elementary teachers could be supplied from them. Prussia alone has 116 of these schools, 106 being for men and 10 for women. Austria-Hungary has 70 and Switzerland 37 normal schools. Great Britain sustains 44 training-colleges for teachers, the Government paying 58 per cent. of the cost, which amounts to \$867,498. Nearly all civilized nations now support normal schools in some form or other.

After the establishment of the "seminary for lay teachers" by La Salle in 1684, the first permanent normal school in France was founded by local authorities at Strasbourg in 1810. Between 1820 and 1822, when the state took charge of the matter, fifteen were founded. The course was usually two years in length, most of the schools being supplied with training-departments. The fundamental law of 1879 organized the normal schools upon their present basis. In 1889 there were 82 schools for the training of male, and 60 for the training of female teachers. All were released from the control of the clergy. Most of them are now installed in new and enlarged buildings, and are well equipped with the needed material and teaching facilities. The students in 1889 numbered 4,754 male and 3,647 female, and as a rule resided in the schools. Nearly all French normal schools now have practice schools connected with them.

The first normal school in the U. S. was established at Lexington, Mass., in 1839. During the same year a similar school was established at Barre (now at Westfield) and in 1840 at Bridgewater, both in the same State. During the period from 1840 to 1860 twelve others were founded, located for the most part in the Eastern and Middle States. Normal schools began at this time to multiply rapidly, forty of them having been established from 1860 to 1870, seven of which were in New York, and most of the remainder in the States of the northern Mississippi valley. In 1890 there were 135 public normal schools in the U. S.

Organization of German and U. S. Normal Schools.—In order to understand the points of difference between German and U. S. schools for the training of teachers the following facts must be borne in mind: (1) Of the 116 Prussian normal schools but 10 are for women, thus indicating that but little more than 84 per cent. of the elementary teachers in that country are women. Normal schools in the U. S. are coeducational, but the number of women attending them is 18,000 and the number of men only 9,000. In Germany

most persons who prepare for teaching follow that business for life, so that the number of new teachers that must be supplied each year is comparatively small, but little over 5 per cent., the average length of service for Prussian teachers during the last 50 years being 16.9 years, while in the U. S. about 30 per cent. must be renewed each year. This fact greatly enhances the cost and labor of preparing teachers in the latter country. To supply trained teachers for all schools it would take—e. g. in the single State of Illinois alone—142 normal schools, each having 100 students (the usual number in a German normal school), a three years' course of study, and graduating 33 students annually. Illinois has in reality two State normal schools, each graduating from 25 to 50 persons every year—that is, instead of furnishing the 4,000 or 5,000 new teachers needed, the normal schools of that State furnish less than 100 annually. (2) The attendance in German normal schools is unbroken save by accident, so that each year there are nearly as many graduating as entering students; but in the U. S. the attendance is so irregular that rarely more than a fourth or a third as many students graduate as enter. This irregularity of attendance causes discontinuity in study, and explains the fragmentary nature of the instruction in the average normal school. (3) As a rule, the preparation enjoyed by students of German normal schools is of uniform amount and excellence, being special instruction in public or private schools for three years after the close of the Volks-school course at the age of fourteen, and concluded by a public examination before school commissioners. The preparation for entrance to normal schools in the U. S. varies much, ranging from that given in the poorest country school to that furnished by the best city high schools. Under such conditions the German method of training teachers can be much more effective in every way than can that in the U. S., with its broken attendance and great variety in preparation. (4) The supply of learned and skillful teachers in Germany being practically unlimited, and the direction of the normal schools being in the hands of state officials and educational experts, it naturally follows that these schools are supplied with thoroughly efficient corps of instructors; whereas in the U. S., in which no such body of trained teachers exists, and where the administration of the normal schools is intrusted to State boards who concern themselves with business rather than with educational affairs, it is not surprising to find a teaching corps in the normal school which varies as much in preparation and fitness to teach as the student body itself does in scholarship and ability.

The normal schools of the U. S. and Germany are practically agreed as to the need of training-schools in which the students may have an opportunity to observe and practice teaching under criticism and direction. The training department usually covers the field of elementary instruction, sometimes including on the one hand the kindergarten and on the other the high school. In Germany it is common to have one class to represent the ordinary country school. In general the student teacher prepares more trial lessons and teaches less in the practice school than is customary in the U. S. Thus there is in Prussia one trial lesson a week for each student during the second and third years, whereas class-teaching in the training-school is reserved for the last year. In the normal schools of the U. S. it is usual to give the actual conduct of a class in the early part of the second year, but it is less common to have repeated trial lessons under searching criticism, followed by thorough discussion on the part of teachers and students.

The following table exhibits the amount and distribution of professional and academic work that is accomplished in the German normal schools, and will furnish a basis for further comparisons:

SUBJECTS.	HOURS PER WEEK EACH YEAR.			Per cent. of whole.
	First.	Second.	Third.	
I. PEDAGOGICS.				
1. History of education.....	2	5.6
2. Pedagogics (psychology and logic)....	..	2	..	
3. Methods.....	2	
4. Teachers' meetings (for pupil-teachers).....	1	12.8
5. Model lessons by teachers.....	..	1	2	
6. Trial lessons by the pupils.....	..	1	1	
7. Preparation for teaching in training-school.....	1	
8. Teaching in training-school.....	4.6	
9. Observation (con.).....	1.2	

WORK IN GERMAN NORMAL SCHOOLS—CONTINUED.

SUBJECTS.	HOURS PER WEEK EACH YEAR.			Per cent. of whole.
	First.	Second.	Third.	
II. RELIGION.				
1. Biblical history.....	3	2	..	7.7
2. Catechism.....	..	2	..	
3. Hymns.....	1	..	..
4. Exegesis and church history.....	..	..	2	
III. GERMAN.				
1. Grammar.....	1	1	1	11.4
2. Essay and oration.....	1	1	..	
3. Cursive reading.....	1	1	..	
4. Careful reading (detailed study of selections, declamations, and systematic study of classical works).....	2	2	..	
5. History of literature.....	..	..	1	
IV. GENERAL HISTORY.....	2	2	2	5.6
V. MATHEMATICS.				
1. Arithmetic and algebra.....	3	3	1	10.5
2. Geometry.....	2	2	..	
VI. NATURAL SCIENCE.				
1. Natural history.....	2	2	..	9.5
2. Physics.....	2	..	2	
3. Chemistry.....	..	2	..	
VII. GEOGRAPHY.....	2	2	1	4.7
VIII. DRAWING.....	2	2	1	4.7
IX. WRITING.....	2	1	..	2.7
X. GYMNASTICS.....	2	2	2	5.6
XI. MUSIC.				
1. Piano.....	1	1	..	19.2
2. Organ.....	1	1	1	
3. Harmony.....	1	1	1	
4. Violin.....	1	1	1	
5. Elementary singing.....	1	..	..
6. Figurative descent and choral singing.....	2	2	2	
7. History of music.....	..	..	1	
8. Mixed choir singing.....	..	..	1	
Total required.....	37	37	32.1	100.0
XII. FRENCH (optional).....	3	3	2	

It can be seen from the foregoing table that no subject is pursued for less than one year, while many subjects, such as history, geography, drawing, gymnastics, and certain branches of music, are studied throughout the entire three years. Many other subjects are pursued continuously for two years. It is curious to notice that the number of hours per week assigned to any given subject does not exceed two, except for arithmetic and algebra, biblical history, and teaching in the training-school. On the other hand, the normal schools of the U. S. usually pursue whatever subjects they have in hand for four or five recitation periods of forty-five or fifty minutes each per week.

There has been a decided movement in many States of the U. S. for the abolition of all academic instruction in normal schools, the argument being that the State should not have to pay for this, since the academies and high schools profess to impart academic knowledge. It is declared that the high schools should teach the *what* and normal schools the *how*. This movement has resulted in securing perhaps a higher grade of academic instruction, but it has nowhere driven it out of institutions for the training of teachers.

The conditions of admission to normal schools in the U. S. do not greatly vary in the different States, and may be summarized as follows: (1) The candidate must be not less than sixteen years of age; (2) must possess sound health and a good moral character; (3) must be able to pass a satisfactory examination in reading, spelling, writing, arithmetic, and the elements of English grammar, or be a graduate of an accredited high school; (4) must sign a declaration of intention to teach for a certain specified time, usually two or three years, in the common schools of the State. In city normal schools it is often customary to require graduation from the high school as a condition of admission. That the actual instruction in normal schools is not, or at least need not be, so elementary as might be inferred from a study of the curriculum that follows, becomes evident when the age of the average normal student is considered. Answers from twenty-four representative State normal schools show that the average age at graduation is twenty-two years. Since, however, their courses do not exceed three years in length, it is clear that the average entrance age

a seven sixteen and nineteen years. This is the age for beginning serious instruction. The schools just mentioned report that 82 per cent of their students are graduates of high schools, or have had an equivalent preparation.

The State Normal School at Normal, Ill., founded in 1857, may perhaps be regarded as a typical normal school. Its educational aims and methods of work were a direct inheritance from the old Bridgewater, Mass., normal school, and the leaders in the early conduct of the Western school were direct from the Bridgewater normal. The faculty consists of twenty-one persons, twelve men and nine women. The president, John W. Cook, A. M., LL. D., is a graduate of the school. Of the professors, ten are college or university graduates, and two have taken degrees at German universities; of the whole number, ten are graduates of the school itself. The scholarship represented in this faculty is considerably above the average for normal schools in the U. S. One of the weaknesses of these institutions comes to light when it is stated that these twenty-one persons must do all the teaching for 446 normal and 122 high school students, besides spending considerable time with the 382 pupils of the model or training school. This makes an average of seventy students in one instructor; in good colleges and universities there are usually only from ten to twelve students to each teacher.

The training-department of this school consists in reality of three groups of pupils—a grammar school with 165, an intermediate school with 99, and a primary school with 121 pupils each of these schools being in charge of an assistant training teacher. There is, besides, a model high school, in which pupils may prepare for college or study ancient and modern languages, but in which students do not teach to any considerable extent. The academic year is divided into three nearly equal terms, and each normal-school student who completes the course is required to teach under inspection at least four terms in the training-school, giving during the year four total lessons in the presence of instructors and of students in the senior class. In many normal schools there is a different organization of the pupil teaching. Some so arrange the matter that a student may do his practice-teaching for a short period at a time, being in charge, it may be, of all the pupils in a given department for a few weeks.

The curriculum of study is not very different from that of most normal schools in the U. S. having a three years' course. It is as follows, the numerals 1, 2 and 3 indicating the time terms of the year respectively:

STUDIES.	First year.	Second year.	Third year.
Elements of pedagogy	1		
Psychology	2, 3		
Elementary psychology		1	
Practical pedagogy		2, 3	2, 3
Life psychology and flower-plant			1, 2, 3
Didactic teaching			1, 2, 3
Second course of history (2 weeks)			3
Reading and orthography	1, 2		
Reading	1, 2, 3		
Spelling	1, 3		
Grammar		2	
Composition		3	
English and German			1
French	1, 2		
Latin	3		
Geography		2, 3	
Practical & book-keeping			3
Practical	1, 2, 3	1, 2, 3	
Practical	2		
Practical	1, 2		
Practical	3		
Practical		1	
Practical		2	
Practical		3	
Practical			1, 2
Practical			3

In addition to this table a number of optional studies, the Latin, Greek, German, astronomy, advanced mathematics, economics, and science, are offered, but the required work so much fills the programme that there is little time for them. The regular number of periods per week for each study is four and a half and five, elements of pedagogy, drawing, penmanship, and vocal music alone having but two each. This is in sharp contrast with the programme of the German normal schools given above. On the other hand, it will be seen that the amount of time

given to many important studies is sadly inadequate for anything more than the most superficial knowledge. Thus chemistry, botany, physiology, zoology, to say nothing of other branches, receive but one term each. Lack of teaching force prevents any specialization on the sciences. It is difficult to see how much more time can be given to the individual subjects unless their number is reduced, or unless the amount of attention given to the common branches is considerably abridged.

The sharpest contrast between the schools of Germany and the U. S. is in uniformity of excellence. The German system of training teachers insures for every school in the land a high minimum of excellence, since every teacher must demonstrate by examination that he has adequate academic knowledge, and has subjected himself to at least three years of professional preparation. In the U. S. this is by no means the case, for only a small per cent of the teachers have any professional training whatever, while their academic knowledge is gauged by constantly varying standards. The results obtained in Germany from the universal training of teachers should therefore be an ever-present stimulant for educators in the U. S. to extend and perfect their normal schools. CHARLES DE GARMON.

V. THEOLOGICAL SCHOOLS.

Their Rise.—As forms of worship developed, divine oracles required interpretation, or holy men attracted disciples, schools of theology grew up in all civilized nations of antiquity. Thus Egypt had her priestly colleges at Heliopolis, Memphis, Thebes, and Sais; Assyria her prophetic schools at Arslah and Nineveh; Babylonia her seats of sacred learning at Uruk, Kutha, Babel, and Borsippa. The prophetic unions of Hama and Gibeah can scarcely be called schools, but the disciples of Isaiah were students, and the canonizing of religious writings made the *bet ha-midrash*, or "house of instruction," a necessity. The Magi imparted particular instruction in the rites and tenets of Manichæism. The cult of Eleusis called for training, and the Orphic revelation for special study; young men were drawn to Pythagoras and Socrates. Plato, Aristotle, and Zeno largely by their religious interest; the best theology of Greece was expounded in the academy, the lyceum, and the stoæ; and Plotinus, Porphyry, and Proclus made the school of Alexandria a theological seminary.

Like John the Baptist, Jesus gathered about himself disciples whom he taught the way of life and the manner of the kingdom. From his personality, his teaching, and his death the mightiest impulses to theological study, as well as to religious life, have gone forth; but he founded no school of theology. Paul recognized the need of apostles, prophets, and teachers, and chose for his companions young men fit to continue his work; but he established no seminary. The charismatic organization of the Church supplied her for some time with an order of apostolic teachers. As tradition grew in importance, the cult developed, and the ministry of the word was added to the episcopal function, the house of the bishop became a home of Christian training. But it was the maiden efforts of Hellenistic philosophy in the service of the Christian faith that resulted, in the second century, in the first regular schools of Christian theology. Such were the schools of Valentinus in Rome, Carpocrates in Alexandria, Saturninus in Antioch, and Bardesanes in Edessa. A maturer fruit of the same tendency was the school of the catechists at Alexandria, founded by Pantenus in 190 and brought to its highest efficiency by Clement and Origen, where candidates for the ministry as well as catechumens received instruction. In 231 Origen opened a school in Caesarea. Of greater importance was the school of Antioch established by Lucian about 300, where Chrysostom and Theodoret of Mopsoesta taught. From 363 to 489 the school of the Persians at Edessa was the great center of Christian learning, and there was a flourishing school at Nisibis in the sixth century. The clergy of the Occident, as a rule, studied in the schools of the rhetoricians, so highly praised by Augustine. Besides the ordinary catechetical instruction, ministerial candidates often enjoyed special episcopal training. After Constantine's conversion the school of the Patriarchium at Rome attracted many students. The closing of the University of Athens in 529 really signified the inability of the pagan schools to furnish any longer the culture needed for theological study. In the same year Benedict of Nursia opened his monastery on Monte Cassino, and in 535 Cassiodorus introduced *trivium*, *quadrivium*, and theology in a cloister school at Vivaria.

Monastic schools had already been established by Cassian

at Marseilles, by Martin at Marmontier, and by Honoratus on the Leryns, about 400. The schools of Armagh, Aran, and Clonard in Ireland, Whithorne, Lantwit, and Llan Elwy in England, may have been founded in the fifth century, and the school of theology at Constantinople owed its origin in the seventh to an independent movement; but it was the Benedictine order and discipline that gave lasting fame to the foundations of Columban at Luxeuil, St.-Gall, and Bobbio, and efficiency to the great schools of Bangor, Iona, Lindisfarne, Canterbury, and York. The *regula* of Chrodegang of Metz (754), made binding on the entire Church in Aachen in 814, provided for an episcopal school at each cathedral. Both episcopal and monastic schools received enthusiastic support by Charlemagne. His palace school, where Alcuin and Erigena taught, set an example followed not only by Tours and Fulda, Corvey and Ferrières, but also by the cathedral schools of Orleans and Rheims. The tenth century marks the ascendancy of Liège, the eleventh that of Le Bec. In this Norman cloister Lanfranc and Anselm laid the foundations of scholasticism, and their influence was quickly felt in Chartres and Rouen, in Glastonbury and Oxford. The mendicant friars brought the heritage of Le Bec to the new centers of learning.

University Schools.—From the thirteenth century theological schools began to be connected with the universities. The *studium generale* rarely had its origin in an episcopal school, never in a monastery. Of the forty-six universities founded before 1400, twenty-eight had at the outset no theological faculty, having generally grown out of city schools, medical schools, or law schools. Among the other eighteen many were new creations and some sprang from private schools like that of Abelard. But the Franciscans and the Dominicans, besides founding their own colleges, gradually secured generous representation on the theological faculties. Probably no other school of theology ever enjoyed the prestige of the Collège de Sorbonne. The theological course at Paris (twelfth century) was open only to masters of arts and covered ten years, five for the baccalaureate and five for the licentiate. The student began with a biblical course familiarizing him with the literal, tropical, allegorical, and anagogic interpretations. This was followed by dogmatics based on Lombard's sentences. Instruction was given by lectures, repetitions in the colleges, and disputations. Substantially the same rules prevailed in all mediæval universities. In advance of Cambridge (twelfth century), and next to Paris in importance, was Oxford (twelfth century). Toulouse was founded in 1229, Coimbra in 1291, Salamanca in 1355, and Valladolid in 1418. Bologna had no theological faculty until 1362; but Rome (1303), Pisa (1343), Florence (1349), and Padua (1363) taught theology at the beginning. Prague (1347) was the first German university. Then followed Vienna (1365), Erfurt (1379), Heidelberg (1385), Cologne (1388), Leipzig (1409), Rostock (1419), Freiburg (1457), Tübingen (1477), and Mayence (1477). Geneva had a university in 1368 and Basel in 1460, Upsala in 1477 and Copenhagen in 1479. Famous Louvain (1431) reflected the wisdom of the *fratres docti*.

Modern Catholic Schools.—The Renaissance inaugurated a new era. Classical antiquity returned, the Semitic world drew nearer, the physical universe expanded and attracted minds emancipated by nominalism, and the religious life demanded greater earnestness and freedom. The intellectual forces of the modern world began to operate. But the renaissance influence has been felt in varying degrees in different parts of Christendom. While the Romance and Teutonic nations claimed the heritage of Byzantium, the Slavs, so long under her tutelage, had not yet reached their majority. But the Orthodox Church, by nurturing national life and letters, has proved a faithful tutor in Russia, Servia, and Bulgaria, not less than in Roumania and Greece, and these nations are making rapid progress. The religious academies of St. Petersburg, Moscow, Kiev, and Kasan may not be consciously affected by Occidental thought, but they are flourishing institutions, and especially devote praiseworthy attention to non-Christian religions and to missionary history. The universities of Bucharest (1869) and Czernowitz (1876), as well as that of Athens (1837), have theological faculties.

The Roman Catholic Church owes it largely to a new order of theological schools that her influence, still so marked in the Romance nations, has survived the Renaissance. By the establishment of colleges, at the universities or independently, embodying Sturm's humanistic and their own religious principles, Loyola and his successors sought

to meet the demands of the age for spiritual earnestness, classical learning, and biblical erudition. Few schools have attained the efficiency of the Collegium Romanum (1550). The *studia superiora* comprised four years of philosophy, three years of positive or biblical theology and dogmatics based on Thomas Aquinas, and three years of casuistry. Other famous colleges were the Germanicum (1552), the Anglicanum (1580), the Claramontanum at Paris (1562), and those of Pont à Mousson (1572) and Dijon (1581). Clerical seminaries were also established at Rome (1585), at Milan (1572), and elsewhere by Borromeo, and subsequently in every Roman Catholic country. Had the searching criticisms of the Port Royalists been heeded, the Society of Jesus might have been saved from spiritual decay and loss of power. When, in 1773, Clement XIV. dissolved the order, it had 669 colleges and 176 seminaries, and controlled 80 theological faculties; but its moral influence was so shattered that not even the restoration of 1814 could rehabilitate it. Its system of education still survives, but scarcely to the profit of the Church. To this day Italy depends upon her 217 seminaries, no Italian university having a theological faculty. Spain is equally dependent, and though Coimbra teaches theology Portugal has many seminaries. France is better provided, with her Roman Catholic faculties at Paris, Lille, Lyon, and Toulouse. At Vienna, Salzburg, Budapest, Cracow, Innsbruck, Agram, and Gratz Roman Catholic theology is taught, and Prague has both a Czech and a German faculty, but there are forty-three seminaries besides in Austria. Freiburg (1457), Munich (1826), Münster (1773), Würzburg (1582), Bonn (1818), Breslau (1702), and Tübingen have Roman Catholic faculties. Besides Louvain, Belgium has sixteen seminaries. Since 1854 Ireland has had a Roman Catholic university at Dublin. England has twenty-seven Roman Catholic seminaries.

German Protestant Schools.—In the independent Teutonic churches the Renaissance bore richer fruits. The influence of Luther was strongly felt in the universities already leavened with humanism, and there the study of Lutheran theology remained in touch with other departments of learning. Luther's suggestions were nobly carried out by Melancthon. Under his presidency Wittenberg (1522) became a great center, and other universities modeled their instruction after it, as Marburg (1529), Tübingen (1536), Leipzig (1539), Königsberg (1544), Greifswald (1545), Rostock (1563), Heidelberg (1551), and Jena (1558). The change involved an extension of the biblical course, interpretation of the Hebrew and Greek texts of the Scriptures, and greater attention to Augustine. The theological faculty became an arbiter in doctrinal matters. In the period of orthodoxy occasioned by this arrangement, Giessen was founded in 1607 and Kiel in 1665. Metaphysics had crowded Bible study and personal piety into the background, when Spener and Francke made their plea for faithful exegesis and living experience, and embodied their ideas in the University of Halle (1694) and the *seminarium ministerii ecclesiastici* (1714). The indifference of pietism to theology as a science undermined orthodoxy and paved the way for rationalism. In the opposition against supernaturalism Göttingen (1737) became a leader. Kant's *Critique* made this conflict meaningless by a higher synthesis, but the new theological development started with Schleiermacher's and Hegel's teaching at Berlin (1810). To their influence the still dominant tendencies emanating from Baur in Tübingen, Reuss in Strassburg, and Ritschl in Bonn are largely traceable. Scientific methods prevail in the biblical departments and find increasing application in Church history, dogmatics, and practical theology. The professors in the seventeen evangelical faculties are free to present their own views and to modify them as research demands. Their lectures are the prominent feature. Disputations are seldom held. Seminars and theses try the student's strength. A triennium leads to the doctorate in philosophy, three additional years suffice for the licentiate. The doctorate in theology is conferred either *rite* or *honoris causa*, the recipient recognizing the honor by dedicating a work to the faculty. The annual average of doctors of divinity made in all Germany is forty.

Other European Schools.—The Universities of Upsala and Lund (1668), Christiania (1813), Copenhagen, Helsingfors (1827), and Dorpat (1832) supply the clerical needs of Sweden, Norway, Denmark, Finland, and Lutheran Russia. Preachers' seminaries have also been established by the Moravians at Gnadefeld and Nisky, the Baptists at Hamburg and Stockholm, the Methodists at Frankfort and Upsala, and the Congregationalists at Christinehamn. In

relationship between the state schools, these seminaries emphasize more strongly personal piety.

France was a humorist, Deza brought the new learning to Lausanne (1529), and Calvin had studied with Sturm in regular lecture founding at Geneva his college (1568) and theological academy (1606). Calvin's new theology and scholarly example made the academy a center of French Protestantism. Like Lausanne it has maintained itself through the centuries, while Nemišal and Fribourg are of modern growth. A reaction against these ideas has called forth theological schools unsupported by the state in Lyons, Louviers, and Nemišal. Similarly Basel, Bern (1628), and Zurich (1802) have theological faculties, and each says also a free seminary. French Protestant seminaries were established at Nîmes (1691), Nismes (1699), Montauban (1700), and Sedan (1704), but the expatriation of the Huguenots left only Montauban, which has been connected with the Academy of Toulouse. In 1877 the seminar of Nismes (1802) was removed to Paris and incorporated in the university. All these schools are open to bachelors of arts who may graduate as bachelors of divinity after three years and as licentiates after four, upon presenting an *opuscule* and a thesis. *L'École des Hautes Études* (1888) also has a section for theology with excellent equipment for the study of comparative religion. In Holland Leyden (1575) became the representative of Arminianism, which in 1614 and Utrecht (1634) expounded Calvinism. Rationalism in the eighteenth century destroyed these landmarks, and Groningen, Utrecht, and Amsterdam (1877) are now making valuable contributions to theological science. The Dutch universities of St. Andrews (1411), Aberdeen (1494), and Glasgow (1511) have remained more faithful to Calvinism, while Edinburgh (1858) is at present liberal. Each has four divinity professors. Masters of arts may gain the bachelor's degree in three years. Six theses and a thesis are required. At St. Andrews bachelors of divinity may obtain the doctorate after eighteen months, presenting a thesis; elsewhere it is conferred three years' lecture. The Free Church has three divinity seats at Edinburgh, Aberdeen, and Glasgow, and the United Presbyterian one each at Edinburgh. Four years' attendance is required, but the course is identical with that at the universities.

In the English universities Cambridge was first affected by the humanism, and under the influence of Puritanism, Calvinism, and rationalism, has steadily advanced, while conservative Oxford was aroused from long lethargy by the Oxford movement. At present both offer excellent opportunities for theological study. Masters of arts may become bachelors of divinity in three years and doctors after two additional years. Durham (1852) admits bachelors of arts and others to theological study. Besides these, the Church of England has 21 theological schools, the Methodists have 10, the Congregationalists 11, the Baptists 8, the Presbyterians 2, the Unitarians 1, and the Jews 1. Two are independent.

Schools in North America.—Canada long depended upon the mother country, but in the nineteenth century the immigrants have established 2 theological schools at Toronto the Presbyterians 2 at Montreal, Toronto, and Quebec the Methodists 2 at Montreal and Toronto, the Baptists 1 at Toronto and the Congregationalists 1 at Montreal.

The English, Dutch, Swedish, and French colonies in America in the seventeenth century were at first served by ministers educated at Cambridge or Utrecht, Upsala or Bologna. New England began to supply her own needs by establishing Harvard (1636) with a professorship of divinity. William and Mary (1693) probably did similar service for Virginia. In 1740 a professor of divinity was appointed at Yale (1701), but the Dutch Reformed Church owned the first theological school, at New Brunswick, N. J. (1784). The example was followed by the Roman Catholics at Baltimore (1791), the United Presbyterians at Xenia, O. (1792), the Methodists at Bethlehem, Pa. (1807), the Congregationalists at Andover (1807), the Presbyterians at Princeton (1811), the Lutherans at Hartwick (1815), the Unitarians at Cambridge (1817), and the Baptists at Hamilton (1819). Since 1820 36 seminaries had been established. After the Civil War the emancipated race and the settled West caused much activity. The commissioners report 161 theological schools; 25 of these have scarcely any existence, 25 are in training, 19 are Roman Catholic seminaries, and 1 is a Jewish school. The remainder 74 belong to 10 Protestant denominations, the most prominent being Baptist: Colgate

(1819), Newton (1823), Rochester (1831), Louisville (1836), Chicago (1867), Oberlin (1869), Congregationalist: Andover (1809), Bangor (1816), Yale (1822), Hartford (1834), Union (1863), Chicago (1868), Pacific (1869); Episcopalian: New York (1820), Virginia (1820), Berkeley (1854), Philadelphia (1897), Cambridge (1897); Lutheran: Gettysburg (1820), Concordia (1826), Augustana (1860), Philadelphia (1864), Methodist: Boston (1847), Hartford (1867), Drew (1867), Vanderbilt (1871); Presbyterian: Princeton (1812), Auburn (1820), Union, Va. (1824), Columbia, S. C. (1828), Lane (1832), Union (1833), Chicago (1839), Dutch Reformed: New Brunswick (1834), German Reformed: Lancaster (1825) and Heidelberg (1831); Unitarian: Harvard (1817) and Mountville (1846); Universalist: Tufts (1860). Sixteen states have no theological school. No state university teaches theology; of the ten leading ecclesiastical universities Harvard, Yale, Princeton, Colgate, and Northwestern have theological faculties; of the privately endowed, Boston, Vanderbilt, and Chicago. These and many independent schools admit only bachelors of arts to the regular course, and confer the bachelors of divinity after a triennium. The anomaly exists that over 300 institutions, not universities and without a theological faculty, can confer degrees of divinity, while only a few theological schools have the right even of nomination. No American theologian has formed a school of thought, but the conservatism of Princeton, the "new theology" of Andover, and the more advanced position of Harvard have exerted a wide influence. The revival of Scriptural learning, the introduction of scientific methods, the decline of sectarian teaching, the missionary zeal, the close contact with Church life, the high moral tone and the warm piety characterizing the North American schools give promise of rich and independent work in theology.

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NATHANIEL SCHMIDT.

VI. MEDICAL SCHOOLS.

1. *In the United States.*—In the earlier history of North America physicians generally received their medical training from preceptors, in whose offices they served an apprenticeship of seven years in the practical branches, receiving at the same time instruction as students and studying such cases of disease as developed in the daily practice of their preceptors. In rare instances these studies were supplemented by a trip to Edinburgh, London, or Paris, and less frequently to Holland or Italy. In some country districts the physician was also the churchman. Frequently he was engaged in tilling the soil.

Dr. Thomas Cadwallader, of Philadelphia, who had studied anatomy under Cheselden, gave anatomical demonstrations

to the physicians of Philadelphia prior to 1751, and Dr. Hunter, of Newport, R. I., gave anatomical demonstrations in 1754-56. Dr. William Shippen, Jr., of Philadelphia, gave a course in anatomy to twelve students in 1762. These were all private enterprises. The first regularly organized school of medicine was the College of Philadelphia, which was founded by Dr. William Shippen, Jr., and Dr. John Morgan at the suggestion of Dr. John Fothergill, of London, in 1765. Dr. Morgan was appointed to the chair of Medicine in May, 1765, and Dr. Shippen to the chair of Surgery in September of the same year. The first course of lectures was given in Nov., 1765, and continued annually thereafter. The College of Philadelphia subsequently became the University of Pennsylvania.

The requirements for the degree of bachelor of medicine were: (1) A satisfactory knowledge of Latin, mathematics, natural and experimental philosophy; (2) one course of lectures in anatomy, materia medica, chemistry, theory and practice of physic and clinical lectures, and one year's attendance on the practice of the Pennsylvania Hospital and a public examination; (3) apprenticeship to a reputable physician.

The requirements for the degree of M. D. were: The candidate, being twenty-four years of age, and a bachelor of medicine of three years' standing, must present and defend an original thesis. The degree of M. B. was first conferred in 1768, and of M. D. in 1771.

The second medical school in North America was founded in New York in 1787 in connection with King's (now Columbia) College by Dr. Samuel Bard and Dr. Peter Middleton. The degree of M. B. was first conferred in 1769, and of M. D. in 1770. It was broken up by the Revolutionary war, but was reorganized in 1792 and merged with the College of Physicians and Surgeons in 1807. The third medical school was founded in connection with Harvard College in 1783, the fourth in connection with Dartmouth College in 1798, the fifth was the Maryland College of Medicine in Baltimore (now the University of Maryland), founded in 1807, and the sixth at Yale College in 1813.

From this date the growth of medical colleges was rapid, until almost every large city possessed one or more. Many, like those at Castleton, Vt., Berkshire, Mass., and Fairfield, N. Y., were established in small country towns independently of any institutions of learning or hospital facilities, and gave purely theoretical instruction by lectures, the effect being to lower the standard of medical education. In some schools a single course of lectures was exacted prior to graduation; in others two courses of four months each; in the vast majority two courses of not more than six months each; and in comparatively few colleges three courses of lectures. Since 1890 a movement to lengthen the number of courses to three, and in some cases to four, has gained strength, to the great advantage of medical education.

Requirements for Admission to Medical Colleges.—Prior to 1892 no uniform requirements for admission to medical colleges existed in the U. S. In 1892 the Association of American Medical Colleges established the following standard: (1) Ability to write an English composition of not less than 200 words. (2) To translate simple Latin prose. (3) A knowledge of algebra or higher arithmetic. (4) Elementary physics.

The regents in the State of New York require that all applicants for admission to medical schools must file a certificate showing:

(A) That they hold a degree of bachelor or master of arts, of bachelor or master of science, or of bachelor or doctor of philosophy; or, (B) That during or prior to the student's first year of medical study he has passed an examination conducted under the regents of the University of the State of New York, or by the faculty of a medical school or college in accordance with the standard and rules of the said regents, in arithmetic, grammar, geography, orthography, American history, English composition, and the elements of natural philosophy; or, (C) That he possesses one or more of the following equivalents:

(a) A certificate of having successfully completed a full year's course of study in any college or university under the supervision of the regents of the university, or registered by them as maintaining a satisfactory standard. (b) A certificate of having satisfactorily completed a three years' course in any institution subject to the visitation of the regents, or registered by them as maintaining a satisfactory academic standard. (c) A certificate of having passed the examination preliminary to the study of medicine, required

by the present medical act of Canada. (d) A certificate of having passed the matriculation examinations of any university in Great Britain or Ireland. (e) A regent's diploma. (f) Regents' pass-cards for any twenty counts not including reading and writing.

Many medical colleges in the South and West do not exact even these modest requirements.

A few medical schools require more, e. g. the University of Michigan, which requires an elementary knowledge of English, mathematics, including arithmetic, algebra and plain geometry, physics, botany, zoölogy, physiology, history, and Latin prose.

The requirements of Harvard Medical School are: English, Latin, physics, chemistry, and any one of the following: French, German, algebra, plane geometry, or botany.

The Johns Hopkins Medical School, at Baltimore, Md., requires: (1) An ability to pass the matriculation examination to enter any undergraduate course at the Johns Hopkins University; (2) a reading knowledge of French and German; (3) a knowledge of minor courses in physics (at least five class-room exercises and three hours' laboratory work each week for one year constituting a minor course), chemistry (five class-room exercises and five hours' laboratory work each week for one year), and biology (five class-room exercises and five hours' laboratory work each week for one year, or the degree of A. B. in the chemical-biological course of the university).

Courses of Study.—The best medical courses are graded and cover a period of four years. In the most advanced schools the first two years are spent in the study of anatomy, embryology, physiology, histology, bacteriology, pathology, physiological chemistry, and pharmacology; the third year is devoted to the study of medicine, surgery, gynecology, and obstetrics, and the fourth year to clinical work and special branches of medical practice. In the first two years laboratory work occupies a prominent place, and recitations and seminary conferences are held rather than formal didactic lectures.

Many schools have three courses of lectures which practically cover identical subjects, but this method of instruction is no longer popular, and laboratory work and graded recitations are fast taking the place of didactic lectures.

Medical educators differ as to the advisability of requiring a degree in arts or sciences preliminary to the study of medicine, and many are of the opinion that the majority of young men can not afford to sacrifice the time needed to secure a degree before commencing a course of medical study proper, extending over a period of at least four years. They prefer the arrangement of studies existing at Cambridge, England, whereby the last two years of study for the degree of B. A. constitute the first two years of medical study leading up to the degree of M. D. at the end of three years thereafter, thus practically giving a medical course of five years.

Requirements for Degree of M. D.—The requirements for this degree vary materially. In some schools in the U. S. the degree is conferred after three years of medical study and an attendance upon two courses of lectures. The majority of the medical schools since 1892 have required three courses of lectures. The leading schools require four courses of lectures and practical work in laboratories.

Number of Schools.—In 1891 there were 95 regular, 9 eclectic, 14 homœopathic, 2 physio-medical colleges, and 9 post-graduate schools of medicine, with 18,160 students and 4,931 graduates receiving the degree of M. D.

II. **Canada.**—There are 12 medical schools in Canada. The requirements for admission are English, arithmetic, algebra, geometry, Latin, and Greek, French, German, or natural philosophy.

Courses of study extend over four years. During the first and second years, anatomy, physiology, histology, chemical physics, general chemistry, materia medica and therapeutics, toxicology, and botany. During the third and fourth years, theory and practice of medicine, including medical pathology; principles and practice of surgery, including surgical pathology; clinical medicine, clinical surgery, midwifery, diseases of women and children, medical jurisprudence, and sanitary science.

In Quebec the requirements for admission to the medical schools are nearly equal to the medium requirements for admission to the schools of Great Britain.

III. **Great Britain.**—**Requirements for Admission.**—**Minimum.**—English, Latin, mathematics, including algebra and geometry, elementary mechanics, and one of the following optional subjects: Greek, French, German, Italian, or

any modern language, logic, botany, zoology, elementary geometry.

Subjects.—Latin, Greek, French, German, Sanskrit or Latin, English language, history and geography, mathematics, mechanics, sciences—some of the following: chemistry, heat and light, magnetism and electricity, botany.

Matriculation.—Latin, translation of selected and non-selected authors, grammar, and short passages to be translated into Latin; Roman history; Greek grammar and translation from a selected author; English language, composition, literature and history; French or German grammar, and translation into English; mathematics—arithmetic, algebra in the theory of indices and logarithms; geometry, plane and solid, with the elements of co-ordinate geometry; trigonometry. This is equivalent to the examination for the B. A. degree in Oxford, Cambridge, and London.

The courses of study occupy at least five years. After leaving the regular courses the students spend several years in the London hospitals.

U. Germany.—The applicant for admission must present a certificate of having successfully passed the final examination of two gymnasial courses. Eight semesters must be devoted to medical study. The first four are devoted exclusively to physics, chemistry, zoology, botany, mineralogy, anatomy, and physiology. The purely medical studies begin with the fifth semester, and must be pursued for two years.

France.—The applicant for admission must possess the "diplôme de bachelier de lettres" and the "diplôme de docteur de sciences naturelles," which are equivalent to B. Sc. of London University, with considerable knowledge of chemistry, zoology, botany, geology, and astronomy added.

Courses of Study.—These must be pursued at one of the six medical faculties of France, viz., Paris, Montpellier, Nancy, Lille, Lyons, and Bordeaux, and must cover four years.

First year: Physics, chemistry, anatomy and dissection, natural history, physiology, and histology; second year, anatomy and dissection, histology, general pathology, surgical pathology and clinical physiology, medical pathology; third year, dissection, surgical pathology and clinical, medical pathology and clinical, operations and apparatus, gynecology; fourth year, dissection, surgical pathology and surgery, medical propædæutics, pathological anatomy, materia medica and therapeutics, hygiene, and gynecology.

VI. Italy.—Requirements for Admission.—Latin, mathematics including algebra, geometry, plane trigonometry and mensurations, mechanics, elementary physics, chemistry, and natural history.

Courses of Study.—Medical studies are to be pursued at various of the twenty universities of Italy. The course is six years. There are no rules as to sequence of studies, but the following order is generally observed: First year, zoology, botany, inorganic chemistry; second year, physics, organic chemistry, comparative anatomy; third year, anatomy, physiology; fourth year, general pathology and pathological anatomy; fifth year, special pathology and surgery and clinical, topographical anatomy, operative surgery; sixth year, medical and surgical clinic, hygiene and medical jurisprudence, ophthalmology, electricity.

VII. Sweden.—The applicant for admission must present a *Maturitetscertifikat* from the gymnasium. The courses of study must be pursued at Upsala or Lund, or the Medical Academy of Stockholm. The period of study is ten years. The first three years are spent in preliminary studies. Three years are then spent in the study of anatomy, physiology, physiological chemistry, general pathology, pathological anatomy, and pharmacology. Two years are spent in the study of practical medicine, practical surgery, ophthalmology, dermatology, and forensic medicine. In addition there are eight months in a medical and surgical clinic, four months in an obstetrical clinic, and two months in a psychiatric clinic.

Number of Schools.—The following is a summary of the medical schools of Europe: Belgium, 4; Denmark, 1; Germany, 20; France, 6; Great Britain, Scotland, and Ireland, 20; Italy, 20; Netherlands, 4; Austria-Hungary, 6; Norway and Sweden, 4; Portugal, 1; Russia, 7; Switzerland, 5; Spain, 1—total, 117.

HENRY M. HURN.

VIII. LAW SCHOOLS.

A Continental Europe.—With the revival of interest in Roman law, students flocked to the medieval universities, mainly in Bologna and Paris; and in countries where the spirit of law is essentially Roman the tradition of obtain-

ing one's legal education at a university is still maintained. Indeed, upon the continent of Europe a university law school is the only avenue to the legal profession. In Germany, for example, the course for one aiming at a legal career is plainly defined. He must first complete the curriculum of a gymnasium; he must then study law for three years at a university and pass an examination at the end of the course; after this theoretical study he must, if he means to be a judge or an advocate, give three years to the "service of practical preparation." Then, upon passing a second state examination, he may expect an appointment as an inferior judge when a vacancy occurs, or, if he prefers to practice, he may be admitted to the body of advocates. One wishing to be a law-professor dispenses with the three years of practical work, and seeks first, by passing a special examination, the position of privat docent. His subsequent promotion to assistant professor and professor will depend wholly upon his ability and success as a private lecturer, for the ranks of the law-professors are recruited, not from judges and successful practitioners, but exclusively from those who have won their spurs as younger teachers. What is true of Germany is, in the main, true of the other continental countries.

In England.—The history of legal education in England has been widely different. The English law was not Romanized and English lawyers were not bred at Oxford or Cambridge. Since the fourteenth century legal education has been in the hands of the four Inns of Court, Lincoln's Inn, Gray's Inn, the Inner Temple, and the Middle Temple. These, with the ten dependent Chancery Inns, have been called by Fortescue and Coke a legal university. In the days of these writers the term was not inapt. The membership of the Inns of Court was made up of students, barristers, readers, and benchers. A student after eight years was admitted to the degree of barrister. From the barristers of longest standing were chosen annually two readers, each of whom was to give a dozen readings or lectures to the members of the Inn, and to preside at meetings. The readers after performing these duties became benchers or governors of the Inn. The two courses of readings were delivered in vacation, and each reading with the discussion that followed between the reader and some of the barristers occupied the morning hours. In term-time the members of the Inns would naturally be engaged in the forenoon in court. Both in term-time and vacation much time was given after dinner and after supper to bolting, i. e. conversational arguments upon cases put to the students by a bencher and two barristers sitting as judges in private, and to meetings, which were public arguments by barristers before the benchers. This continued discussion of points of law could not fail to develop legal acumen and the art of ready speaking. But the readings and the discussions came in time to be regarded as too great a burden. They were at first shortened and finally, in the latter half of the seventeenth century, given up altogether. Membership in an Inn of Court for three years became the sole requisite for a call to the bar. A legal education being no longer obtainable in the Inns of Court, students of law turned to private reading, supplemented at first by experience in attorneys' offices; but after Lord Mansfield's time the chambers of special pleaders, conveyancers, or equity draughtsmen were resorted to instead of attorneys' offices. Since the middle of the nineteenth century attempts have been made to convert the Inns of Court into a genuine law school, but thus far with very little success. Annual courses of lectures on five subjects have been introduced, upon four of which students must pass examinations before being called to the bar. The attendance at these lectures is not large. At Oxford and Cambridge there are courses both in Roman and English law, but the attendance is small. Another generation may see the establishment of a true law school, but private study and the attendance at the chambers of a barrister are still the normal mode of learning law in England.

In the United States.—This same method was naturally adopted so far as practicable by the English colonists in North America; but the English distinction between the upper and the lower branches of the legal profession was not followed, the law-work of the barrister and the business of the attorney being united in the same person. For this reason the office of a lawyer in the U. S., regarded as a place for legal training, was distinctly inferior to the chambers of the English barrister. It is doubtless a source of the inadequacy of a law office to give a satisfactory legal education that is due the early origin and later widespread success of the

American law school. It is claimed that the earliest law school in the U. S. was at the College of William and Mary in Virginia. Chancellor Wythe was certainly appointed Professor of Law in that college in 1779; but it may be doubted if a law school, in the proper sense of the term, existed there at that time. Be this as it may, the famous school at Litchfield, Conn., may justly be regarded as the parent of law schools in the U. S. This school was established by the Hon. Tapping Reeve in 1782. The Hon. James Gould was associated with him in 1798, and after Judge Reeve's retirement in 1820 remained in charge of the school until its discontinuance in 1833. This school was eminently successful in attracting a high class of students from all parts of the U. S., the average attendance being about twenty-five a year. The course, with two months' vacation, occupied fourteen months. The instruction was by lectures, thrown into the form of legal treatises, specimens of which may still be seen in *Reeve's Domestic Relations* and *Gould's Pleading*.

Mention should be made of sporadic and ephemeral courses of lectures delivered by Judge James Wilson at the College of Philadelphia in 1791 and 1792, by James Kent, Esq., afterward Chancellor Kent, at Columbia College, New York, in 1797, and by Prof. Stearns at Harvard College from 1815 to 1817. But it is still true that the Litchfield school was for many years without a rival, the Harvard Law School, the oldest of all existing law schools, not being established until 1817. The first dozen years of this new school were full of discouragement. Most of those who desired a law-school education still resorted to Litchfield, or, during the years 1823-29, to another successful private school at Northampton, Mass., conducted by Judge Samuel Howe and John Hooker Ashmun. The prosperity of the Harvard school dates from its reorganization in 1829 when Judge Story and Mr. Ashmun were appointed professors. In 1833, when the Litchfield school was given up, there were law schools at Harvard, University of Maryland, Yale, University of Virginia, Cincinnati College, and at Transylvania University, Kentucky, with less than 150 students in all. There were two new schools in the next decade, at Dickinson College, Pennsylvania, and at the University of Indiana. Five more were established between the years 1846 and 1850. In 1860 the number of law schools had risen to twenty-two, with a total attendance in that year of about 1,000 students. The following table gives the law schools existing in the U. S., with the date of their foundation, the length of the course, and the number of students in the academic year 1893-94:

NAME OF LAW SCHOOLS.	Date of establishment.	Length of course, years.	Number of students in 1893-94.
Harvard.....	1817	3	353
University of Maryland.....	1822	3	146
Yale.....	1824	2*	188
University of Virginia.....	1826	2	139
Cincinnati.....	1833	2	158
Dickinson.....	1836	2	56
University of Indiana.....	1842	2	66
University of Louisville.....	1846	2	47
University of North Carolina.....	1846	2	66
Tulane.....	1847	2	75
Cumberland.....	1847	1	74
Washington and Lee.....	1849	1	62
University of Pennsylvania.....	1850	3	228
Albany.....	1851	1	43
De Pauw.....	1855	2	37
University of Mississippi.....	1855	2	20
Columbia.....	1858	3	270
University of the City of New York.....	1858	2	251
University of Georgia.....	1859	1	21
Northwestern.....	1859	3*	139
University of Michigan.....	1859	2	607
M'Kendree.....	1860	2	27
Columbian.....	1865	2	228
University of Kentucky.....	1865	2	6
University of South Carolina.....	1866	2	24
St. Louis.....	1867	2	116
University of Iowa.....	1868	3*	200
University of Wisconsin.....	1868	2	169
Howard.....	1869	2	48
University of Notre Dame.....	1869	2	43
Georgetown.....	1870	2	267
Richmond.....	1870	1	28
Boston.....	1872	3	256
University of Missouri.....	1872	2	77
University of Alabama.....	1873	2	11
Illinois Wesleyan.....	1874	2	55
Mercer.....	1875	1	14
Vanderbilt.....	1875	2	30
Hastings.....	1878	3	140
University of Kansas.....	1878	2	82
University of West Virginia.....	1878	2	47

* Prior to 1895-96 the course was two years.

LAW SCHOOLS IN THE UNITED STATES—CONTINUED.

NAME OF LAW SCHOOLS.	Date of establishment.	Length of course, years.	Number of students in 1893-94.
National University.....	1879	2	96
Northern Indiana Normal School.....	1879	2	121
Central Tennessee.....	1879	2	19
Chaddock.....	1880	2	8
Allen.....	1882	2	1
Iowa College of Law.....	1883	2	61
University of Texas.....	1883	2	161
National Normal.....	1884	2	22
Willamette.....	1884	2	5
University of Oregon.....	1885	2	72
Emory.....	1886	1	1
Buffalo.....	1887	2	50
Cornell.....	1887	3*	258
University of Minnesota.....	1888	2	300
Shaw.....	1888	3	10
University of Tennessee.....	1888	2	19
Lake Forest.....	1889	2	479
Arkansas Industrial.....	1890	2	31
Sioux City.....	1890	2	14
Atlanta.....	1891	2	17
University of Nebraska.....	1891	2	53
Metropolis.....	1891	3	162
New York.....	1891	2	47
Ohio State University.....	1891	3	72
Detroit College of Law.....	1891	2	65
University of Colorado.....	1892	2	28
Denver.....	1892	2	67
Kent.....	1892	2	163
Western Reserve.....	1892	3	34
Leland Stanford Junior.....	1893	3	65
University of the South.....	1893	1	11
Centre College.....	1894	2	1
Wake Forest.....	1894	2	1
American Temperance University.....	1894	2	1
Total, 75 schools.....			7,844

* Prior to 1895-96 the course was two years.

Fifty-three law schools have been organized since the civil war—seventeen in the period 1890-95. There were 3,806 students in law schools in 1888-89, and 7,804 in 1893-94. This shows the rapidly growing conviction that a legal education is best acquired in a law school. It is noticeable also that at only eight of the seventy-five schools is the course limited to a single year. In eleven the course extends over two years. It is highly probable that in a few years a majority of the schools will have the three years' course. Furthermore, but seven of the seventy-five schools are university schools. The significant feature of legal education in the U. S. will be seen, is the wide departure from English traditions in favor of study with a practicing lawyer and the closer approximation to the continental principle of university legal training. This result has been reached not by imitation of continental methods, but by an independent development. There are still important differences. Upon the continent of Europe the student's attendance at the university law school is compulsory, while in the U. S. it is optional. In continental countries a collegiate education is a prerequisite to admission to the law school. In the U. S. the great majority of law students have no academic degree, and the standard of admission requirements is lamentably low, although gradually rising. The Harvard Law School, indeed, after the academic year 1895-96 will, with rare exceptions, give the degree of LL. B. only to college graduates.

Methods of Instruction.—There is, as yet, no consensus of opinion as to the best mode of teaching law in a law school. In the European universities the professors teach almost wholly by lectures, but the *seminar* courses, in which the students and the professor discuss the original authorities, are growing in favor. In American law schools, also, in early days the instruction was generally given in the form of lectures, but since the multiplication of legal treatises the lecture method has been largely superseded by the recitation method. The student reads a certain number of pages of a given text-book, upon which he is catechised in the classroom by the professor, who also expounds and criticises the treatise. In 1870 the inductive and genetic method, which is almost universally adopted in the teaching of other sciences, was for the first time used in the teaching of law. To Prof. Langdell, dean of the Harvard Law School, belongs the honor of this innovation. The chief merit of the new system lies in its development of the habit of intellectual self-reliance. The text-books used contain, instead of treatise or commentary upon the original sources, but the original sources themselves, being collections of cases and arranged as to show the historical development of legal principles.

case. These cases are subjected to the classroom in a theoretical and systematic way to the students, who are made what is so far as possible, that they and the instructor are both made subject to the common pursuit of scientific truth. In a word, the students apply to the questions concerned arising in the orderly development of a branch of science the same method which is employed by a successful scientist in solving the heterogeneous questions arising in professional life. The inductive method, as we all know, is not infrequently called, the case method, of which it has been adopted by all of Dean Langdell's disciples at the Harvard Law School. It is also the exclusive prevailing mode of instruction at the law schools of Columbia College, Northwestern University, Western Reserve University, and at the Metropolitan Law School, and has also been adopted in one or more courses at the following law schools: Cornell, Leland Stanford Junior, University of Illinois, Columbia, University of Iowa, University of Wisconsin, University of Minnesota, St. Louis, University of New York, University of Pennsylvania, University of Kentucky, University of Tennessee.

JAMES HARRIS.

VIII. Technical Schools.

Into this class must be included polytechnic institutes, schools of technology, schools of technology, schools of agriculture, mining schools, all schools, in fact, in which the sciences are taught with a view to their practical application to the promotion of the material interests of man. They will necessarily be included also technical departments of colleges and universities, some of which have distinct and separate organization as to facilities of instruction, and often a distinctive name, although controlled by the same corporate body as other departments, while others are different than technical or professional courses of study, which instruction is given by the college or university professors.

It is difficult to point out the exact beginnings of technical education, when considered in a general sense as education, usually planned to prepare young men for the positions in which they are likely to be engaged during active lives. Perhaps the earliest authentic records of any system of training are those of the ancient Persians. The curriculum, like many in more modern times, was tripartite. It included riding, shooting with the bow, and raising the truth. The first two accomplishments may easily be considered as technical in their character, being closely related to the probable future occupation of the young men being educated. That speaking the truth is the counterpart of sufficient importance to form an essential element of this training is extremely interesting, especially as it appears to have furnished about all three of the moral intellectual side of the educational discipline. The purely intellectual found its earliest pronounced development among the Greeks, and technical education became recognized at that time. It is true that Aristotle solved and taught an elaborate system of natural philosophy, but when it is remembered that it was founded on two principles, namely, the principle of generation and the principle of corruption, it is easy to admit that the growth of science was seriously retarded during the nearly 2,000 years which the influence of Aristotle was dominant. Sometime, another Greek, living a century later, was the founder of applied science, the great forerunner of the noble art of agriculture which has brought the forces of nature to submission for the benefit of man. He was the first to possess some knowledge of the fundamental principles of science. Out of a clear insight into the doctrine of equilibrium he created the science of statics, one of the two sciences which the best part of engineering rests. He accomplished two accomplishments, even now necessary and all the while to the production of a successful engineer. He had the skill and instincts of a mechanic, and he was a profound mathematician.

It was of the life and work of Archimedes, the influence of which remained paramount for many centuries, and throughout all Europe; but a new era began with the appearance of Galileo, who was especially fitted for the task which seems to have awaited his coming. Possessed of many accomplishments, music, painting, eloquence, with unusual success, he was at the same time bold and courageous. At the age of thirteen he began his career as an experimental philosopher by making a discovery which the world will never forget, and which was the beginning of a

series resulting in a few years in the establishment of an experimental basis of the fundamental principles of dynamics. These had been beyond the grasp of Archimedes, but the work of the Italian furnished the other pillar upon which, through a system of rational mechanics, the science and art of engineering might now rest. For the first time it came to be recognized that whenever possible every dictum of the science of philosophy should be subjected to the final tests of trial and experiment before acceptance, and the reign of authority was ended, although not without a struggle.

It would seem that the time was ripe for this development, for contemporaneous with Galileo were two Englishmen, Dr. William Gilbert and Lord Bacon, who took a prominent part in the work. The work of Gilbert, although relatively very narrow and restricted, was on the same high plane of originality as that of the Italian, and furnished one of the earliest and very best examples of the purely experimental method of discovering truth. That of Bacon, while generally overestimated, was valuable as a formulated expression of the principles of the new philosophy, and a masterly analysis of the methods of inductive reasoning. The labor of these men resulted in the destruction of the method of antiquity. They were followed by Kepler, Newton, and a host of others, who, by creating science, made applied science possible.

Much time elapsed, however, before experimental science was admitted to the sacred precincts of the college curriculum. Brilliant scholars had made beautiful discoveries concerning the interpretation of natural phenomena, the exposition of which at once charmed the cultivated and delighted the ignorant. Practical applications of these discoveries were made from time to time, by means of which the comforts of life were enormously multiplied and woe, disease and anxiety enormously lessened; but all of these originated in more or less irregular and sporadic examples of scientific activity. Science had, it is true, found its way into many institutions of learning before the beginning of the nineteenth century, but the methods of instruction in vogue were those then, and until recently, in use in teaching mathematics, language, philosophy, and history. Such experimental studies and research as were carried on were mostly the private work of the professor; students continued to learn from books only, as they were accustomed to do in other subjects, and independent thinking was not encouraged. As early as the beginning of the nineteenth century, however, the importance of a systematic study of the applications of scientific discovery to the practical affairs of everyday life was felt by more than one man, and the possibility of an organized effort to encourage experimental research and the pursuit of applied science was recognized. The establishment of the Royal Institution in London by Count Rumford was an epoch in the history of science. He unquestionably had in his mind a technical school or college of the modern type. He founded the institution that it might serve for "the general diffusion of the knowledge of all new and useful improvements, and teaching the application of scientific discoveries to the improvement of arts and manufactures, and to the increase of domestic comfort and convenience." It originally contained a workshop for blacksmiths, with a forge and bellows, all sorts of models of machinery, and at one time a score of young mechanics were housed and lodged in the house. But, fortunately indeed for the world at large, it was not destined to continue as an example of what its founder evidently intended it to be, and what has been so abundantly realized in other more recent institutions. One of the first men to begin the work of the Royal Institution was Davy, and he quickly inaugurated for it a career on a distinctly higher plane. By a rapid evolution it became the most famous laboratory of research in the world, and even its founder would be compelled to admit that by its devotion to pure science and seeming neglect of the practical it has been infinitely more useful to those whom it was originally planned to benefit than if it had been held closely to the lines at first laid down. The splendid and continuous series of epoch-making discoveries by Thomas Young, Davy, Faraday, Tyndall, and Rayleigh constitute an everlasting monument to the founder of the institution.

Indeed it may be safely affirmed that during the first half of the nineteenth century the time was not yet ripe for the establishment of the technical school as it now exists. A science must come to be more or less of an exact science, and it must have accumulated a tolerably well-di-

gested and compact body of facts and principles before its application to practical problems can be undertaken with assurance of success. The splendid researches carried out by a generation of scholars now passed away were essential to successful development of the school of technology, and in a still greater degree were the methods of scientific investigation necessary to that development. Observation and experiment came to the front, and for the first time in the history of education began to be esteemed at something like their full value. It came to be understood that the path to success was not alone through the study of books, but that the study of things was more important. What is known as the "laboratory method" of instruction began to be adopted in the most progressive institutions of learning, and soon proved itself to be vitalizing and powerful. All other departments of learning were forced to become the imitators of science in the use of this method, and the "new education" resulted. Many feared the effect upon the courses of study tending to produce what was long erroneously called a "liberal education," but it was soon found that if the simple "culture effect" be considered alone, the new education asks no odds of the old, while in the production of sound thinking and a virile intellectuality it is far and away ahead.

All of this was a necessary forerunner to the perfectly organized school of technology, but as a matter of fact the development of the latter was in a large measure contemporaneous with the evolution of the new education as outlined above. A class of professional schools has existed, indeed, almost as long as education itself, namely, those organized and maintained for the training of clergyman, lawyers, and physicians. Military schools have also long been in existence, and out of these latter came the beginnings of technical instruction.

In Europe this beginning is to be found in the creation of the celebrated École Polytechnique in France, in the third year of the Convention (1794). It was primarily for the training of young men in mathematics and drawing, to fit them for the Engineer and Artillery Corps of the French army. It owes much of its excellence to the labors of Carnot, who strove to give it a secure and proper foundation. The number admitted to its classes was limited, and only the best of the candidates were selected. Some of the most celebrated military and civil engineers of France have received their training there, and it has numbered among the members of its faculty such famous men as Lagrange, Laplace, Berthollet, Poisson, etc. It continues to adhere with considerable conservatism to the principal methods of its early history, and, in spite of innumerable competitors that have sprung up since its foundation, its rank is among the highest.

The famous School of Mines at Freiberg, earlier in its establishment by many years, has enjoyed a long and illustrious career, and is an excellent type of a technical school differing very decidedly from the École Polytechnique. In its early development, amid the rich mining resources and industries of Saxony, it illustrates the general principle that nearly every one of the first technical schools owes its origin to the demands of the leading industry in its immediate vicinity, by which also the character of its instruction was largely determined. Influenced largely by this principle, schools of technology became very numerous throughout continental Europe during the first half of the nineteenth century. Most of them have kept pace with the extraordinary development of science and scientific methods which has taken place during the last half of the century; their facilities for instruction have increased, and their courses of study have become largely professional. The polytechnic school has begun to assume its proper place in European schemes of education as something quite distinct from the earlier trade schools, from which, however, it was in many instances evolved. Besides France and Germany, Austria, Sweden, Switzerland, and Russia have maintained technical schools of high repute. Indeed, the U. S. is indebted to Russia more than to any other nation for some of the most important and valuable features of the modern school of technology. It was at two famous Russian schools, the Imperial Technical School, at Moscow, and the Institute of Technology, at St. Petersburg, that the experiment was first made of combining in the engineering courses the study of text-books, lectures, and other exercises long known to form a necessary part of scholastic training, with practical exercises in workshops in which the student was made familiar with machines, their construction and use, and the

nature of the materials upon which they worked. Many of the older and more conservative schools in Europe have been reluctant to follow the example of the Russians, but the numerous and great advantages of the method have been recognized in England and in a still greater degree in the U. S., where nearly every school of technology has adopted the Russian plan in a greater or less degree.

Great Britain, although contributing more largely, perhaps, than any other nation to those scientific discoveries upon which all technology is based, was slow to realize the necessity for technical education. It was not until it became evident that France, Germany, and other nations of continental Europe were likely, through their encouragement of technical schools and colleges, to deprive the United Kingdom of the prestige of first place in engineering and manufacturing skill, that the British began to develop this side of their educational system. Much interest was suddenly created, royal commissions were appointed, the work of foreign countries was examined and reported upon, and organized efforts resulted in the rapid advancement of the interests of technology. One organization, extensive in scope and comprehensive in plan, deserves more extended notice, even in a brief treatment of the subject. It is the City and Guilds of London Institute for the Advancement of Technical Education. The Prince of Wales is the president of the institute, and among its vice-presidents are the lord mayor of London, the president of the Royal Society, the president of the Institute of Civil Engineers, and many other of the most eminent men of Great Britain. The operations of the institute include the management of three London colleges and the system of technological examinations. The three colleges are the City and Guilds Central Technical College, which is "a college for higher technical instruction in mechanics and mathematics, civil, mechanical, and electrical engineering, and chemistry," the City and Guilds Technical College at Finsbury, and the London Technical Art School. The scheme of technological examinations is very elaborate and ambitious. Examinations are conducted once every year at various centers in the United Kingdom, upon a wide variety of technical subjects, more than sixty in number. Prizes and honors are awarded, and in some cases grants of funds are made. The object is to encourage local development of technical education, and the results are commensurate with the magnitude of the undertaking.

In the U. S. the earliest foundation for technical education was that of the Rensselaer Polytechnic Institute at Troy, N. Y. It was established in 1824 by Stephen van Rensselaer as a School of Theoretical and Applied Science. In the early years of the republic it was the necessary custom to employ learned and skilled foreigners in various public works, and most of the engineers at first engaged on the construction of canals and roads came from France. Many young men were sent there from the U. S. to be educated, and the Rensselaer School evidently owed its origin to a desire on the part of its founder to create an institution capable of supplying this demand. Its work has been mostly confined to the education of civil engineers, in which it has had a long and successful career.

About the middle of the century the importance of the sciences of chemistry, physics, geology, etc., had become so evident that several of the more important colleges established special departments for scientific work. The old education still held sway, and was at most only willing to admit the new as a sort of annex, but carefully avoiding responsibility in most cases by providing quite a distinct organization for the scientific school. The Sheffield Scientific School of Yale University was the earliest of these, having been founded in 1847. It was followed by the Lawrence Scientific School of Harvard University in 1848, and the Chandler Scientific School of Dartmouth College in 1852. The first two were for a long time schools of science rather than its applications, although they have latterly taken more of the character of schools of technology with thorough courses in several branches of engineering. The school at Dartmouth College has confined its work largely to civil engineering. All have done work of a high order.

Technical education in the U. S. received its greatest impetus, however, during the later years of the civil war and those first following its close. This must be attributed to two causes: First, the passage of the Morrill Act by which large land grants were made to the several States for the purpose of enabling them to establish institutions for giving instruction in agriculture and mechanics; second, the very

pressure, endowment of schools of technology during those years by private institutions. At this time the great industrial resources of the country began to receive the attention they deserved; the civil war had demonstrated the great need of technical knowledge and skill, and by the rapid rise in the value of real estate near cities and towns, and the consequent enormous expenditure of the Government in supplies during the period of the war, many men had themselves amassed of larger fortunes than they had been used to possess. Some of them were wise enough to turn a part share of their accumulations to the people through educational endowments.

From these two sources came a number of technical colleges, which usually divide themselves into two great classes: the best are founded principally through schools owing their origin to the national land grant and a few others, including some of the early schools already mentioned, all of which are departments or schools or colleges belonging to a university or college organization. Probably half of the institutions growing out of the land grant fund have departments in the various branches of engineering and the technical sciences. Among those best known for the length of the technical courses may be mentioned Cornell University, at Ithaca, N. Y.; Purdue University, at Lafayette, Ind.; the University of Wisconsin, of California, the Ohio State University, at Columbus, and the Illinois Institute of Technology. To these should be added, as among somewhat important technical schools attached to colleges or universities now founded or supported by the land grant, the Sheffield, Lawrence, and Chandler Scientific schools mentioned above, the Thayer School of Civil Engineering, also connected with Dartmouth College, the School of Engineering of the Washington University at St. Louis organized in 1870, and the School of Mines connected with Columbia College, New York.

In the second class are found schools of technology on an independent and separate foundation, and mostly the outcome of private endowment. The earliest of these was the Lowell Polytechnic Institute, already referred to. The year in order of time and one of the foremost in the number is the Massachusetts Institute of Technology, at Boston. First mentioned in a report prepared by Prof. William B. Ewing, entitled *Objects and Plan for an Institute of Technology, embracing a Society of Arts, a Museum of Arts, and a School of Industrial Sciences*. It was chartered in 1826, and opened to students in 1829. The school of industrial sciences has grown to be the foremost feature of the institute, although the other features are still retained. Even at the date of its incorporation is the Lowell Polytechnic Institute, at Worcester, Mass. It was incorporated in 1826, and its first building opened to students in 1827. It was the first school of technology in America to add a workshop to its equipment for the instruction of mechanical engineers and systematically to provide workshop practice as a part of the course of study. In its class should also be included Lehigh University, at Bethlehem, Pa., incorporated in 1866. Although using the same university, and providing courses of study in general literature as well as in technical subjects, the location of the school in the heart of a region rich in mineral resources has given it such a bent in the direction of applied science that it may not unjustly be regarded as a school of technology. In 1871 the Stevens Institute of Technology was established through the munificent liberality of Edwin A. Stevens, himself a noted engineer. The School of Applied Science was opened in Cleveland, Ohio, in 1870, and the Rose Polytechnic Institute, at Terre Haute, Ind., in 1880. All of the schools named as belonging to the first class owe their origin to private endowment. The Massachusetts Institute of Technology receives a share of the congressional aid in land grant colleges.

The course of study in the schools of technology in the United States through four years in nearly every instance. Students are not usually admitted under sixteen years of age, and the requirements for admission are not, in general, less than those of other institutions of college rank, and in some instances they are higher. Modern languages are usually required for admission instead of Latin and Greek. The course of study generally includes, besides mathematics, the more purely technical subjects and sciences, languages, history, and political economy, differing in this respect from many of the European technical schools. They are usually as to the range of their technical courses, a few making themselves almost exclusively to civil engi-

neering, or in some cases to mining engineering, while the greater number include civil, mechanical, and electrical engineering and chemistry, in which in a few instances are added mining engineering, sanitary engineering, architecture, and general scientific courses. The instruction is largely of a practical character, extensive use being made of laboratories, workshops, etc. Considerable difference exists in the character and amount of workshop practice as a part of the course in mechanical engineering. In some schools this is largely restricted to hand and bench work, little or no attention being given to construction. In others, the use of machine tools and experience in the actual construction of machines, and the assembling of their parts, is regarded as of paramount importance to the engineer. In all schools of technology worthy of the name the methods of instruction are such as tend to create independence of thinking and personal responsibility in judgment. With properly managed courses of study they are not deficient in the production of that intellectual discipline and culture which constitute a liberal education. While not organized for original research, their methods naturally tend to it, and in the U. S. they have probably during the period of their existence contributed more to the advancement of science than have educational institutions non-technical in character. They represent one of the most important achievements of an age whose chief glory is found in the increase and diffusion of science and its applications.

T. C. Mendenhall.

IX. TRADE SCHOOLS.

The inception and growth of the trade-school idea is, strictly speaking, confined to the nineteenth century. As an institution the trade school is purely a logical outgrowth of the changes in industrial methods which have taken place since the invention of the steam-engine. In the days of the guilds, when all production was in the hands of the master workman and his corps of journeymen, the youth seeking a trade found his natural place in the household of his master, where during the long years of his indenture he was initiated into all the secrets of the craft. With the introduction of machinery, however, a great change began in industrial methods. The economic advantage of quantity production, coupled with the division of labor, appeared, and the master, no longer simply the master craftsman, has gradually developed into the directive head of an industrial establishment. No longer working with his own hands, he uses his brain to direct more effectively the hands of many. Under these conditions the natural relation between the apprentice and his master has ceased, and without any provision for systematic training the apprentice, except in rare instances, is left to pick up the practice of his trade by observation and to such opportunities as chance and the good nature of his fellow workmen afford. Under such conditions a large amount of time is inevitably wasted and the training obtained liable to be one-sided and lacking in thoroughness.

Object of the Trade School.—The trade school represents an attempt to provide a modern substitute for the apprenticeship system better suited to these changed conditions. Before discussing the institutions engaged in such instruction it will be necessary to make clear certain distinctions in purpose and methods existing among the present schools. The trade school proper, with which this article is immediately concerned, is an institution designed to prepare handicraftsmen for practical work at a trade. Such a school may or may not include instruction other than manual, but its primary object is manual dexterity. Such schools are represented by the *Fachschulen* of Germany and Austria and the trade schools of the U. S. A technical school is an institution in which, in addition to practical instruction in the methods of a craft, the scientific principles upon which it is founded are thoroughly explained and their bearing upon the operations of the trade clearly demonstrated. Such schools may prepare superior craftsmen, fitted to become foremen or superintendents, or they may produce designers. The Pennsylvania School of Industrial Art and the weaving-school at Crefeld, Germany, are typical examples of such schools.

Schools in Continental Europe.—On the continent of Europe a large amount of study and experiment has been given to the problem of industrial training, and trade and technical schools have there reached a high point of organization and efficiency. This is particularly true of Germany, Austria, Belgium, and France. In Germany and Austria the system of trade schools is very thorough and much special-

ized. General industrial schools, in which a number of trades are taught, are found throughout the two empires, while special trade schools, in which one particular branch is dealt with, are distributed according to local needs. Thus there are special trade schools for silk-weaving, linen-weaving, watch-making, wood-working, mason-work, machine-work, brewing, etc. Courses in these schools are generally from three to five years in length, and embrace, besides practical trade-training, instruction in mechanical and free-hand drawing, geography, business forms, mathematics, book-keeping, and science. From the nature and extent of the instruction many of these schools should more properly be classified as technical schools, and even when the object is merely to combine the elements of a general education with the training of a handicraftsman the large amount of time required prevents their benefits being very generally reaped by the artisan class. The actual effect of these schools is in consequence rather to prepare a limited number of graduates fitted for superior workmen and foremen than to supply a means of training the great mass of artisans.

The aim of the Belgian schools approaches more nearly to that of a true trade school than those of the schools just described. Trade proficiency rather than an all around education is the end sought. Mental instruction is indeed generally provided, but its character is limited to such branches as have a direct bearing upon the trade. Besides a number of institutions supported by guilds and trade-unions, as well as several parochial schools in which practical trade-training is furnished, two very comprehensive trade schools exist at Tournay and Ghent. In these schools the pupil upon entering selects a special trade, which he pursues for a course of three years. Instruction is given in these schools in drawing, mathematics, science, and industrial economy.

In no country is the character of trade and technical instruction more differentiated than in France. In each of the French schools the grade of product aimed at, whether it be artisan, foreman, superintendent, or engineer, is accurately defined. Of the first mentioned class are the manual apprenticeship schools, into which boys are admitted at twelve or thirteen years of age. These schools are municipal institutions receiving state aid. They are in fact elementary trade schools which devote the greater part of a three years' course to practical manual work. The aim is not to turn out full-fledged workmen, but rather to shorten the period of apprenticeship. Mental instruction to the extent of three or four hours a day is given throughout the course. There are schools of this character in Paris for the mechanical trades, for bookmaking, and for furniture-making. Other schools exist at Havre, St.-Etienne, Rheims, Nantes, and St.-Chamond. Besides these municipal schools there exists a system of national apprenticeship schools, which are divided into primary and secondary grades. The primary schools are similar in character to the municipal schools, but afford somewhat more advanced instruction. In the three secondary schools at Châlons, Angers, and Aix, the instruction in both theoretical and practical branches is very thorough, and is such as to fit the graduates to become superintendents and masters of industrial establishments. The course is three years in length, and pupils must be between fifteen and seventeen years at entrance.

Great Britain.—In Great Britain trade schools (with one or two possible exceptions) do not exist. There are a large number of technical schools representing a great variety of aims and methods in which workshop instruction plays a part, but the principle almost universally obtains that a trade can only be properly acquired in a regular shop.

The United States.—Practical trade-school work in the U. S. began with the foundation of the New York trade schools in 1881. At first the work of these schools was confined entirely to evening classes. From the beginning the aim has been to train beginners for practical work at the trades. It is not designed, however, to reach the expertness of the finished mechanic, but rather to give a thorough grounding in the science and practice of the trade, leaving speed and experience to be acquired in after-practice at the trade. These schools have been pre-eminently successful. Starting with thirty-three pupils in 1881, the attendance has steadily grown, until in 1893 it reached 556. Manual instruction is supplemented in all classes by instruction upon the nature of materials and the scientific principles involved in the trade. Schools of like nature have been established by the Philadelphia Master Builders' Exchange and by the Pratt Institute of Brooklyn. In all of these institutions the principle obtains of confining the instruction given in the

schools to an essentially practical preparation for the trade and to pupils of sufficient age to learn rapidly, leaving the general education to be gained in the common schools previous to entering.

This system has received the endorsement of the National Association of Master Builders, who at their meeting of 1888 at Cincinnati passed resolutions recommending that a man who wished to enter the building trades should go at first to a trade school to learn the science and practice of his trade. When the trade-school course is finished and he has proved by an examination held by a committee of master mechanics that he has profited by it, he is to enter a workshop as a "junior." When old enough and able to do a full day's work he is to apply for a second examination, which if passed entitles him to be considered a journeyman.

This system seems well suited in its essentials to the needs and genius of the people of the U. S. and destined to develop throughout the country. One great obstacle to progress, however, is the attitude of the labor-unions, who oppose the entrance of trade-school graduates into the trade upon the same ground that they seek to limit the number of apprentices. In order to secure a full and free development of the trade-school movement in the U. S., a recognition of the trade-school graduate by the organization of the journeymen as well as by organizations of masters is necessary, and his establishment with a definite place and a definite economic value in the industrial world. C. R. RICHARDS.

Schooner: a vessel with two or more masts and fore-and-aft rigged; or, if the foremast have a square topsail, the vessel is called a topsail schooner. When sailing by the wind, schooners have an advantage over square-rigged vessels, and they are easily handled by a small crew.

Schoonmaker, AUGUSTUS: lawyer; b. at Rochester, Ulster co., N. Y., Mar. 2, 1828; was educated in the public schools of his native town; 1848-50 taught in the district schools of the county; in 1851 began the study of law, and was admitted to practice in 1853. He was elected county judge in 1863; re-elected in 1867; in 1875 was elected to the State Senate, where he drafted a bill to provide for uniformity of text-books in the common schools, which embodied the principle of the one which finally became a law of the State. In 1877 he was elected attorney-general of the State, and during his term of office (1877-79) had to deal with the questions relating to the release of William M. Tweed, the complications of the Erie Railway, the new apportionment under the census of 1875, and the constitutionality of that portion of the New York city charter creating a board of estimate and apportionment. In 1883 he was appointed one of the civil-service commissioners of New York. In 1887 he became an interstate commerce commissioner. D. at Kingston, N. Y., Apr. 10, 1894.

Revised by F. STURGES ALLEN.

Schopenhauer, shō'pen-how-er, ARTHUR: philosopher; b. in Dantzic, Prussia, Feb. 22, 1788. His father was a banker; his mother, Johanna, a writer of novels and books of travels. He entered the University of Göttingen in 1806, studied philosophy under Schulze the skeptic, and gave especial attention to Kant and Plato; in 1811 heard the lectures of Fichte at Berlin; wrote his famous essay, *On the Fourfold Root of the Principle of Sufficient Reason*, for his degree at Jena in 1813; adopted Goethe's theory of colors, and wrote in 1816 an essay *On Seeing and Color*. His principal work, *The World as Will and Representation*, was composed in Dresden and published in 1819. After a visit to Italy he settled at Berlin University as docent, and remained there in this capacity until 1831, with the exception of some intervals spent in Italy. Want of success as a lecturer caused his withdrawal from Berlin in 1831 to Frankfort-on-the-Main, where he spent the rest of his life in seclusion, and died Sept. 21, 1860. His characteristic doctrine is pessimism. The world is the worst of possible worlds. We can alleviate our lot in it by sympathizing with the suffering, and in a still more effectual way by an asceticism which destroys our will to live. This view of the world he connects with his doctrine of the Will, but not in a very obvious manner. According to him the Will is the only substantial essence in the universe; it is Kant's "thing in itself." The intellect, consciousness, our entire theoretical activity, is simply a result of the Will in its higher forms. The Will constantly energizes toward life, and the stadia of nature are simply the instrumentalities of the Will created on its way to life. Mere matter, as the product of forces, is the lowest

stage, the realm of blind Will; in chemical action, where there is conscious extension to activity, the Will is manifest on a higher stage; finally, the Will abstracts itself as a regulative, which do not depend upon externally exerting causes for their activity, but work from internal motives, and select likewise their own field, and hence need intelligences to further blind exerting impulses into qualities. The universe thus exhibits a brain in which the Will manifests its highest objectivation. With the brain, and intelligence which is its function, there arises simultaneously, as result, the world as representation with all its forms: subject and object, space and time, causality, etc. The brain with its intelligence is therefore only the tool or instrument of the will to live. He adheres to the Oriental idea of annihilation, and sometimes the Christian idea of immortality a delusion, hence "the highest moment of life is the complete transcendence of self in sleep, and the worst death is the most selfish and conscious." The world presents a continued rebirth before us, in which eternal justice becomes visible as the Nemesis which refuses to nullify again the individuals which have arisen like bubbles upon the surface of the eternal Will. Hence the highest act of morality is resignation, renunciation. Enjoyment of art is the only permissible pleasure, because that is cognition devoid of Will, the attainment of the Buddhists is the ultimate desideratum as the aim of Schopenhauer. In this world, which was the worst possible, the worst features in it, to Schopenhauer, was the contemporary philosophers, Fichte, Schelling, Hegel, and their followers, who achieved popularity and success, while he failed. He estimated his ingenuity in inventing speculations suitable for these "professors of philosophy"; but the dependence of his own views upon contemporary systems is quite obvious, especially upon those of Fichte and Schelling. Optimism might as well have been the logical consequence of his theory that the energy of the Will determines the intellect as its tool; for the world as representation must be then regarded as the ultimate final product of the Will, and any pessimistic amendment thereof as retrogression to a less complete standpoint. It was therefore illogical to adopt Buddhism as a consequence of his system. Consistent elaboration would have developed a philosophy much resembling the earlier system of Schelling, besides the three works already named, the following are noteworthy: *Upon the Will in Nature* (1836); *The Freedom of the Human Will* (1860); *The Basis of Morals* (1841). *The Parerga and Paralipomena* (1851) contains his views in a fragmentary form, and is the most popular of his works. The following of his works have appeared in English translations: (a) *The World as Will and Idea*; (b) *The Fourfold Root of the Principle of Sufficient Reason*; (c) *On the Will in Nature* (London); selections from his *Parerga and Paralipomena*; (d) *On the Theory of Life*, etc. (Milwaukee); (e) *The History of Philosophy*, etc.; (f) *Religion*, etc. (London). See his *Life*, by Helen Zimmern (1876), and by Wallace Stone *Writers Series*, 1886. Julius Frauenstädt has edited his works, and done much to make known his doctrines. Alfred von Hartmann, in his *Philosophy of the Unconscious*, presents in a modified form the philosophy of Schopenhauer.

THE PISCOPAL.

WILLIAM T. HARRIS.

Schopp, ROBERT DEO SCOPPIUS.

Schouler, JAMES, A. B., LL. D.; lawyer and historian; b. at Arlington, Mass., Mar. 20, 1829; graduated at Harvard (1850); served in the civil war; practiced law in Boston and Washington, D. C.; author of legal text-books on *Domestic Relations*, *Personal Property*, *Real Estate*, *Wills, Executors and Administrators*. He is more widely known as the author of *History of the United States under the Constitution* (6 vols., 1890-91).

C. H. T.

Schooten, also known as, WILLEM CORNELIS; navigator; b. at Breda, Holland, about 1567. He was long employed by the Dutch East India Company, but resigned in 1610, and engaged with the merchant Isaac Lemaire to find a new route to the W. Indies. Leaving the Texel June 14, 1611, he passed by the Strait of Magellan, discovered the passage named by him Lemaire Strait, was the first to double Cape Horn and reached the Indies in safety. There he was arrested, but was subsequently acquitted, re-entered the service of the Dutch East India Company, and died on the coast of Balambangan in 1663. The Cape Horn route was speedily adopted as preferable to the Strait of Magellan; it is still used by the sailing vessels.

H. H. S.

Schuyvaloff, another spelling of the name SCHUYALOV

Schrader, KENNETH; Orientalist; b. at Brunswick, Germany, Jan. 5, 1866; studied at the gymnasium in Brunswick and the University of Göttingen; Professor of Hebrew and Semitic Languages successively at Zurich, Göttingen, Jena, and since 1876 professor and member of the Royal Academy at Berlin; author of *Die Sprache der Äthiopier aus cognatis Sprachen* (Leipzig, 1890); *Studien zur Kritik und Erklärung des biblischen Urgeschichte* (1890); *Einführung in das alte Testament* (with de Wette, 8th ed., 1899); *Die vorderasiatischen Keilschriften* (Leipzig, 1874); *The Keilschriften und das alte Testament* (Göttingen, 1872); 2d ed., 1883; Eng. trans., *The Cuneiform Inscriptions and the Old Testament* 2 vols., London, 1885-86); *Die Hittitische Sprache* (1874); *Keilschriften und Hittitische Sprache* (Göttingen, 1876). Editor of *Keilschriftliche Bibliothek* (1869, seq.).

Revised by W. W. W.

Schrader, JAMES FRANKLIN; painter; b. in Berlin, Prussia, June 19, 1815; studied painting at the academy of the native city, at Düsseldorf 1837-45, and in Rome 1845-47, and was appointed professor at the Academy of Berlin in 1851. His most celebrated pictures are *The Death of Leonardo da Vinci* (1851); the great fresco in the New Museum at Berlin, *The Conversion of the Church of St. Sophia in Constantinople* (1860); *Robert before Alexander* (1866), and a number of portraits.

Schrader, OTTO; comparative philologist; b. at Weimar, Germany, Mar. 28, 1856; educated at the gymnasium in Weimar, and at the Universities of Jena, Leipzig, and Berlin; teacher in the gymnasium at Jena, and assistant professor in the University of Jena; author of *Langensprachliche Forschungen zur Handbuchgeschichte und Wortkunde* (1886); *Sprachvergleichung und Urgeschichte* (1881); 2d ed., 1890; Eng. trans., *Prehistoric Antiquities of the Aryan Peoples*, 1890; *Völker und Sprachen* (1891); edited the 6th (revised) edition of Hahn's *Kulturpflanzen und Haustiere* (1894). He is an eminent authority in linguistic archaeology.

W. L. W.

Schreyer, ADOLF; animal-painter; b. at Frankfurt-on-the-Main, May 9, 1828; studied at the Städels Institute, Frankfurt; medals, Paris Salons, 1854, 1855, and 1867; medals at Brussels Exhibition 1863 and Munich 1876; Order of Leopold of Belgium. He has traveled and painted in Egypt and Algiers, and lived in Paris until 1870, when he removed to Kronberg, near Frankfurt. His pictures of horses and Arabs are very popular in the U. S., and many of his works are in private collections in New York and other cities. Studies in Paris and at Kronberg.

W. A. C.

Schriver, ENRIQUE; soldier; b. at York, Pa., Sept. 16, 1812; graduated at U. S. Military Academy, and promoted brevet second lieutenant of artillery July 1, 1830, captain 1842; resigned July 31, 1846, having served as captain of staff and assistant adjutant-general almost continuously from 1838 to 1846. In Apr., 1861, he accepted an appointment on the staff of Gov. Morgan of New York, with the rank of colonel and A. D. C., and May 14 was appointed lieutenant-colonel of the Eleventh Infantry U. S. army; colonel and A. A. D. C. May, 1862, and served as chief of staff to Gen. McDowell and Gen. Fremont (third corps); appointed inspector-general U. S. army (rank of colonel) Mar., 1863, and assigned to the Army of the Potomac; was engaged at Chancellorsville and Gettysburg 1863, and in the Richmond campaign of 1864, up to the investment of Petersburg. He was breveted brigadier-general in 1864 and major-general in 1865; was inspector of the Military Academy 1866-71; retired 1881.

Revised by JAMES MAURIN.

Schröder, FERDINAND LUDWIG; actor; b. at Schwerin, Germany, Nov. 3, 1744; was abandoned, while still a boy, by his parents, who were strolling actors, at Königsberg; found his parents in 1759 in Salsburg, where he was trained to become a dancer; joined them finally in Hamburg in 1764; undertook in 1771 the management of the troupe after the death of his step-father, Ackermann, and raised the stage of Hamburg to a position of literary and artistic influence in Germany, partly by his plays (collected and published in 1841 in four volumes with an introduction by Tock), partly by the rigid sense of social propriety with which he governed the theater, but especially by his grand impersonations of some of the principal Shakespearean characters, such as Lear, which he was the first to introduce on the German stage. D. at Rellingen, Sept. 3, 1816. His *Life* has been written by F. L. W. Meyer (1816) and Brander (1844).

Revised by R. B. VALLENTINE.

Schröder, SOPHIE (Bürger): actress; b. at Paderborn, Westphalia, Feb. 23, 1781; appeared upon the stage when twelve years of age in St. Petersburg, where the troupe to which her parents belonged was playing; married in 1795 Stollmers (whose true name was Smets), the director of another band, in 1804 the singer Schröder, and in 1825 the actor Kunst; acted in all the principal theaters of Germany, but principally at Vienna, and acquired a great fame by her impersonations of Phædra, Medea, Merope, Lady Macbeth, Sappho, etc. In 1840 she retired from the stage with a pension from the Austrian court. D. at Munich, Feb. 25, 1868. Her *Life* was written by P. Schmidt (Vienna, 1870).—Her daughter, **WILHELMINE SCHRÖDER-DEVRIENT**, b. at Hamburg, Oct. 6, 1804, made her *début* as a singer in 1821 in *The Magic Flute*; sang as Donna Anna, Euryanthe, Fidelio, etc., and was soon acknowledged as the first singer of Germany; was received with great enthusiasm in Paris, London, and St. Petersburg; retired from the stage in 1847. D. at Coburg, Jan. 26, 1880. She was twice married, the first time (1823) to the actor Karl Devrient. Her *Life* was written by Claire von Glümer (1862) and Wollzogen (1863).

Schubert, FRANZ: "the immortal melodist"; b. in Vienna, Jan. 31, 1797; son of a school-teacher in the Lichtenthal district of the city; was trained chiefly by the organist of the parish church; became leader of the choristers' school of the court chapel; composed his first symphony in 1813; taught in his father's school to avoid conscription; in 1818 became teacher of music in the family of Count Esterházy at Zélez, Hungary; in the same year returned to Vienna, where the publication (1821) of his *Erl King* gained him popularity; gave his first and only public concert in 1828 in Vienna. D. in Vienna, Nov. 19, 1828. He is best known by his songs, several hundred in number, of which some fifty or sixty are celebrated and will live. His music was scarcely known to the outside world during his lifetime. His fecundity was marvelous, and the quantity of MS. left behind to be discovered by the musical world was enormous. His original MSS. prove the great ease and rapidity with which he wrote, rarely making a revision. This, indeed, is the source of a characteristic drawback to the merit of most of Schubert's instrumental compositions—viz., a too great diffuseness, or lack of condensation, coupled frequently with literal repetition of large sections. Among his larger works, aside from the songs, may be specially mentioned the great *C major Symphony* (No. 9), the *Unfinished Symphony*, many fine sonatas for piano solos, and also with violin, trios for piano, violin, and violoncello, the *Mass in E flat*, etc. He wrote several operas which were not successful. Schubert's technical handling of his material compares respectably with his contemporaries, but in this regard he made no attempt at originality. The chief characteristics of Schubert are the continued freshness of his peculiarly delightful melodies, supported by harmonies of equal interest. See the *Lives* by von Hellborn (Vienna, 1865) and Reissmann (Berlin, 1875).

DUDLEY BUCK.

Schuchardt, shoo'khärt, HUGO: Romanic philologist; b. at Gotha, Germany, Feb. 4, 1842; educated at the gymnasium in Gotha and at the Universities of Jena and Bonn; 1870-73 privat docent in Leipzig; 1873-76 Professor of Romanic Philology in Halle; since 1876 professor in Graz; author of *Vokalismus des Vulgärlateins* (3 vols., 1866-68); *Ueber einige Fälle bedingten Lautwandels im Churwölischen* (1870); *Ritornell und Terzine* (1874); *Slavo-Deutsches und Slavo-Italienisches* (1884); *Ueber die Lautgesetze* (1885); *Romanisches und Keltisches* (1886); *Kreolische Studien* (1881-91); *Auf Anlass des Volapüks* (1888); *Baskische Studien* (part i., 1893); *Wellsprache und Wellsprachen* (1894). He is a brilliant creative scholar.

B. I. W.

Schulte, shoöl'te, JOHANN FRIEDRICH, von: polemical writer; b. at Winterberg, Westphalia, Apr. 23, 1827; studied law at Berlin; practiced there and at Arnsberg and Bonn; became Professor of Canon Law at Prague 1855. He wrote *Handbuch des katholischen Eherechts* (Giessen, 1855); *Das katholische Kirchenrecht* (2 parts: *Quellen des katholischen Kirchenrechts* und *System des allgemeinen katholischen Kirchenrechts*, 1856-60); *Lehrbuch des katholischen Kirchenrechts* (1863; 4th ed. 1886); *Lehrbuch der deutschen Reichs- und Rechtsgeschichte* (2 parts, Stuttgart, 1860-61; 6th ed. 1892); *Die Rechtsfrage des Einflusses der Regierung bei den Bischofswahlen in Preussen* (Giessen, 1869). He made a sensation by his pamphlet *Die Macht der römischen Päpste über Fürsten, Länder, Völker, Individuen* (Prague, 1871), for in it he set himself against the dogma of papal

infallibility. He then (1871) left Prague and removed to Bonn, to whose law faculty he belongs. He is a leader of the Old Catholics. In their behalf he has produced many books and pamphlets, of which may be mentioned a second edition of the pamphlet just mentioned with an addition, *Die entgegengesetzten Lehren der Päpste und Concilien der ersten 8. Jahrhunderte über das Verhältniss der weltlichen Gewalt der Kirche gegenübergestellt*; also *Die Stellung der Concilien Päpste und Bischöfe vom historischen und canonischen Standpunkte und die Päpstliche Constitution vom 18. Juli, 1870* (1878); *Der Cölibatszwang und dessen Aufhebung gewürdigt* (in advocacy of its abolition, Bonn, 1876); *Die Geschichte der Quellen und Literatur des canonischen Rechts von Gratian bis auf die Gegenwart* (3 vols., Stuttgart, 1875-80); *Die Geschichte der Quellen und Literatur des evangelischen Kirchenrechts in Deutschland und Oesterreich und die evangelischen Kirchenrechtsschriftsteller* (1880); *Die Summa der Paucapala über das decretum Gratiani* (Giessen, 1890); *Der Alt-Katholicismus, Geschichte seiner Entwicklung, u. s. w.* (Giessen, 1887); *Die Summa des Stephanus Tornacensis über das Decretum Gratiani* (1891); *Die Summa magistri Rufini zum Decretum Gratiani* (1892).

SAMUEL MACAULEY JACKSON.

Schultz, JOHN CHRISTIAN, M. D.: lieutenant-governor of Manitoba; b. at Amherstburg, Ontario, Jan. 1, 1840; graduated as a physician in 1861; assisted Gov. Macdavid and Bishop Anderson in establishing the Institute of Rupert's Land in 1863. In 1867 and 1868 he agitated in favor of the union of all the provinces; and when the Northwest was purchased by Canada in 1869 he and others, loyal to the Government, were captured by insurgents who opposed the transfer, and were imprisoned in Fort Garry. He effected his escape and in 1870 returned to Manitoba, and at the first general election was chosen to represent Lisgar in the Dominion Parliament, which seat he held until 1882, when he was appointed to the Senate. He was captain of the Lisgar Rifle Company 1871-74; a member of the executive council for the Northwest Territories in 1872; appointed member of the Dominion board of health for Manitoba and the Northwest Territories same year, and one of the board of governors of Manitoba medical board, and has been president of the Southwestern Railway of Manitoba. He was appointed lieutenant-governor of Manitoba July 1, 1888.

NEIL MACDONALD.

Schultze, shoöl'te, CARL AUGUST JULIUS FRITZ, Ph. D.: professor of philosophy and pedagogy; b. at Celle, Hanover, May 7, 1846; educated at the gymnasium in Celle, and at the Universities of Jena, Göttingen, and Munich; privat tutor 1869-70; high-school teacher 1870-72; privat docent 1872-75; and Professor Extraordinary of Philosophy 1875-76 in Jena University; Professor of Philosophy and Pedagogy since 1876 in the Royal Polytechnic School in Dresden. Of his pedagogical works the best known is *Deutsche Erziehung* (1893), an important contribution to Herbartian literature. Others are *Der Fetischismus, Ein Beitrag zur Anthropologie und Religionsgeschichte* (1871); *Geschichte der Philosophie der Renaissance* (vol. i., 1874); *Philosophie der Naturwissenschaft* (2 vols., 1881-82); *Die Grundgedanken des Materialismus und die Kritik derselben* (1881); *Die Grundgedanken des Spiritismus und die Kritik derselben* (1883); *Die Sprache des Kindes* (1880); *Stammbaum der Philosophie* (1890); *Vergleichende Seelenkunde* (vol. i., 1892); *Der Zeitgeist in Deutschland, seine Wandlung von 19. und seine muthmassliche Gestaltung im 20. Jahrhundert* (1894).

J. E. RUSSELL.

Schultze Powder: See EXPLOSIVES.

Schumacher, shoo'mäkh-er, HEINRICH CHRISTIAN: astronomer; b. at Bramstedt, Holstein, Germany, Sept. 3, 1780; studied mathematics and astronomy at Kiel, Jena, Copenhagen, and Göttingen, and became Professor of Astronomy at the University of Copenhagen in 1815; removed in 1821 to Altona, where he died Dec. 28, 1850. In 1821 he founded the *Astronomische Nachrichten*. In 1830 he made the observations of the length of the seconds-pendulum, which formed the basis of the Danish scale of measure.

Schu'mann, ROBERT: composer; b. at Zwickau, Saxony, June 8, 1810; after a short course in law and philosophy at Heidelberg, he settled in 1830 at Leipzig, in order to study under Wieck, an eminent piano-teacher; but having crippled his right hand he was forced to devote himself to composition instead of piano-playing, and in his studies was guided by Heinrich Dorn. In 1843 he was appointed Professor of Composition in the conservatory at Leipzig, and

in 1830 musical director at Düsseldorf. While living at Düsseldorf he became deranged, attempted suicide in the Rhine, was rescued and taken to an asylum. D. at Kiel, Schleswig, near Hamburg, July 26, 1856. With the exception of the symphonies, Schumann's works include almost every art-form: two symphonies, several cantatas, an opera, a mass, sonatas, nocturnes, quartets for strings and also for voices, many pieces for the piano, a few for the organ, and a number of song-songs. The symphonies have been accorded a rank immediately after those of Beethoven. The opera *Genoveva* was given at Leipzig, but failed. Schumann possessed a highly cultivated literary ability, and founded the *Zeitschrift* at Leipzig, a music review to which he contributed many important articles. He may also be considered the founder of the so-called romantic or emotional school. There is a certain semi-mystical trait about a number of Schumann's compositions, which, however, does not prevent him from being clear and strong in the majority of his works, at least in those composed prior to the time when he began to be clouded with coming insanity. The gradual approach of this sad fate may be traced in the works themselves. Several lives of Schumann have been published, including those by Wladislawski (3d ed., Dresden, 1891), Karg, Berlin, 1879, and Prof. Niekisch, of Edinburgh (1890). Also see his *Collected Writings* as editor of the *Neue Zeitschrift*, with a number of letters (4 vols., Leipzig, 1854; 3d ed. 2 vols., 1875).—His wife, Clara (Wiese), b. at Leipzig, Sept. 13, 1819, was the most celebrated female pianist of her day. She has contributed greatly to a correct understanding of her husband's works by her masterly interpretation of them both in public and private. Besides this, Clara Schumann may be said to have first introduced Chopin to the German musical world. DUNSTON BUCK.

Schurman, Jacob Gould, D. Sc., LL. D.: president of Cornell University; b. at Fredonia, Prince Edward Island, Feb. 22, 1824; educated first in Canada, and then (from 1850 to 1860) in England, Scotland, France, and Germany. He was Christian scholar for Canada 1875-78; holder of Robert Trevelyan fellowship (for Great Britain) 1878-80; professor of Logic, Psychology, and English Literature in Amherst College 1880-82; professor of Philosophy in Cornell College 1882-90; professor of Philosophy in Cornell University since 1890, and president since 1892; editor of *The Philosophical Review* since 1892 and of *The School Review* since 1893; author of *Kantian Ethics and the Ethics of Evolution* (1891); *The Ethical Import of Darwinism* (1892); *Belief in God* (1890); and essays and addresses on moral, religious, educational, and philosophical subjects.

Schurz, Adolph, Cam. LL. D.: statesman and author; b. a lawyer, near Cologne, Rhinish Prussia, Mar. 2, 1829; educated at the gymnasium of Cologne and at University of Bonn 1846-48; aided Prof. Gottfried Kinkel in the publication of a liberal newspaper, begun after the revolutionary outbreak of 1848; took part in the revolutionary movements of 1848 and in the following year, and succeeded in effecting the escape of his companion, Kinkel, from imprisonment in the fortress of Spandau. After spending some months in Paris (1851-52) he settled in the U. S.; entered with great interest national politics, becoming a leader of the German faction of the newly founded Republican party. He began as reporter of law at Milwaukee in 1859; was prominent in the Republican national convention at Chicago 1860, and in an ensuing presidential campaign; was appointed by President Lincoln minister to Spain Mar., 1861, but resigned in December of the same year in order to enter the army. His retirement was highly honorable. He was appointed brigadier-general of volunteers Apr., 1862; became major-general May, 11, 1863; commanded a division in the second battle of Bull Run and in the battle of Chancellorsville; was temporarily in charge of the Eleventh Army-corps at Gettysburg; took part in the battle of Chattanooga, and resigned May 9, 1865. Having settled in Missouri, he was U. S. Senator from that state 1869-73, and acquired a high reputation for ability by his speeches on finance and national policy. The policy of Grant's administration drove him into the "liberal" movement, and he presided over the Cincinnati convention which nominated Horace Greeley for the presidency 1872. After his return from a visit to Europe in 1875 he became a resident of New York. He took part in the second campaign of 1876 in Ohio, advocating the election of Hayes on a "hard-money" platform, was one of the names of the independent conference of May 15, in New York, and Secretary of the Interior 1877-81. From 1881 to

1892 he was editor-in-chief of the New York *Evening Post*. In the campaign of 1884 he repudiated the candidacy of Blaine, and was one of the earliest and most vigorous of the Republican supporters of Cleveland. Civil-service reform, tariff reform, and the purification of New York politics have received his hearty support. His *Life of Henry Clay* (1897) has given him a high place as an historical writer and interesting writer. F. M. COLBY.

Schus'tar (Arab. *Tislar*): town; in the province of Khuzestan, Persia; on the Karun; in lat. 32° 5' N., lon. 48° 02' E. (see map of Persia and Arabia, ref. 8-11). It is fortified, and its streets, though narrow and dirty, are lined with elegant houses, but large parts are in ruins and uninhabited since the plague and the inundation which early in the nineteenth century successively visited the city. It was a flourishing Persian provincial capital, and in ancient times was in a populous district, with Susa (Bibi, Shushan) to the N. W. and Ham Hormuz on the opposite side. Pop., according to Hüner, 27,000. Revised by M. W. HARRINGTON.

Schura'ov, Pyotr Alexandrovich, Count: diplomatist; b. in St. Petersburg, Russia, July 15, 1827; entered the army, and became a general at the age of thirty. As governor-general of the Baltic provinces 1863-66 he showed great tolerance in dealing with the German element in the population and opposed the persecutions of the Protestants. In 1890 he was made chief of the secret service, just as the Nikhil movement began to show its power. In 1873 he was sent as ambassador to London, and arranged the marriage between the daughter of Alexander II. and the Duke of Edinburgh. Again representing his Government at the court of St. James, he did much to avert the threatened war between Russia and Great Britain after the Russo-Turkish war of 1877-78. D. in St. Petersburg, Mar. 22, 1899.

Schuyler, Alfred: city; capital of Colfax co., Neb.; on the Platte river, Shell creek, and the Union Pac. and the Harrington Route railways; 16 miles E. of Columbus, 20 miles W. of Fremont (for location, see map of Nebraska, ref. 10-11). It contains 6 churches, high school building (cost \$25,000), a large U. S. sugar-beet experiment station, flour-mill, cigar factory, 2 national banks with combined capital of \$100,000, 2 State banks with capital of \$27,000, and 4 weekly newspapers. Pop. (1880) 1,017; (1890) 2,191; (1895) estimated, 3,100. Editor of "Sun."

Schuyler, Edmund, LL. D.: diplomatist; b. at Ithaca, N. Y., Feb. 20, 1840; graduated at Yale in 1859 and at Columbia Law School in 1863. He was U. S. consul at Moscow 1867-69 and at Reval 1869-70; secretary of legation at St. Petersburg 1870-75 and at Constantinople 1875-78; *chargé d'affaires* at Bucharest 1880-82; minister to Greece, Serbia, and Roumania 1882-84; consul-general at Cairo from 1889 till his death. In 1875 he traveled in Central Asia; an account of the journey is given in his *Turkistan* (2 vols., 1876). Besides contributions to magazines, etc., he wrote also *Peter the Great* (2 vols., 1884) and *American Diplomacy* (1886). D. at Cairo, Egypt, July 18, 1890.

Schuyler, Peter: soldier; b. probably near Newark, N. J., about 1710; recruited and commanded the regiment called the Jersey Blues, and joined the army for the invasion of Canada 1746; commanded Fort Clinton in Saratoga 1748-49; again joined the colonial army with his regiment 1754; attended the congress convoked by Gov. Shirley at New York 1755; was in command at Oswego when that place was taken by the French Aug. 14, 1756, and for a short time was a prisoner in Canada, and was again in command of the New Jersey regiment in Sir Jeffrey Amherst's campaign, which resulted in the conquest of Canada 1759. D. near Newark, N. J., Nov. 17, 1762.

Schuyler, Philip: b. at Albany, N. Y., Nov. 20, 1738. He was appointed captain of New York volunteers in June, 1755, and was engaged in the expedition against the French at Crown Point. At the end of the campaign of 1756 he left the army, but in 1758 accepted the appointment of ensign with the rank of major. Two days after the battle of Bunker Hill Congress appointed him a major-general, and placed him in command of the northern department. In the expeditions against Canada Schuyler commanded that by way of Lake Champlain, but was compelled, owing to ill health, to relinquish his command to Montgomery in September and return to Albany, after having taken possession of Isle au Noix on Nord river. At Albany, besides continuing to exercise an active supervision of affairs in the northern department, his influence among the Indians was

of great value. The failure of the Canada expedition excited much hostility toward Schuyler, and insinuations were uttered against his loyalty, which became so offensive that in the autumn of 1776 he sent in his resignation to Congress, which that body declined to accept; but the abuse continuing, Schuyler, in Apr., 1777, proceeded to Philadelphia and demanded a court of inquiry, which entirely approved his management of affairs, and he resumed command of the northern department. The forced abandonment of Ticonderoga by St. Clair, and his retreat to Fort Edward, where Schuyler had just arrived with re-enforcements, compelled the latter to fall back to Saratoga, after using every means to obstruct the advance of Burgoyne. The losses thus sustained in stores, ammunition, etc., caused a widespread consternation throughout the country, and the clamor against Schuyler was renewed, and this time Congress ordered his superseding by Gates. At the time of the latter's arrival (September) to assume command, Schuyler occupied a fortified position at the mouth of the Mohawk, to which he had fallen back from Saratoga. Gates had, since Schuyler's resumption of the command of the northern department, been unfriendly to Schuyler, and it was with feelings of mortification that the latter received the order deposing him at a time when the feeling of depression arising from former disasters had been dispelled by recent victories, and when volunteers were from all quarters swelling his army. He, however, obediently turned over his command and placed his successor in possession of full information of the situation, and, though without command, remained with the army to aid in any capacity, and was present at the surrender of Burgoyne. A court of inquiry again approved of his management in strong terms, but in Apr., 1779, he resigned, though continuing to render valuable service in the military operations in his native State. From 1778 to 1781 he was a member of the Continental Congress, and in 1789 was appointed U. S. Senator from New York, and again in 1797 to succeed Aaron Burr. In the New York Senate he contributed largely to the code of laws adopted by the State, and was an active promoter of the canal system. D. at Albany, Nov. 18, 1804. See his *Life and Times*, by B. J. Lossing (2 vols., 1860-62; new ed. 1872).

Schuykill, skool'kil [Dutch, liter., hidden channel, because unobserved by the first explorers]: a river which rises in Schuylkill co., Pa., and after a southeasterly course of 125 miles flows into the Delaware at Philadelphia, which city it traverses. Its lower portion affords extensive wharfage, and is of much commercial importance. The river was (1816-25) adapted to slack-water navigation for freight-boats to Port Carbon, 3 miles above Pottsville. The river affords the greater part of the water-supply for Philadelphia. It enters the Delaware between League island, containing a navy-yard, and Mud island, on which is Fort Mifflin.

Revised by I. C. RUSSELL.

Schuylkill Haven: borough; Schuylkill co., Pa.; on the Schuylkill river and canal, and the Lehigh Val., the Penn., and the Phila. and Reading railways; 4 miles S. of Pottsville, 31 miles N. N. W. of Reading (for location, see map of Pennsylvania, ref. 5-H). It is in an agricultural and coal-mining region, has large wharves and canal-boat docks for shipping coal, and contains rolling-mills, hosiery-works, railway car-shops, shoe and soap factories, and a weekly newspaper. Pop. (1880) 3,052; (1890) 3,088.

Schwab, shraap, GUSTAV: author; b. at Stuttgart, Germany, June 19, 1792; studied theology and philosophy at Tübingen; was appointed Professor of Ancient Literature in the gymnasium of Stuttgart in 1817; pastor at Gomaringen in 1837, and of the St. Leonhard church in Stuttgart in 1840, where he died Nov. 4, 1850. His poems show purity and warmth of feeling, though they do not possess the simplicity and classic perfection of form of Uhland's songs. Like the latter poet and other members of the Suabian school to which he belonged he wrote many ballads, some of which have become very popular. The first collected edition of his *Gedichte* appeared in 2 vols. in 1828-29; a second revised edition, *Neue Auswahl* (Stuttgart, 1838), has been often reprinted. Of his prose works, the most remarkable are *Schillers Leben* (Stuttgart, 1840; 3d ed. 1859); *Sagen des klassischen Alterthums* (Stuttgart, 1838-40; 14th ed. Güterslohe, 1882); *Deutsche Volksbücher* (1843; 13th ed. Güterslohe, 1880); and *Wegweiser durch die Litteratur der Deutschen* (Leipzig, 1846; 4th ed. 1870). See K. Klüpfel, *Gustav Schwab als Dichter und Schriftsteller* (1884).

Revised by JULIUS GOEBEL.

Schwalbe, shraal'be, GUSTAV ALBERT, M. D.: professor of anatomy; b. at Quedlinburg, Germany, Aug. 1, 1844; educated in the gymnasium at Quedlinburg, and at the Universities of Zurich, Bonn, and Berlin; became privat-docent at Halle Jan., 1870; professor at Freiburg in Baden May to Oct., 1871; professor extraordinary at Leipzig Oct., 1871 to Oct., 1873; ordinary Professor of Anatomy at Jena Oct., 1873, to Apr., 1881; held same position at Königsberg Apr., 1881, to Oct., 1883, when he accepted a chair at Strassburg. His principal works are *Lehrbuch der Neurologie* (1881) and *Lehrbuch der Anatomie der Sinnesorgane* (1887). He is editor of *Morphologische Arbeiten* (begun 1891), and has edited part i. of *Anatomy* (20 vols., 1872-92), and with Hoffmann and Hermann a *Yearly Report of Anatomy and Physiology*.

Schwal'ber [better known as CHELIDONIS, the punning Græco-Latin translation of the German *Schwalbe*, a swallow; Gr. *χελιδών*]: a friend of Albert Dürer, and the author of the text in Latin verse to his three series of wood-cuts, *The Apocalypse*, *The Passion of Christ*, and *The Life of the Virgin Mary*. Schwalber was a monk of the abbey of St. Egidius (St. Julian, St. Gilgan, St. Giles), built by Conrad III. in 1140 for a society of Scotch Benedictines. He was nicknamed Musophilus, from his love of learning, and he had a reputation for considerable knowledge of the classical Latin poetry. While a member of this monastery he wrote the text for Dürer's wood-cuts, besides verses about his monastery, *Versic. de Fund. Cœnob. Egid.*, and about the abbots, *Versic. de Abbat. nonnullis ejusdem Cœnob.* In 1515 Schwalber left Nuremberg to become abbot in the Schotten Kloster, near Vienna. D. there Sept. 8, 1521.

Schwann, THEODOR: physiologist; b. at Neuss, Prussia, Dec. 7, 1810. He studied at the Jesuits' College, Cologne, at Bonn, Würzburg, and Berlin, where he graduated in medicine in 1834. He was assistant to Johannes Müller in the Anatomical Museum at Berlin till 1838. He discovered pepsin and its function in digestion, the envelop of nerve-fibers, the organic nature of yeast, and made a series of researches on muscular contractility, and other physiological subjects. He was Professor of Anatomy at the Roman Catholic University of Louvain 1838-48, and at Liège from 1848. D. at Cologne, Jan. 14, 1882. His cell-theory, which is the basis of modern histology, was published in *Microscopical Investigations on the Accordance in the Structure and Growth of Plants and Animals* (Berlin, 1839; trans. by Sydenham Society, 1847).

Schwann, White Matter of: See HISTOLOGY (*Nerves and Nerve-centers*).

Schwanthaler, shraan'thal-er, LUDWIG MICHAEL: sculptor; b. at Munich, Aug. 26, 1802, the son of a sculptor, studied in Rome, but wrought in Munich. His statues, decorations, and models, are seen in the great cities of Germany, but chiefly in Munich. He executed the frieze of the Barbarossa hall, the colossal statue of Bavaria, and the metopes of the Ruhmeshalle which adjoins it, the colossal bronze statues in the throne-room of the palace at Munich, and the monumental images in the Walhalla. D. Nov. 28, 1848.

Schwartz, shraarts, CHRISTIAN FREDERICK: missionary; b. at Sonnenburg, Prussia, Oct. 26, 1726; studied in the University of Halle 1746-49; was ordained at Copenhagen 1749; embarked at London for India, where he arrived July, 1750; settled at Tranquebar, a Danish mission on the Coromandel coast; transferred his services to the English Society for Promoting Christian Knowledge 1766, when he removed to Trichinopoly, and in 1778 to Tanjore; was sent as ambassador to Hyder Ali at Seringapatam to negotiate a peace, and admitted by him after all other envoys had been refused, and succeeded in relieving the city of Tanjore from imminent danger of famine by his influence with the native farmers, who brought in their cattle on his personal pledge of payment. D. at Tanjore, Feb. 13, 1798. He was one of the most celebrated missionaries of modern times. He aided Schultz in translating the Bible into Tamil, and was tutor to the son and heir of the rajah of Tanjore, who erected to his memory in the mission church a magnificent monument designed by Flaxman; the East India Company also placed a monument of him by Bacon in St. Mary's church, Madras. See *Memoirs of his Life and Correspondence*, by H. Pearson, D. D. (2 vols., 1833; 3d ed. 1839).

Schwartz, MARIA SOFIA (*Birath*): novelist; b. at Braas, Sweden, July 4, 1819; was married in 1840, and became a widow in 1858. She was the author of a number of novels, all of which have been translated into German and

black, and many of them into English. Their interest eventually in their plot. Among them may be mentioned *Thomas of Lincoln grammar or folio* (The Man of Birth and the Women of the Papal, 1666); *Hand von lebendigen (1670)* and *Education*; *Arbeits- und Lebensregeln* (Luther's Rules, 1666); *Aufgaben- und* (The Nobleman's Daughter, 1666); *The Theologian's Son* (1666); *A Child of the Time* (1677). D. 1664. D. R., 1666.

Schwartz, Hermann, whose true name is said to have been *Herrmann Achenbach*; the reputed inventor of gunpowder; received the name of Bernhard on entering a Prussian infantry at Münster, Cologne, or Hildesheim, and was called Schwartz (black) on account of his position for the time being. According to legend, he invented gunpowder in 1326 (see dates 1326 and 1328 are also given), and in Freiburg, his reputed birthplace, a monument was raised in his honor in 1862. All the details of his life are uncertain, however, while it is certain that gunpowder was known before 1326, though not used in war or hunting.

Schwaburg-Rudolstadt, principally and state of the German empire, between the Saxon duchies, comprising an area of 265 sq. miles, with 85,000 inhabitants in 1890. It is located with well-wooded parts of the Thüringerwald, and occupies a north-facing slope of the principal mountain. Flax is not extensively grown, and some linen manufactures are noted. The total revenue for 1890 was 2,542,950 marks; expenditure, 4,015,688 marks. Capital, Rudolstadt.

Schwaburg-Sondershausen, *Sondershausen*, principally and state of the German empire, in the Prussian province of Saxony; comprising an area of 265 sq. miles, with 75,710 inhabitants in 1890. It resembles in every respect Schwaburg-Rudolstadt, except that it is a little smaller. Capital, Sondershausen.

Schwarzenberg, *schwarz'berch*: a princely family of Germany, descended from *Leobhard von Schwarzheim*, who was ennobled in 1417 by the Emperor Sigismund, and in 1521 bought the estate of Schwarzenberg in Franconia. In 1520 the head of the family was made a prince of the empire by the Emperor Leopold I., and in 1746 this dignity was conferred on all members of the house by the Emperor Francis I. The most celebrated names of the family are—(1) *Karl Philipp*, soldier; b. in Vienna, Apr. 15, 1771; received a military education, and distinguished himself in the battles of Würzburg, Ulm, Hollabrunn, and Wagram, after the peace of Vienna (Oct. 14, 1809) he went to Paris as Austrian ambassador, and negotiated the marriage between Napoleon and Maria Louisa. Napoleon placed great reliance on him, and demanded that he should command the Austrian contingent in the Russian campaign of 1812. The absence of his movements and the inefficiency of his measures have provoked much criticism from French historians, but Napoleon himself never uttered a doubt of his ability, and requested the Austrian emperor to make him a field-marshal. In the next year he commanded the Austrian army of observation in Bohemia, and when Austria joined Russia and Prussia he was made commander-in-chief of the allied army, gained the battle of Leipzig (Oct. 16-18, 1813), and led the army victorious into Paris. D. at Leipzig, Oct. 15, 1859.—(2) *Friedrich Johann Friedrich Schwarzenberg*, a member of the preceding; b. at Krimau, Bohemia, Oct. 2, 1800; entered the Austrian army in 1818, and became a lieutenant field-marshal in 1848, shortly before the battle of Custozza, but was mostly employed in diplomatic missions in Russia, Great Britain, Brazil, and Naples, and Nov. 29, 1848, was placed at the head of the Austrian government as chancellor of the empire. He found the empire nearly dissolved, Vienna, Prague, Hungary, and the Italian provinces in open insurrection, the treasury on the verge of bankruptcy, the Austrian influence in Germany almost annihilated, and the German states about to recognize their union under the leadership of Prussia, etc. All these difficulties he confronted with a courage and energy which earned admiration, even among those who were far from approving either his aims or his measures. By the aid of Russia he put down the revolution in Hungary, and in a very short time succeeded in trying to gather once more the disunited parts of the Austrian empire by means of a military and bureaucratic government. He was, however, by no means a mere repetition of Metternich. He was not averse to reform when it could be achieved in a prudent and settled manner. He raised the credit of Austria, and he laid all the Prussian plans in Germany by forcing the southern and middle states over to the Aus-

trian side. D. in Vienna, Apr. 8, 1862.—(3) *Ferdinand Johann Joseph Schwarzenberg*, a brother of the preceding; b. in Vienna, Apr. 6, 1809; was made Archbishop of Salzburg, 1860, cardinal 1862, Archbishop of Prague 1864. He opposed the declaration of the dogma of the papal infallibility as inappropriate, but accepted it afterward. D. in Vienna, Mar. 27, 1867.

Revised by P. M. Colby.

Schwarzwald: See *HEIDE FOREST*.

Schwatka, *schwack*: explorer; b. at Galena, Ill., Sept. 29, 1819; graduated at the U. S. Military Academy at West Point, N. Y.; commissioned second lieutenant in 1871; pursued his studies while in the army, and was admitted to the bar in Nebraska in 1879; graduated in medicine at Bellevue Medical College, New York, in 1876. In 1876 he obtained leave of absence from the army and conducted the Arctic expedition which cleared up the mystery surrounding the fate of Sir John Franklin's expedition. He returned to duty in the army in 1880, but finally resigned in 1885. Between 1881 and 1889 he made three journeys to Alaska for the purpose of exploration, and in one of these trips descended the Yukon on a raft from its source to its mouth. In 1889 he conducted an expedition to Northern Mexico to study the remains of Aztec civilization and those of the cliff and cave dwellers. He received the Linguistic Arctic medal of the Geographical Society of Paris, and a medal from the Imperial Geographical Society of Russia. D. at Portland, Ore., Nov. 2, 1892. See his *Along Alaska's Great River* (New York, 1885); *Norad of the North* (1886); and *The Children of the Cold* (1886).

MARK W. HARRINGTON.

Schwegler, *shueh'ler*, ALBERT: philosopher and theologian; b. at Michelbach, Württemberg, Feb. 10, 1819; studied theology at the University of Tübingen, where he was appointed Professor of Classical Philology in 1848, and later of Ancient History. D. at Tübingen, Jan. 5, 1857. In theology and criticism he belonged to the Tübingen school of Dr. Baur. Besides annotated editions and translations of the Clementine Homilies (1847), Aristotle's *Metaphysics* (1847-48), and Roschius (1852), he published *Der Manichæismus* (1841), which brought him into conflict with the Church and caused him to give up his ministry; *Das Nachapostolische Zeitalter* (1846); and *Ästhetische Geschichte* (unpublished; 1853-54). His best-known work is his *Geschichte der Philosophie* (1848; 11th ed. 1882), originally written for the *Neue Encyclopädie für Wissenschaften und Künste*, but afterward often reprinted and translated into most European languages—into English by J. H. Seelye of Amherst (New York, 1859), and by Seeling in England. His *Geschichte der griechischen Philosophie* appeared in 1859.

P. M. Colby.

Schweidnitz: town of Prussian Silesia; on the Weigritz, 30 miles by rail S. W. of Breslau (county of Gersdorf Empire, ref. 5-B). It is well built, contains several interesting public buildings, and carries on a flourishing manufacturing industry in cloth, paper, leather, chemicals, beetroot-sugar, vinegar, etc. Pop. (1890) 24,725.

Schweigger, *shueg'ger*, KARL ERNST THEODOR, M. D.: ophthalmologist; b. at Halle, Prussian Saxony, Oct. 29, 1800; studied medicine at the Universities of Erlangen and Halle, graduating at the latter 1852; was assistant in Krukenberg's medical clinic 1852-55; in 1856 studied the microscopic anatomy of the eye under H. Müller at Würzburg; from 1857-64 was an assistant of A. v. Grafe at Berlin; in 1860 became privat-docent of ophthalmology at the University of Berlin; in 1868 was appointed Extraordinary Professor of Ophthalmology and director of the eye clinic at the University of Göttingen; in 1871 was appointed extraordinary and in 1873 ordinary professor at the University of Berlin; in 1885 was made privy councillor. He became coeditor of the *Archiv für Augenheilkunde* in 1881. His best-known work is *Handbuch der speziellen Augenheilkunde* (Berlin, 1871).

S. T. AKERSTROM.

Schweighäuser, *shueh'hae'zer*, JOHANN: classical scholar; b. at Strassburg, Germany, June 26, 1742; studied theology and the Oriental languages; went to Paris to perfect his linguistic studies under de Guignes; visited Germany, England, and Holland; was appointed Adjunct Professor of Philosophy at Strassburg in 1770, and in 1775 Professor of the Greek and Oriental Languages. After the organization of the university at Strassburg he was made Professor of Greek Literature and dean of the faculty of letters, and was also appointed librarian. His editions are esteemed for

the elaborate and learned commentaries annexed; among the most valuable are Appian (3 vols., 1782-85); Polybius (8 vols., 1795; 5 vols., 1831, Oxford) with *Lexicon Polybianum*; Seneca's *Epistolæ* (2 vols., 1809); Epictetus (5 vols., 1799); Athenæus (14 vols., 1801-07); Herodotus (6 vols., in 12 parts, 1815), to which was added a *Lexicon Herodoteum* (2 vols., 1824); *Opuscula* (2 vols., 1806). D. at Strassburg, Jan. 19, 1830.

Revised by ALFRED GUEDEMAN.

Schweinfurth, shvîn'fôort: town of Bavaria; on the Main; 28 miles N. E. of Würzburg by rail (see map of German Empire, ref. 5-E). It is beautifully situated and well built, and has large manufactures of chemicals and pigments, especially ultramarine blue and Schweinfurth green. Large cattle and wool markets are held here. Pop. (1890) 12,438.

Schweinfurth, GEORGE AUGUST: explorer and botanist; b. at Riga, Russia, Dec. 29, 1836; studied botany and natural science at Heidelberg, Munich, and Berlin; made several journeys in the valley of the Nile to investigate the flora and fauna of those regions 1864 to 1886, and wrote *Plantæ quædam Niloticæ* (1862); *Beitrag zur Flora Æthiopiens* (1867); *Reliquiæ Kotschyaræ* (1868); *Im Herzen von Afrika* (2 vols., 1874; translated into English as *The Heart of Africa* in 1874); *Artes Africanæ* (1875), etc.

Revised by M. W. HARRINGTON.

Schweinfurth Green, or **Paris Green**: a pigment said to have been discovered by Ruz and Sattler at Schweinfurth in 1814, but there is reason to believe that it was manufactured at Vienna at an earlier date under the name of *Mitis green*. Other names are *Imperial*, *Vienna*, *Emerald*, and *Kaiser Green*. Some varieties of berg or mountain green and of Newied green consist of this pigment mixed with gypsum or heavy spar. The first chemical paper by Justus von Liebig related to this color; it was published by him in July, 1822, in the *Repertorium der Pharmacie*.

Schweinfurth green is an aceto-arsenite of copper of variable composition. It has been very extensively used for wall and other paper staining, for tarlatans, artificial flowers, and as a vermin exterminator, especially for cockroaches and potato-bugs. Its use for wall-paper has greatly diminished. Much has been written with regard to the dangers of arsenical wall-paper. It has been alleged that not only may green papers, to which the pigment is loosely attached, give off arsenical dust, which may enter the mouth and air-passages and produce harm, but that paper containing even very small quantities of arsenic, in any form, may evolve arseniuretted hydrogen or other arsenical gases of a very poisonous character. Distinguished chemists, however, deny the possibility of the production of any arsenical gases from wall-paper, and the alarming suggestions concerning arsenical wall-paper are regarded as entirely without foundation.

Revised by IRA REMSEN.

Schweinitz, EDMUND ALEXANDER, de, S. T. D.: bishop; son of Lewis David von Schweinitz; b. at Bethlehem, Pa., Mar. 20, 1825; studied theology in the Moravian seminary of his native town and at the University of Berlin; became a clergyman, and was pastor of several churches in Pennsylvania; edited *The Moravian* for several years; consecrated bishop at Bethlehem 1870; was president of the Moravian College and Theological Seminary 1867-84; was one of the translators of Herzog's *Realencyclopædie* (Philadelphia, 1856, seq.), and author of *The Moravian Manual, being an Account of the Moravian Church* (Philadelphia, 1859; 2d ed. Bethlehem, 1869); *Systematic Beneficence* (1861); *The Moravian Episcopate* (Bethlehem, 1865; 2d rev. ed. London, 1874); a *Life of Zeisberger, the Western Pioneer and Apostle to the Indians* (Philadelphia, 1870); and *The History of the Church known as the Unitas Fratrum* (1885). D. Dec. 18, 1887.

Schweinitz, GEORGE EDMUND, de, A. M., M. D.: ophthalmologist; son of Bishop de Schweinitz; b. in Philadelphia, Pa., Oct. 26, 1858; educated at the Moravian College, Bethlehem, Pa., and at the University of Pennsylvania, where he graduated in 1881; prosector of anatomy in the university 1883-88; lecturer on medical ophthalmology 1891-92; Professor of Ophthalmology, Philadelphia Polyclinic, 1891; Clinical Professor of Ophthalmology, Jefferson Medical College, Philadelphia, 1892; ophthalmic surgeon to Children's, Philadelphia, Methodist, and Orthopaedic Hospitals. His principal published works are *Congenital Anomalies of the Eye in American System of Ophthalmology* (1889); *Affections of the Eyelids, Lachrymal Apparatus, Conjunctiva, and Cornea in Cyclopædia of Diseases of Children* (vol. iv., 1890); *Affec-*

tions of the Conjunctiva, Cornea, and Sclera in System of Therapeutics (1892); *Diseases of the Eye: a Handbook of Ophthalmic Practice* (Philadelphia, 1892). He was editor, with Dr. Hare, of *The University Medical Magazine* Oct., 1888-Sept., 1889, and of the same journal with Dr. E. Martin Oct., 1889-Sept., 1891. Since 1892 he has been ophthalmic editor of *The Therapeutic Gazette*.

Schweinitz, LEWIS DAVID, von, Ph. D.: botanist; b. at Bethlehem, Pa., Feb. 13, 1780; educated in Germany, where he resided from 1798 to 1812; Moravian minister at Salem, N. C., 1812 to 1821; settled in his native town 1821, and resided there until his death Feb. 8, 1834. He added by his own researches more than 1,400 new species to the catalogue of American flora, the greater part being fungi which had been previously little studied. He was the author of *Conspectus Fungorum in Lusatia superioris agro Niskiensi crescentium e methodo Persooniana* (with Albertini, 1805); *Synopsis Fungorum Carolina superioris, etc.* (1822); *Synopsis Fungorum in America Boreali media degentium* (1831-34); and monographs on *Viola*, *Carex*, and other genera.

Revised by CHARLES E. BESSEY.

Schweizer-Sidler, shvî't'ser-zid'ler, HEINRICH: Latinist; b. at Elgg, Switzerland, Sept. 12, 1815; educated at Zurich; teacher in gymnasium of Zurich, docent in the university, and professor from 1871; author of *Elementar- und Formenlehre der lateinischen Sprache* (1869; 2d ed. as *Grammatik der lateinischen Sprache*, 1888); *Germania of Tacitus* (5th ed. 1890); and numerous articles in journals. D. at Zurich, Mar. 31, 1894.

B. I. W.

Schwenkfeld, HANS KASPAR, von: sectarian leader; b. at Ossig, Silesia, 1490; employed in the service of the Duke of Liegnitz; embraced the Reformation with great enthusiasm, but developed afterward its ideas in a manner which brought him in conflict with the Reformers. It was especially his conception of the Lord's Supper as a sacrament of spiritual nourishment without change in the elements and his demands for the establishment of a Church to which only the saints, the truly converted, should be admitted, which gave offense. His teaching was known as The Middle Way. Political pressure having forced the Duke of Liegnitz to adopt Lutheranism, Schwenkfeld voluntarily left Silesia (1529) and went to Strassburg. There he was suspected of Anabaptism, tried, and banished (1533). The next two years were passed in Augsburg, but again Lutheran antagonism drove him away and he went to Ulm, and from there as a center went about preaching. D. at Ulm, Dec. 10, 1561. In his *Grosse Confession* (1540-57, 3 parts) he gave a representation of his doctrines. An edition of his numerous writings appeared at Frankfurt 1564-70 in 4 vols. folio. A sect, the Schwenkfelders, was organized in Silesia, but most of them emigrated in 1734 and settled in Pennsylvania, where they number about 1,000 members, and have their own churches and schools. See O. Kadelbach, *Ausführliche Geschichte Kaspar von Schwenkfelds und der Schwenkfelder in Schlesien, der Ober-Lausitz und Amerika* (Lauban, 1861).

Revised by S. M. JACKSON.

Schwerin: capital of the grand duchy of Mecklenburg-Schwerin, Germany; on the western side of Lake Schwerin (see map of German Empire, ref. 2-F). It is connected by railways with Hamburg and Wismar, and is beautifully situated, surrounded with old walls, generally well built, and contains many magnificent buildings, among which the ducal palace is the most remarkable. It has good educational institutions, museums, galleries, and collections, and numerous manufacturing establishments. Pop. (1890) 33,643.

Schwerin, KURT CHRISTOPH, Count von: soldier; b. in Swedish Pomerania, Oct. 26, 1684; studied at Leyden, Greifswald, and Rostock; entered the Dutch army in 1700, and fought at Ramillies and Malplaquet; took service with the Grand Duke of Mecklenburg in 1706, and distinguished himself by repelling the Hanoverians, who invaded the country; after that part of Pomerania in which his estates were situated was ceded to Prussia, he entered the service of that country, and was sent by Frederick William I. on several important diplomatic missions. He enjoyed in a still higher degree the confidence of Frederick the Great, who raised him to the rank of field-marshal and gave him the title of count. He won the battle of Mollwitz Apr. 10, 1741, in the first Silesian war, stormed Prague Sept. 16, 1744, in the second, and fell in the battle of Prague May 6, 1757, in the Seven Years' war. See Varnhagen von Ense, *Biographische Denkmale* (Leipzig, 1873).

F. M. COLBY.

Schwesethum: See **RAVENHOLM AND RAVENS OF THE FINE FINE**.

Schwytz, *shvütts*: one of the four so-called forest cantons of the cantons of Switzerland; borders N. on the Lake of Zurich and S. on the Lake of Lucerne, and comprises an area of 251 sq. miles. It is entirely covered with mountains, but only one peak, the Rindstock, on the eastern frontier, 8,990 feet high, reaches the line of everlasting snow. Agriculture can be pursued only to a limited extent, though fruits and wine are produced. Cattle-breeding is the principal branch of industry, and cheese, cattle, and timber are largely exported. Manufactures are confined to home demands. The inhabitants speak German, and are Roman Catholics. Pop. (1890) 50,907. The capital is Schwytz, a walled town, with a good college and 6,700 inhabitants.

Sclarea, *shk-lay*: town, in the province of Girgenti, Sicily, 31 miles N. W. of Girgenti (see map of Italy, ref. 5-6). It occupies a site near the ruins of the ancient *Theraps Scythra*, the birthplace of Agathodes (220 A.D.). The cathedral was founded in 1090 by Julia de Hauteville, daughter of Roger I. At the foot of Monte S. Caterino are hot wells that have been used as baths from Phoenician times. On the sandy gravel-banks are worked. Pop. 91,431.

Scleridae (Mod. Lat., from *Scler*, from *Scler*, the typical genus, from Lat. *scler* = *Os*, *aridus*, a sea-fish, the mackerel; *Scler*, and *idus*), a family of fishes of the order *Telostei*, including the drum, croakers, kingfishes, and weakfishes. The body is more or less elongated and compressed; the scales small and distributed in very oblique rows; the lateral line continuous and extending generally between the median rays of the caudal fin; dorsal fin two, the first short and with the spines generally falcate, the second longer and with branched rays; anal fin comparatively short, generally with two, but sometimes with one or three, spines; pectoral fins with branched rays; ventrals thoracic, each with a spine and five rays; the skull is channelled by muciferous canals, bridged over by osseous bars; the stomach is caecal, and pyloric appendages are developed in moderate number; the air-bladder has generally a number of slender caecal appendages. The family is represented by about 130 or 140 species, distributed in different parts of the world; most of them are marine and inhabitants of the tropical and subtropical regions, but a few are confined to fresh waters. The most celebrated fish of this family is the famed sclera of the ancients, *Sclera aquila* of modern systematists. This grows to a very large size, sometimes attaining a weight of more than 60 lb. It was much esteemed by the Romans for the delicacy of its flesh, and was generally sold in slices. The scales or osseous of the ear are comparatively large in this fish, as in others of the family, and they were esteemed in former times as "coddles," and were encased in gold and suspended from the neck.

THOMAS GILL.

Sclafuta, *shk-lay-ut*. **ANTONIO**: economist; b. at Presida, near Naples, in 1817; studied law, and gave himself to its practice, but in 1840 he was called to the University of Turin as Professor of Political Economy; in 1848 was Minister of Agriculture and Commerce at Naples; was arrested and imprisoned in 1849, and after three years of confinement was banished. He then returned to Turin, where he resumed his chair in the university, and in 1859 was elected to Parliament; in 1860 became chief secretary of the ministry of finance, and two years later was sent to Paris to negotiate a commercial treaty between Italy and France; in 1865 he took the portfolio of finance, and during the war of 1869 signed the decree for a legal-tender paper currency and for a forced loan. He also warmly advocated the impo- sition of a tax upon personal property. In 1872-73 he was for some months Minister of Public Instruction. His chief works are *I Principi dell'Economia Sociale* (Naples, 1849); *La Proprietà dei Prodotti di Ingegno* (Naples, 1853); *La Scienza e la Pratica* (Leghorn, 1849); *Trattato elementare dell'Economia sociale* (Turin, 1849); and *Prolegomena alla prima parte del corso di economia e diritto* (Turin, 1853). D. at Presida, Oct. 14, 1877. See also *Osario*, *La vita, i tempi e le opere di Antonio Sclafuta* (Rome, 1879). **F. M. COCHR.**

Scleritis (from Lat. *scler*, from Lat. *scler* = *Os*, *aridus*, a sea-fish, the mackerel; *Scler*, and *itis*, deriv. of *argos*, pain in the loins, deriv. of *argos*, hip-socket); *neuritis* ischialis, a neuritis of neuritis of the great sciatic nerve, the great plexus, or any of the nerves of the thigh and hip. According to Nishner, the cutaneous nerve of the thigh, the superficial branches of the peroneal nerve, and the sural

nerve are the principal seats of what is called sciatica. Exposure, rheumatism, gout, tumors near the nerve, food poisoning, haemorrhoids, disordered venous, neuritis, and post-traumatic, are reckoned among the causes. It sometimes follows a severe labor in childhood. Exacerbation, cupping, the moxa blisters, hot baths, and local or general anodynes are frequently palliative, and sometimes curative. Venous stasis may often be relieved by quinine. Issues of potassium and turpentine are both sometimes extremely useful, and so is the constant electric current. Absolute rest with fixation, and dosing alternately with hot and cold water, or the application of ice for a short time daily, will sometimes cure obstinate cases. Revised by W. PERRY.

Science [tri O. Fr., from Lat. *scire*, to know, knowledge, skill, science, deriv. of *scire*, to know]: in a general sense, knowledge reduced to order; that is, knowledge classified and arranged so as to be easily remembered, readily referred to, and advantageously applied. All science is based on the assumption that the laws of nature are immutable. From this point of view science may be regarded as a knowledge of the laws of nature, embracing the processes of experiment, observation, and comparison, by which they are discovered, and the modes of reasoning by which their operation in the production of phenomena is made known. Hence most widely it signifies the knowledge of a truth in relation to other truths. Various attempts have been made to classify the sciences, so as to make clear their relations to each other. Of these the best known is that of Comte, who first explicitly drew the distinction between abstract and concrete sciences. See **HERBERT SPENCER ON THE CLASSIFICATION OF THE SCIENCES AND PRINCIPLES OF SCIENCE**, and the article **POETRY**. **R. A. R.**

Science, Christian: a doctrinal and curative system discovered in 1880, by Mrs. Mary Baker Eddy (a native of New Hampshire then resident in Lynn, Mass., and now professed and practiced by several hundred thousand disciples in both Europe and America. As stated in their Church Tenets, its members acknowledge and adore one Supreme God, and take the Scriptures for their guide to eternal life. They acknowledge God's Son and the Holy Ghost, and man as the Divine image and likeness. They acknowledge God's forgiveness of sin in the destruction of sin, and believe that sin and suffering are not eternal. They accept the atonement as the efficacy and evidence of Divine Love, of man's unity with God, and the great merits of the Way-shower. They hold the way of Salvation demonstrated by Jesus to be the power of Truth over all error, sin, sickness, and death, and solemnly promise when they unite with the Church to strive, watch, and pray for that Mind to be in them which was in Christ Jesus, viz.: to love one another, and to be meek, merciful, just, and pure. The curative system is variously spoken of as "Christian Science Mind-healing," or "Metaphysical Healing," and is based on the theory of the unreality or non-existence of matter. All is Mind, and there is, in reality, but one Mind, viz., God. Man is the idea of God.

The following authoritative statement in regard to the history and principles of the system was specially prepared for this cyclopædia by Mrs. Eddy, and is given just as it left her pen:

CHRISTIAN SCIENCE is the Science of God and His universe, including man. Its Principle is the divine triunity of Life, Truth, and Love. There is but one God, one Christ, and one Jesus of Nazareth. God is Mind, and All-in-all; therefore there can be nothing real but infinite Mind, and its manifestation.

The compound individual idea of the Divine Principle is Christ, the spiritual idea of Truth, personifying the primal order of Being, and so perfect as its source.

Jesus represented the incarnation of Christ's Principle, he stood for Truth, healing the sick and sinful, and triumphing over the tomb. By his metaphysical therapeutics, it was proved that miracles do not violate, but fulfill law.

Jesus' mission was not limited to any period, but touches universal humanity. Hence his promise: "Verily, verily, I say unto you, he that believeth in me, the works that I do shall he do also; and greater works than these shall he do." And "these signs shall follow them that believe;" the word *them*, instead of *you*, clearly making this assurance applicable to all Christians in all ages. Jesus' statement for sin was a human sacrifice which demonstrated man's life in God, divine Good, and this verity when understood is the way of salvation, for it destroys sin. (See **ROMANS 8:1**.)

In the material world, like produces like—a bird is not the product of a beast. In the spiritual world—that is the real world,—matter is not the progenitor of mind. If Mind is first, it cannot produce its opposite, matter. If matter is first, it cannot produce mind. Hence the irrefragable, logical, cardinal point in Christian

Science.—There is no matter, All is Mind. Christian Science defines Soul and dreams. In truth Soul is God. In error soul is sense. Dreams are the conscious and unconscious states of matter; wherein the night dream is quite as real and tangible as the day dream; for Life or mind in matter, is a dream at all times, and is never the reality of Being.

That matter is substance, or includes mind, is pantheism which has no kinship with Christ. Spirit must be substance, since matter is neither the substance of Spirit, nor its reflex universe.

Man's origin is not material but spiritual. The universe is not the result of physical propulsion, but is an evolution from infinite Mind. "God is Spirit," Truth. As matter is the opposite of Spirit, Truth, so must it be the opposite of God. Matter is the subjective state of error, deflecting from the everlasting uprightness, and eventuating in false personal beliefs in sin, disease, and death, only to be overcome by conquering Truth,—eradicated not by drugs or hygienic rules, that is, laws of matter, but by the power of Mind. Jesus, referring to this original evil, which he cast out in healing the sick, called it "the devil," and "a liar from the beginning."

This theory is corroborated by Jesus' supremacy over all phases of matter,—a control not supernatural, but divinely natural, in one abiding in God, Good, the centre and circumference of the universe. From this it follows that genuine healing must be wrought upon thought, not body. When following these leadings of scientific Revelation the Bible was the writer's only text book.

Practically Christian Science is the fulfilling of the law of Love, namely, loving God supremely, loving your neighbor as yourself, and loving your enemies.

These doctrines were brought into modern light by the present writer, in the years 1866-7. When apparently near death, her convictions laid hold upon the sublime verity that all evil, whether moral or physical, must be non-existent because contrary to the omnipotent Good, God. She found in the Bible a new meaning, whereby she was snatched from the Valley of shadows, and her feet set on the Rock. As it was through this understanding of God, through Christ, God's idea, that all healing must come, she adopted Christian Science as the name of this curative system.

In 1867 she began healing others with wonderful success, and taught her first student.

Her textbook, *Science and Health with Key To The Scriptures*, is the outgrowth of her experience, and was first published in 1875. On July 4th, 1876, the first Christian Scientist Association was organized. In June, 1879, the first Church of Christ, Scientist, was founded in Boston, with twenty-six members, the writer becoming its pastor, though she did not receive ordination till 1881. This Mother Church has, in 1895, a membership of five thousand one hundred in different parts of the country, about eight hundred being local residents. During the same year she founded her Massachusetts Metaphysical College in Boston, the laws then enabling her to obtain a charter for medical instruction; though no such privileges were granted after 1883. She started in 1883, as editor and proprietor, *The Christian Science Journal*, still the official organ of the Scientists. The first National Association was convened in New York, on February 11, 1886, and still meets, though discarding organized action.

The first denominational chapel was erected at Oconto, Wisconsin, in 1886, and has been followed by others. In 1894 the Boston Church completed a beautiful edifice, as a Testimonial to the writer of this. It was dedicated on Jan. 6th 1895, and cost, including the land, nearly two hundred and fifty thousand dollars. In 1894, it was estimated that in Europe and America there were at least two hundred thousand disciples, while half a million people more attest its power. In the U. S., in 1894, there were three hundred societies meeting regularly for worship, twenty-six teaching institutes, and sixty-six dispensaries and reading rooms.

The Christian Science Publishing Society, issues *The Christian Science Journal*, the *Quarterly Bible Lessons*, and many tracts, some in German and Norwegian. The writer's works include *Science and Health with Key to the Scriptures* (already mentioned), *Retrospection and Introspection* (1891), *Christ and Christmas*, a poem, illustrated (1893), *Pulpit and Press* (1895), *Unity of Good and Unreality of Evil* (1897), *No and Yes* (1891), *Rudimental Divine Science* (1891), *People's Idea of God* (1886), and *Christian Healing* (1886).

MARY BAKER EDDY.

Though numerous books and pamphlets purporting to deal with Christian Science have been published, Mrs. Eddy and her followers recognize as authoritative only those enumerated above.

ROBERT LILLEY.

Scientific Schools: See *Technical Schools*, under *SCHOOLS*.

Scilla: See *SCYLLA*.

Scilly (sil'lee) **Islands** (anc. *Cassiterides*): a group of islands belonging to Great Britain, situated 30 miles W. of Land's End, the southwestern promontory of Cornwall. It consists of 140 isles and rocks, of which six are inhabited.—St. Mary, Treco, St. Agnes, Sampson, Bryher, and St. Helen's. Total area, 3,560 acres. Pop. about 2,500, of whom about 1,300 live on St. Mary, where Hugh Town, the capital, is situated. On St. Agnes is a lighthouse; and on Bishop Rock, 6 miles westward, is one of the finest lighthouses of its kind. All

the islands are rocky, consisting of granite with a thin layer of light sandy soil. Agriculture and fishing are the principal occupations; good crops of barley, oats, and potatoes are raised. The navigation around these isles is very dangerous. In 1705 the fleet under Admiral Sir Cloudesley Shovel fell upon these rocks, when his ship and several others were lost.

Revised by M. W. HARRINGTON.

Scin'cidae [Mod. Lat., named from *Scin'cus*, the typical genus, from Lat. *scin'cus* = Gr. *σκινκος*, *σκινκος*, a kind of lizard]: an extensive family of lizards of the group *Leptoglossa*. As limited by Gray, it includes those forms in which the body is subcylindrical or fusiform, and with the tail cylindrical or tapering; the scales generally smooth, but sometimes keeled or striated; the head sub-quadrangular and regularly shielded, with the rostral plate moderate, and the nostrils lateral, and in a special nasal shield interposed between the frontal and labial shields; the limbs variable in development, typically four, generally more or less weak, sometimes atrophied. According to Prof. Cope, the temporal fossa is roofed, the premaxillary double, the palatine maxillary laminae dilated, and rarely a xiphisternal fontanelle is developed. The tongue is short, flat, and squamous. The family embraces numerous genera, distributed in almost all parts of the world. There is every gradation in the development of the members, from those forms in which the limbs are quite strong and provided with five digits each, to those in which they are entirely wanting, and the number or development of these parts is of comparatively little systematic value in the group. The family is well represented in the U. S. chiefly by species of the genus *Eumeces*.

Revised by F. A. LUCAS.

Scinde: a province of India. See *SINDE*.

Scio, or **Chios** (Turk. *Sakiz Adasi*): island; in the Aegean, in the latitude of Smyrna, and separated from the western extremity of Asia Minor by a strait less than 5 miles wide where narrowest; 32 miles long from N. to S., and from 18 to 8 from E. to W.; area, 579 sq. miles. It is rocky, but so fertile and beautiful as to justify its title of Queen of the Aegean. Water-springs abound. There are few forests near the coast, but the interior of the island is covered with firs. Toward the south there are remarkable plantations of mastic-trees, the culture of which furnishes the main support of twenty villages, and from which a valuable hygienic gum is obtained. Its many harbors render the island easy of access from every direction. The Ionians colonized Scio about 1180 B. C., and it formed a part of the Ionian confederacy. It heroically resisted the Persians, from whom it was delivered by the treaty of Cimon (449 B. C.). During the Peloponnesian, Roman, and mediæval wars, it experienced many vicissitudes. Under the Genoese it enjoyed prosperity from 1346 until 1566, when it was conquered by the Ottoman admiral Piali Pasha. As the private property of the sultana, the island was mildly governed, and the inhabitants became unwarlike and effeminate, and were undisposed to join in the struggle for Greek independence. Hence the atrocious massacre of Apr., 1822, was without provocation and almost without pretext. The Ottomans slew or enslaved 30,000 persons; 20,000 who escaped were scattered over the world, some even reaching America, and by August the population had shrunk to 10,000. Scio has suffered much from frequent earthquakes, yet the industry and intelligence of the people have largely restored their former prosperity. Pop. 70,000, of whom 68,000 are Greeks, and 1,200 Mussulmans. Scio, the capital, was founded by the Genoese at the extremity of the plain of Cambos. It has dockyards and a good harbor, and is the maritime center of the Archipelago. The principal exports are lemons, oranges, olives, almonds, anise, beans, mastic, and worked leather.

E. A. GROSVENOR.

Scloppius, stsee-op'pée-ōs (*Kaspar Schopp*): classical scholar and controversialist; b. at Neumark, in the Palatinate, May 27, 1576; studied at Heidelberg, Altdorf, and Ingolstadt; visited Italy, Bohemia, Poland, and Holland; abjured Protestantism and became a Roman Catholic in 1598. His fanatical propaganda earned for him the titles of Duke of Clara Valle in Spain and patrician of Rome. His virulent invectives against the Jesuits and Joseph Scaliger (see *SCALIGER*, JOSEPH), and his insane diatribes against Cicero, Varro, and many post-Augustan writers, alienated even his own partisans, so that he was compelled to publish many of his polemical writings under an assumed name. He died in Padua, Nov. 19, 1649. Among his scientific writings may be mentioned his *Grammatica philosophica*

which rises from the general level and forms a dead wall in front of the orbit; post-orbital processes are more or less developed; the lower jaw has its descending ramus subquadrate, the upper angle acute and sub-erect, and the lower rounded or subtruncate and bent inward; molar teeth $\frac{1}{2} \times 2$, provided with roots, and (except the anterior upper one when present) of nearly equal size, with tubercular crowns; perfect clavicles are developed; the hind limbs moderately large; the fibula and tibia separate from each other. At least 150 species are known, represented in almost all quarters of the world, except Australia. There are all gradations, between the slender and graceful form of the squirrel and the heavy, almost bear-like, form of the woodchuck. This transition is manifest from the arboreal squirrels (*Sciurus*) through the ground-loving *Tamias* with well-developed tails; the *Spermophilus*, or prairie-squirrels, with shorter tails; *Cynomys*, or the prairie-dogs, with stouter forms; and *Arctomys*, or the woodchucks, with still more robust forms.

Revised by F. A. LUCAS.

Sclater, PHILIP LUTLEY, Ph. D., F. R. S., F. L. S.: ornithologist; b. at Hoddington House, Hampshire, England, Nov. 4, 1829; educated at Winchester College and Corpus Christi College, Oxford, graduating in 1849; took a first class in mathematics, and subsequently became a fellow; was called to the bar at Lincoln's Inn in 1855, and practiced in the western circuit for several years. In 1859 he became secretary to the Zoological Society in London, and in 1860 editor of *The Ibis*, positions which he has held ever since. He is a member of the council of the Royal Geographical Society, and from 1877 to 1882 was one of the general secretaries of the British Association. He has published about 1,000 papers on ornithology and other branches of natural science. Among his more important works are *Monograph of the Tanager Genus Calliste* (1857); *Monograph of the Jacamars and Puff-birds* (1882); *Nomenclator Avium Neotropicalium* (1872); *Catalogue of Birds in the British Museum*, vol. xi., *Certhiidae, Tanagridae, and Icteridae* (1888), vol. xiv., *Oligomyzidae* (1888), vol. xv., *Tracheophones* (1890).

F. A. LUCAS.

Scleren'chyma: See HISTOLOGY, VEGETABLE (*Stony Tissue*).

Scleroder'ma [Mod. Lat.; Gr. *σκληρός*, hard + *δέρμα*, skin]: a sub-order of plectognath fishes, in which the bones of the upper jaw are but imperfectly united, the teeth independently developed, and the scapular arch, with the hypacoracoid and hyperacoracoid bones both developed. The form is typically fish-like, in which respect the species differ much from the other members of the order. The dermal armature is developed in the form of small scale-like plates or bristles; the dorsal fin is represented by from one to six spines; the pelvic elements are well developed. To the group thus distinguished belong two well-defined families—*Triacanthidae*, including the most fish-like forms, and *Balistidae*, comprising the more aberrant species.

Sclerotica: See EYE.

Selo'pis, FEDERIGO PAOLO, Count: politician and writer on historical law; b. at Turin, Italy, Jan. 10, 1798; took his legal degree in the university of his native city in 1818, and in 1827 gave his first historical lecture, *I Longobardi in Italia*, before the Turin Academy of Sciences. This was followed by *La Storia dell' Antica Legislazione nel Piemonte* (Turin, 1833); *La Storia della Legislazione Italiana* (4 vols., Turin, 1840-64); *Ricerche Storiche sopra le Relazioni Politiche tra la Dinastia di Savoia ed il Governo Britannico* (Turin, 1853). In 1845 he was elected corresponding member of the Institute of France, and in 1869 foreign member of the same; in 1847 was made president of the superior commission of press censorship in Piedmont; in Mar., 1848, accepted the portfolio of justice; in 1849 was named senator, and from 1861 to 1864 was president of the Italian Senate; was also elected president of the Turin Academy of Sciences. In 1868 Victor Emmanuel bestowed upon him the highest order of the kingdom, that of the Annunziata; in 1871, being selected as representative of Italy in the congress of arbitration which assembled at Geneva for the settlement of the Alabama question, he was elected president of this congress, and performed the duties of his office with signal ability. D. Mar. 8, 1878.

Revised by F. STURGES ALLEN.

Sclot, BERNAT: See D'ESCLOT, BERNAT.

Scollard, CLINTON: poet; b. at Clinton, N. Y., Sept. 18, 1860. He graduated at Hamilton College 1881, and studied in the graduate department of Harvard University and for

a short time at Cambridge University, England. In 1888 he was chosen Assistant Professor of Rhetoric at Hamilton College, and subsequently Professor of English Literature. He has published *Pictures in Song* (1884); *With Reed and Lyre* (1886); *Old and New World Lyrics* (1888); *Giovio and Giulia* (1891); *Songs of Sunrise Lands* (1892); and an edition of Ford's *Broken Heart* (1895).

H. A. B.

Scolopac'idae [Mod. Lat., named from the genus *Scolopax*, from Lat. *scolopax*, *scolopacis* = Gr. *σκολοπαξ*, *σκολοπακος*, snipe, woodcock]: a family of wading birds, including snipe, woodcock, sandpipers, and related forms. The bill is long and slender, rather soft and flexible, and with the sides compressed and grooved to the tip, which is blunt; the lower mandible has no angle at its lower margin; the nostrils are basal, elongated, and situated in a groove closed by a membrane; the wings are long and pointed, the first or second primary being longest; the tail is usually short and even; the legs elongated; the thighs exerted and naked; the tarsi elongated and slender; the toes moderately long and attenuated, the anterior being connected more or less by a basal membrane, the hinder short or wanting. Some members of the family are found in uplands far from water, and others in inland forests. See CUBLEW, SANDPIPER, SNIFE, WOODCOCK, etc.

THEODORE GILL.

Scomberesoc'idae [Mod. Lat., named from *Scomberesox*, the typical genus; Lat. *scomber*, from Gr. *σκόμβρος*, mackerel + Lat. *esox*, *esocis*, pike]: a family of fishes comprising the flying fishes, half-beaks, and other remarkable forms. The body is more or less elongated, the scales are cycloid, a lateral peak developed along each side of the belly; the head is more or less quadrangular and flattened above; the jaws are very variable in development, sometimes very much elongated, and sometimes short and subtruncate; the upper is constituted by the intermaxillaries at the middle and the maxillaries at the sides; the teeth are variable in development; the branchial apertures confluent below; branchiostegals in considerable number; the dorsal fin single and far back, composed mostly of branched rays; anal fin opposite the dorsal; caudal distinct and generally emarginated, and with its lower lobe longest; pectorals with branched rays and variable in development; ventrals abdominal. The air-bladder is generally present, but is shut off from any communication with the intestinal canal; the pseudobranchia are hidden and glandular; the stomach is not distinct from the intestine, which is straight and without pyloric appendages. The species are mostly inhabitants of the tropical seas.

Revised by F. A. LUCAS.

Scom'bridae [Mod. Lat., named from *Scomber*, the typical genus, from Lat. *scomber*, from Gr. *σκόμβρος*, mackerel]: an important family of fishes, including the mackerels, tunnies, bonitoes, and related forms. The body is elongated and fusiform; the scales very small or wanting (generally cycloid, but about the thorax larger and sometimes ctenoid ones are developed, which form the so-called corselet of the tunnies); dorsal fins two, the first composed of rather slender spinous rays, the second with branched rays, the posteriors of which are free and developed as finlets; anal similar to the second dorsal; caudal forked, and well adapted for powerful propulsion; pectorals pointed; ventrals thoracic, each with one spine and five rays; numerous (more than twenty-five) vertebrae; numerous pyloric caeca developed. The species vary in size from the dimensions of a small mackerel to those of the great tunny, which sometimes attains a weight of over 1,000 lb. Some are great wanderers. In the summer of 1871, for example, there appeared suddenly on the coast of Massachusetts large numbers of a small tunny (*Orcynus aliteratus*) which had previously been unknown along the coast of America, although familiar as a Mediterranean fish. See MACKEREL and TUNNY.

Scop'as (Gr. *Σκόπας*): sculptor; b. in the island of Paros, flourished a. c. 390-350, and was one of the most celebrated of Grecian artists. He worked mostly in marble, the product of his native place, and chose his favorite subjects from the myths of Dionysus and Aphrodite. With Praxiteles, he formed the character of the second or later Attic school of sculpture, in contradistinction to the earlier school of Phidias. He was celebrated also as an architect, and constructed the temple of Athena Alea at Tegea, and engaged with Leochares and others in embellishing the mausoleum at Halicarnassus. The statement that he assisted in the erection of the temple of Artemis at Ephesus rests on a doubtful passage of Pliny. Among the most noted works ascribed to Scopas were a statue of Aphrodite Pandemos in Elis, one of Apollo Smin-

place in Ceylon; the group of Nades and her children, and the grouped sea-demons escorting Achilles to the island of Lemnos. The separate figures are commemorated by Sillig in his *Iconography of Ancient Artists*.

Scorpionidae [Mod. Lat., named from *Scorpius*, the typical genus, from *Skorpiō*, high rock, cliff; a family of fishes found in the *Melanoidei*, etc., many members of which are noticeable from the possession of phosphorescent spots. They have an elongate body, either naked or covered with crocod-like scales, the upper lip formed of the immovable bones, a large gill-opening and an adipose fin; snake-like looking. The fifty species are arranged in some fifteen genera. All are marine, some living at the surface of the sea in the warm waters, others being found at considerable depths. The phosphorescent spots of *Scorpius* have been regarded as sensory eyes by Cuvier.

J. S. KIRKPATRICK.

Scorpius WILLIAMS, D.D., F.R.S.; Arctic explorer and physician; b. near Whitby, England, (Oct. 5, 1790), son of a small tradesman of the same name; went to sea in one of the East India ships when ten years old; spent the intervals between his annual voyages in scientific studies at Edinburgh; reached the highest northern latitude that had then been attained May, 1801; made important observations on the electrical phenomena of the Arctic regions, and by his communications to Sir Joseph Banks, president of the Royal Society, was instrumental in inducing the Government to send the first (1817) of the long series of Arctic exploring expeditions. After seventeen voyages to the Greenland or North-western regions he published his *History and Description of the Arctic Regions* (2 vols., 1830) and his *Journal of a Voyage* (1827). When above forty years of age Capt. Williams passed through a course of literary and theological study, graduating in divinity at Cambridge; filled several parishes, received the degree of D.D., was noted for philanthropic labors; visited the U.S., in 1842 and 1848, and made a voyage around the world for magnetic research 1849-51; D. at Torquay, Mar. 21, 1887. He published valuable works on magnetism and several scientific books, and wrote a *Life of his father* (1851). His own *Life* was written by a nephew (1891).

Revised by M. W. HARRINGTON.

Scorpaenidae [Mod. Lat., named from *Scorpaena*, the typical genus, from Lat. *scorpaen* = Gr. *skorpaen*, the scorpion-like, derivative of *scorpio*, scorpion; a family of fishes of the suborder *Atheriniformes*. The body is more or less elongate and compressed; the scales (sometimes wanting), typically smooth and indurated; the lateral line continuous. The head compressed, often inflated laterally, and more or less armed with ridges and spines; teeth acute and present on the jaws as well as palate; dorsal fin differentiated into a longer spinous and a shorter rayed portion; anal with a rayed portion smaller than that of the dorsal, and armed generally with three spines; caudal well developed and free; pectorals with at least the inferior rays generally somewhat enlarged and simple, not branched; ventrals thoracic, with a spine and generally five rays; the stomach is saciform, and pyloric appendages are developed in moderately small number. The family includes many genera, the principal of which are *Scorpaena*, *Nebulosa*, *Schodanthus*, *Percis*, *Pholidichthys*, *Tautoga*, and *Apistus*. They are chiefly inhabitants of the tropical or sub-tropical regions, but *Scorpaenopsis* is peculiar to the northern seas, and of *Schodanthus* and *Schodanthus* a number of species are found on the western coast of the U.S., as well as corresponding latitudes of the Asiatic portions of the Pacific. In some (*Apistus* and *Pholidichthys*) an independent pectoral filament or ray is developed.

Revised by J. S. KIRKPATRICK.

Scorpio See SCORPION.

Scorpioides [From Lat. *scorpio*, scorpion; a group of arachnid (spider-like) animals in which the body is divided into a short leg-bearing cephalothorax and a long abdomen, the seven basal joints of which are as broad as the thorax, the last six, including the terminal sting, being much narrower. To the cephalothorax are attached six pairs of appendages, the first pair being very short, and, like the long second pair, bearing lobster-like pincers at the end. The remaining four pairs are for locomotion. The abdomen is without dorsal appendages except a pair of comb-shaped bristles (pectens) upon the second segment. These are supposed to be sensory in function. There are from three to six pairs of eyes upon the cephalothorax. A peculiarity is noticeable in the respiratory organs, which consist of four

pairs of sacs (lungs) upon the basal joints of the abdomen. In each lung is a series of plates, through the walls of which oxygen passes to the blood. The young are born alive. Scorpions are best known for their poisonous character. The poison-plant is in the last joint of the abdomen, its duct emptying in the terminal spine. In tropical countries this sting is not infrequently fatal to man, but in the U.S., while very painful, it only occasionally causes death. The scorpions are largely nocturnal, living under logs and stones and in burrows by day. They feed upon the larvae of spiders and insects, which are killed by the sting. In inflammation they will eat humans. The scorpions are inhabitants of warm countries, but have been found as far N. as Nebraska. About 200 species are known. They occur as fossils in the Silurian rocks. To the arachnids the scorpions possess great interest, as they are the most primitive of the *Arachnida* and because they show most striking resemblances to the horseshoe-crab (*Limulus*). See THORNTON, *Classification (Annals and Magazine of Natural History, 1879)*; LANKASTER, *Limulus as Arachnid* (*Quarterly Journal of Microscopical Science, 1891*); LAURIE, *Embryology* (*Quarterly Journal of Microscopical Science, 1890*).



Black scorpion (*Scorpio*) after.

J. S. KIRKPATRICK.

Scorpion-flies See ENTOMOLOGY (under *Meconoptera*).

Scorpius, or **Scorpio**: the eighth sign of the Zodiac (q. v.), also a constellation, the Scorpion. Two thousand years ago the constellation and the sign coincided; but now, owing to the precession of the equinoxes, the constellation Scorpio is situated in the sign Sagittarius. It may be recognized by the bright red star Antares, with a smaller companion on each side of it, and a curved row of stars toward the W.

S. N.

Scorzonea [Mod. Lat., from Ital. *scorzona*, appar. alter., black bark; *scorza*, bark + *zera*, fern, of *zera*, black; a garden vegetable popular in parts of Europe, but unknown in the U.S. The *Scorzona hispanica*, *S. gladiifolia*, *S. delavayi*, and *S. tuberosa* (family *Compositae*) furnish edible roots, whose taste is compared to that of asparagus, celery, basil, and salsify. The black skin is washed off, and the root is soaked in fresh water and then boiled fifteen minutes. *Scorzona* is very highly esteemed by many, and is especially praised as food for invalids. It is very hardy and of easy cultivation.

Scotch Confession of Faith: a confession drawn up by John Knox and his coadjutors at the request of the Scotch Parliament, which assembled at Edinburgh in Aug., 1560, after the death of the queen-regent, Mary of Guise (June), and the close of the civil war. It consists of a preface and twenty-five articles on the chief doctrines of religion, which are briefly, tersely, and vigorously stated. It agrees with the other Reformed confessions of the sixteenth century, but is more pronounced in its opposition to the Roman Catholic Church than most of them. It was rather hastily composed in four days, twice read article by article in Parliament, and adopted by the same as being "based upon the infallible word of God." Only three temporal lords voted against it, for the reason that they believed as their forefathers believed. The Roman Catholic bishops were called upon to object and refute, but kept silence. Seven years later (1567), after the abdication of Queen Mary, the confession was readopted, and the Reformed Kirk of Scotland formally acknowledged and established. In 1590 the confession was signed by King James VI., and a supplementary confession (sometimes called the *second* Scotch Confession) added to it. It continued to be the only doctrinal standard of Scotland recognized by the civil government till the Revolution of 1688, but it was practically superseded by the Westminster Confession, which is more logical and complete, and was adopted by the Covenanters and the General Assembly during the Commonwealth. The Scotch Confession is printed in the acts of the Scotch Parliament for 1560, in Knox's *History of the Scotch Reformation* (ed.

Laing, vol. ii.), in Calderwood's *History of the Kirk of Scotland*, in Dunlop's *Collection of Scotch Confessions* (vol. ii.), in Niemeyer's *Collectio Confess. Reform.*, and in Schaff's *Credo of Christendom* (vol. iii.).

Scoter: any sea-duck belonging to the genus *Oidemia* of Fleming. The species are distinguished by the bill being much swollen at the base, with the terminal part depressed and broad, and the extension of the feathers of the chin forward as far as the nostrils. The color is to a great extent black. The American species are *Oidemia americana* (the common scoter), *O. fusca* (velvet scoter), *O. perspicillata* (commonly called surf-duck or sea-coot), and *O. deglandi* (the velvet duck or white-winged coot).

Scotists: among the SCHOOLMEN (q. v.), the followers of John Duns Scotus. Their principal adversaries were the Thomists. The Scotists held to freedom of the will and the immaculate conception of the Virgin. Franciscans were generally Scotists; the Dominicans, Thomists.

Scotland: that part of Great Britain which lies N. of the Cheviot Hills and the Tweed. It is bounded on the N. and W. by the Atlantic Ocean, on the E. by the North Sea, on the S. by England and the Irish Sea. Its greatest extent, from Dunnet Head in the N. (58° 41' N.) to the Mull of Galloway (54° 38' N.), is 288 miles. The area is 29,785 sq. miles, of which the islands comprise over one-seventh.

Coast.—The development of the coast-line is very considerable in proportion to the area of the kingdom, for it amounts to 2,300 miles, which gives 1 mile of coast-line to every 12 sq. miles of area. No point of the country is farther than 40 miles from the sea.

No contrast could be greater than that between the east and west coasts. The former resembles that of England. It is generally formed of soft sandstones and clays and generally low and shelving, although marked by a few bold headlands, such as Duncansby Head, Tarbat Ness, Kinnaird Head, Buchan Ness, Fife Ness, and St. Abb's Head. Its indentations, including the Firths of the Forth and the Tay, and the Moray Firth, which bifurcates into Loch Beaulieu and Cromarty Firth, are few, but they penetrate far inland, and form the estuaries of comparatively important rivers. The west coast, on the other hand, as far S. as the Firth of Clyde, is formed of hard rocks, rises boldly from the sea, and is intersected by numerous narrow sea-lochs, bounded by steep hills, and separated from each other by mountainous peninsulas. The most considerable of these peninsulas is that of Kintyre or Cantyre. It is nearly 60 miles in length and terminates in the Mull of Kintyre. Narrow sounds separate the mainland from Skye, Mull, and others of the Inner Hebrides; and a broad strait, the Minch, separates these from the Outer Hebrides, or Long Island.

The eastern coast of the Firth of Clyde is generally level, while that of the peninsula of Galloway, farther S., is generally steep, and juts out in the Mull of Galloway, the most southerly point of Scotland, in lat. 54° 38' N. The northern coast, between Duncansby Head and Cape Wrath, is wild and rugged and marked by bold headlands.

Relief.—In its broad features Scotland may be divided into a highland region in the north, a lowland plain in the center, and an upland region in the south. The Highlands are cleft in two by a long and narrow valley, the Great Glen (Glenmore), which extends along an anticlinal axis from Loch Eil to the Beaulieu Loch. This valley is occupied by a chain of lakes connected by the Caledonian Canal, and its summit-level is only 105 feet above the level of the sea. The mountain region to the N. of this glen is, for the most part, sterile and inhospitable and very thinly peopled. Lofty mountains lift their summits above its extensive moors, the most considerable being Ben Dearg (3,547 feet), Ben Wyvis (3,929 feet), and Mam Soul (3,862 feet). Toward the N. E. this mountain region merges into the undulating sandstone plains of Caithness, which form bold and striking headlands on the coast.

The mountain region to the S. of Glenmore is known as the Grampians. In its arrangement it is much more linear than the Northern Highlands. A central chain can be traced from Ben Nevis (4,406 feet) in the southwest to the coast of Aberdeen. The Pass of Drumochter, on the confines of Perthshire and Inverness, crosses this chain at an elevation of 1,488 feet. The Northern Grampians branch off from the central chain near the head-waters of the Dee, and attain an elevation of 4,296 feet in Ben Macdui. The Southern Grampians culminate in Ben Lawers, 3,984 feet. The Grampians are almost as sterile as the Northern Highlands, and

moors abound, but there are excellent pastures in the valleys; and where these open out toward the N. E. and S. E. they offer every facility for a successful pursuit of agriculture. The western coast of the Highlands is generally steep and rugged, and sea-lochs penetrate far into the land; their interior abounds in picturesque lakes. Strathmore (the great vale) extends along the foot of the Highlands from Loch Lomond, in the southwest, to Stonehaven, in the northeast. It is separated from the sea and the great central plain extending between the Forth and the Clyde by a series of hills broken through by the Forth and Tay, and known as the Campsie Fells, the Ochil Hills (2,363 feet), and the Sidlaws (1,399 feet). Southern Scotland consists of an extensive hilly region stretching from St. Abb's Head on the German Ocean to Stranraer on the Irish Sea, and culminating in the Broad-Law (2,754 feet) and the Merrick (2,764 feet). The valleys of the Tweed and Clyde almost cut off from the main mass the outlying ranges of the Lammermuir and Pentlands Hills toward the N. The range forming the boundary toward England is known as the Cheviots (2,636 feet). The southern hills are generally broad and flat; they are intersected by deep grassy glens, which open out into fertile valleys and plains. Among the latter that called the Merse, at the mouth of the Tweed, is the most considerable.

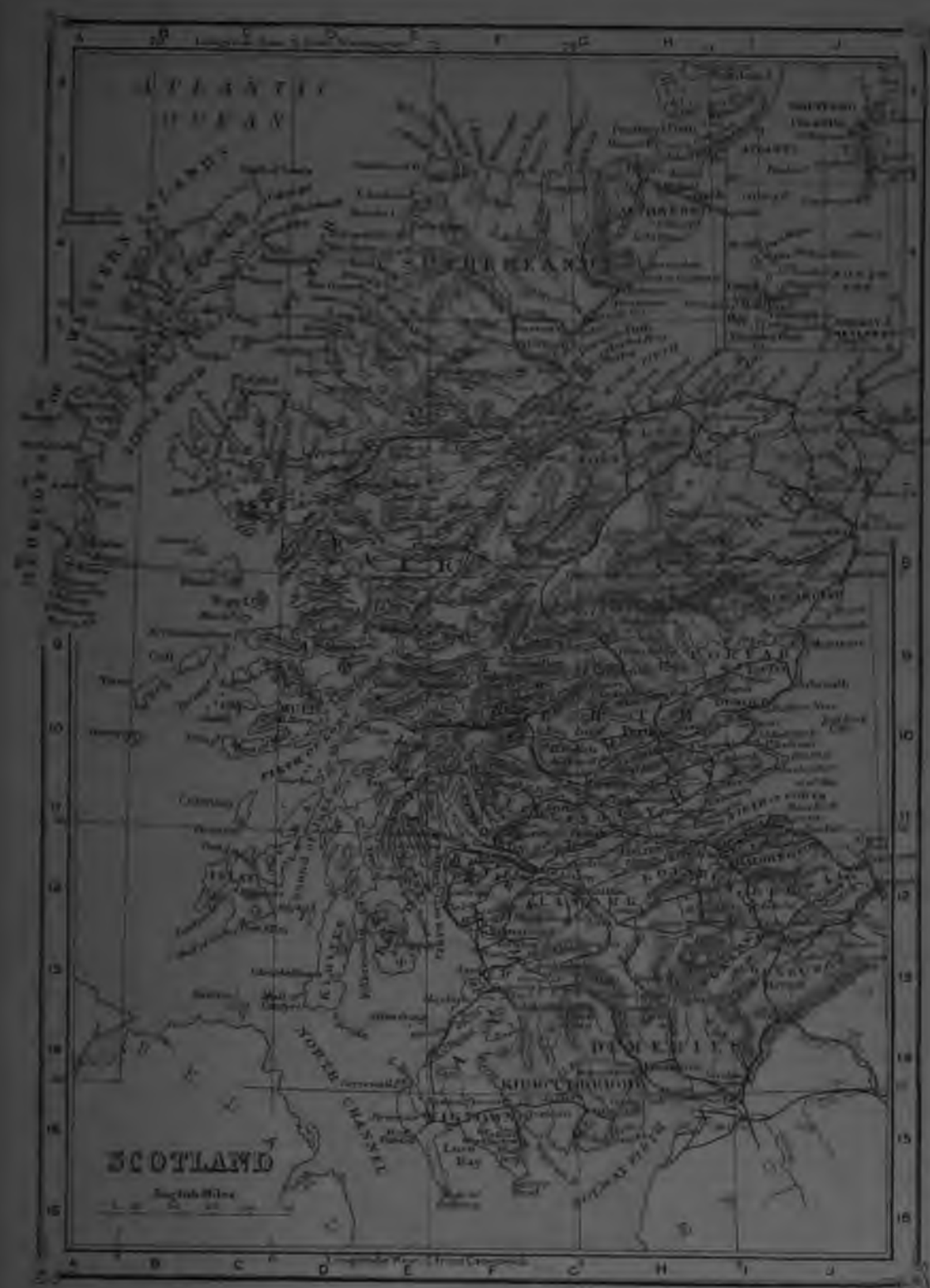
The western islands are generally of considerable height (Ben More, on Mull, 3,185 feet); the Orkneys and Shetlands, though they present bold cliffs toward the sea, and are much broken up by intricate channels, rise to a height of only 1,600 and 1,475 feet respectively.

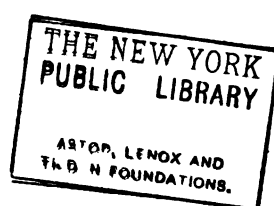
Geology.—The rocks are chiefly of Palæozoic age. The clay and chlorite slates and the graywacke, interstratified with mica-schist and gneissose flagstones, which form nearly the whole of the Highlands, are classed by Prof. A. Geikie as metamorphosed Lower Silurian. On the west coast there occur sandstones of Cambrian age, while crystalline gneiss, equivalent to the Laurentian rocks of North America, occupy the Outer Hebrides and the west coast of Sutherland. These rocks are frequently broken through by igneous rocks, which form some of the highest summits. Granites predominate, but porphyry is found in the southwest, and basalt is highly developed on the islands of Skye and Mull. On the S. E., from the Clyde to Stonehaven, around Moray and Dornoch Firths and in Caithness, these Silurian rocks of the Highlands are bounded by flagstones and sandstones of the Devonian formation, which prevails in the Orkneys, while the Shetlands exhibit the geological features of the Highlands.

The great lowland plain is occupied by limestones and coal-measures of the Carboniferous system, the hills being largely formed of porphyritic rocks and basalt. Tuff and volcanic agglomerate occur in various localities. A narrow belt of Devonian rocks separates these lowlands from the southern uplands, whose graywacke and shale of Silurian age, pierced by masses of porphyry (Cheviots) and granite (on the west), are the prevailing rocks. Indications of an ancient glaciation are frequent. Subsequently an upheaval of the country, evidenced by raised beaches, took place. Scotland is rich in coal and iron. Lead is found in the southern hills. Excellent building-stones abound. Aberdeen is known for its granite; Craigleith for its freestone. Scotch pebbles, garnets, amethysts, and other precious stones are among the minor products of the mineral kingdom.

Hydrography.—The rivers rise in the hills, and frequently pass through mountain lakes. Their course is more rapid than that of the rivers of England. The water-parting being near the west coast the rivers of the eastern slope are much the longest. The Tweed is a rapid stream, forming in its lower course, the boundary between England and Scotland, and entering the German Ocean at Berwick. The Forth, though an inconsiderable stream, deserves to be mentioned because of its firth. It is navigable to Stirling. The Tay is the most important river of Scotland. It rises to the N. of Loch Lomond, flows through Loch Tay, leaves the mountains at Dunkeld, intersects the Strathmore, and finally enters the Firth of Tay. It is navigable as far as Perth. The remaining rivers, with the exception of the Clyde, are of little use to navigation, but they abound in fish. The Clyde rises in a small lake on the southern confines of Lanarkshire, and enters the Firth of Clyde below Glasgow. Its current is very rapid, and it forms several waterfalls, but at a vast expense for dredging it has been made navigable for large vessels as far as Glasgow.

Scotland abounds in lakes. They are almost without exception in the Highlands and collectively cover an area of





Manufactures.—These are of considerable importance, especially in the lowlands. The textile industry (1891) gave employment to 206,550 persons, and there were 747 factories with 2,413,735 spindles, 71,471 power-looms, and 154,591 hands. The cotton industry has its centers at Glasgow and Paisley; the woolen manufacture is carried on at Hawick and Galashiels on the Tweed, but also in Stirling, Kilmarnock, and Bannockburn; carpets are made at Kilmarnock and Glasgow; Dundee and Dunfermline are the principal seats of the linen, hemp, and jute industries. Knitting is widely carried on as a domestic industry. The making of machinery, which employs 51,426 men, and ship-building (23,518 workmen) have their chief seats on the Clyde, where the largest ocean steamers and ironclads are built. Other industries of importance are printing (20,317 workmen), paper-making, sugar-refining, the preserving of provisions, glass-making, and the manufacture of chemicals.

Commerce.—Glasgow is the commercial capital of the country, although as a shipping-port it ranks seventh in the United Kingdom, being preceded not only by London or Liverpool, but also by Cardiff, Hull, Newcastle, and Southampton. The railways at the end of 1893 had a length of 3,215 miles, and there were also 86 miles of tramway and 153 miles of canal. For further details, see GREAT BRITAIN.

National Wealth.—In 1886 the total value of property and profits assessed by the income-tax amounted to £59,406,708; in 1893 to £65,606,195 (all incomes of less than £150 are exempt). This increase, however, did not extend to the owners or occupiers of lands and tenements. The number of depositors in savings-banks (1893) was 596,179, and £12,583,676 stood to their credit, an increase of £4,338,681 since 1883. In 1892 there existed 342 co-operative industrial and provident societies, with 195,919 members, a capital of £2,983,303, and a turn-over of £9,743,238; and 61 building societies employing a capital of £976,255. On the other hand, in Jan., 1894, there were 61,978 paupers with 33,218 dependents (2.3 per cent. of the total population).

Religion.—Scotland, since 1560, has an Established Church, organized on the Presbyterian system, and now governed by 1,348 parochial kirk sessions of ruling elders, with the minister as moderator; 84 presbyteries, 16 synods, and a General Assembly which meets annually in May. It claims 604,984 communicants, and about 45 per cent. of the entire population are claimed to adhere to it. Since 1874 its ministers are elected by the congregations. This question of patronage led in 1843 to a secession and the foundation of the Free Kirk, with 1,260 ministers and missionaries, 1,050 churches, 343,069 communicants, and the adherence of 34 per cent. of the population. There are several other bodies of Presbyterians (e. g., the United Presbyterian Church, with 615 ministers, 573 churches, 48 home mission stations, and 188,706 members), as well as an Episcopal Church, which temporarily, 1662-88, enjoyed the advantages of establishment, although it numbered very few adherents. It now has 7 bishops, 268 churches and missions, and 266 clergy. The Roman Catholics are supposed to number 365,000 souls, and besides the Irish in the towns they embrace the inhabitants of the islands of Barra, South Uist, Eigg, and Canna, and of a few Highland valleys. See SCOTLAND, CHURCH OF.

Education.—Scotland has long been in advance of England in educational matters, more especially as regards secondary education. Since 1872 all public, elementary, and middle-class schools are administered by school boards, and education is free for all children between the ages of five and fourteen. In 1893 there existed 3,005 of these schools, attended by 617,448 children. In addition to these there are numerous superior schools in the enjoyment of endowments or supported by public bodies, the more famous among these being the Edinburgh Academy, Fettes College, the Edinburgh High School, Merchiston College, and the five schools supported by the Merchant Company. There are four universities and a university college, with 285 professors and 6,382 students. The oldest of these universities, that of St. Andrews, was founded in 1411. Among schools for special purposes may be mentioned the theological colleges, seven training-colleges for teachers, an agricultural college, veterinary colleges, and a school of medicine for women. Many of these schools are at Edinburgh, which is likewise the seat of the Royal Society (founded 1783) and of the Royal Scottish Academy. See SCHOOLS AND COMMON SCHOOLS.

Political Institutions.—Scotland sends 72 members to the House of Commons, and 16 representative peers to the

House of Lords, who are elected for the duration of each Parliament (the Scottish peerage numbers 87 members, of whom 48 are also peers of the United Kingdom). At the time of the Union (1707) the Scottish Church and the judicial system were left intact, and Scottish law differs in many notable respects from that of England. The high court of justice includes a court of session for civil cases, and a high court of justiciary for criminal offenses. The inferior jurisdiction is exercised by sheriff courts, by borough magistrates and justices of the peace (bailies). The police force numbers 4,488 men. In 1893 2,394 persons were committed for trial, and 1,902 convicted.

Local government was reorganized in 1889 on the outlines followed in England. Elected county councils have taken the place of the old commissioners of supply and road trustees. Municipal bodies, presided over by a provost, exist in numerous cities and burghs. In 1888-90 (the last year for which there is a complete return) the local expenditure amounted to £7,341,893, inclusive of £886,543 for the relief of the poor, and £1,493,015 for the support of schools. Of the total amount required £4,590,788 was raised by rates, tolls, and dues, £964,525 was contributed by the imperial Government, and £1,410,398 was raised by loans.

History.—When Scotland first became known to the Romans its Highlands were occupied by Gaelic Picts, while the south was held by Cymric Britons. The Highlands were known to them as Caledonia (a corruption of Gael Dun, Land of the Gael). Julius Agricola (80-85) first penetrated this "Barbaria" as far as the Tay, and inflicted a defeat upon the Picts at Mons Grampius, but his conquests were only temporary, and when the Emperor Hadrian was in Britannia (122) he caused a wall to be built from the Solway to the Tyne as a protection of the Roman provinces against the predatory northern tribes. Twenty years afterward, in the reign of Antoninus Pius, the legate Q. Lollius Urbicus once more advanced into Caledonia, and constructed the Antonine wall between the Forth and Clyde. In 208, however, Severus once more retired to the Tyne, and although Flavius Theodosius, the father of Theodosius the Great, once more recovered the country between the two walls (369), and bestowed upon it the name of Valentia, in honor of the Emperor Valentinian I., the Romans finally retired from their conquests and abandoned Britannia.

The Picts again swept down over the lowlands and far into England, ravaging and devastating the country with savage but irresistible valor. The Britons now called the Anglo-Saxons to their aid, and the Picts were once more confined to their Highlands; in 449 a Saxon chieftain, Edwin, founded Edinburgh. In 503 the Scots—that is, the Celts from Ireland—crossed over to Britain and founded, under the leadership of Fergus, a Scottish kingdom along the western coast of Caledonia, from the Firth of Clyde to the present Ross-shire. The Celts of Ireland were Christians, having been converted by St. Patrick, and in 563 St. Columba went over from Ireland and settled among the heathen Picts, spending the rest of his life, till 597, in converting them to Christianity. In the beginning of the seventh century Scotland formed four independent kingdoms, namely, that of the Scots, along the west coast to the N. of the Clyde; that of the Picts, to the N. of the Forth; Strathclyde in the southwest, which was held by the Britons; and the Saxon domain of Bernicia. In 836 Kenneth, a lineal descendant of Fergus, became King of the Scots, and in 843 he also became King of the Picts, transferring his residence to Forteviot in Strathorne, the old capital of the Picts. Thus the Scots and the Picts, two tribes of the Celtic race and speaking two dialects of the Celtic language, coalesced and formed one empire, which was originally known as Alban (Highlands), but developed in course of time into Scotia or Scotland, a designation by right belonging to Ireland. In 945 the King of England bestowed upon Malcolm I. (942-954) a portion of the Cambrian kingdom, and thus was established that claim for homage which subsequently led to many wars. In 970 King Edgar of England bestowed upon Kenneth III. the purely Saxon district of Lothian. The same king occupied also Strathclyde, and his successor, Malcolm II. (1003-33), acquired the Merse and Teviotdale from the Prince of Northumberland, thus extending Scotland to the Tweed.

While the Scottish kingdom was externally much extended, the Scottish people underwent an internal change by which the Celtic character almost disappeared. So many Teutonic elements were absorbed that in the course of two centuries a new national type was developed, in which the

Fierce elements were hardly more than recognizable. Two main invasions, those, and more, invaded Scotland both from the north and the south. The Norwegians and the Danes had the islands before the time of Kenneth, and afterward, as time, also large tracts of the mainland, and a lively intercourse took place between the Norse and the Scandinavians, both as friends and as foes. The Hebrides and the Isle of Man were not united to Scotland until the reign of Alexander III. (1249-60), who defeated Hacon, King of Norway, at Largs, on the coast of Ayr, and the islands of Orkney and Shetland not until the reign of James III. (1406-37), who married Margaret, daughter of King Christian I. of Denmark, and received them as her dowry. Still greater was the Teutonic influence coming from the north—first Anglo-Saxon, then Norman. Malcolm III., who slew and succeeded Macbeth in 1057, was educated at the English court and married an English princess. Her brother, Edgar Atheling, and many Anglo-Saxon nobles sought refuge and support with Malcolm after the Norman invasion of England, but in 1072 William the Conqueror penetrated into Scotland and compelled Malcolm to submit and do homage to him. David (1154-65), the youngest son of this Malcolm, who had resided for several years at the polished court of his brother-in-law, King Henry of England, married three times Scotland to support the claims of his three Matilda in the throne, but was defeated on each occasion. He is famous among Scottish kings for having introduced into Scotland the type of feudal civilization which obtained in England. He secured peace throughout his dominions, promoted trade and industry, and established schools of learning. During the whole of this period the Scottish kings were looked upon as vassals of the English crown. William the Lion (1165-1214), who resisted the claims of Henry II. of England, was captured at Alnwick (1174), and sent to England on renewing his allegiance. This question of homage and the meddling of the Scottish kings in the affairs of England led to frequent wars, for the commission made by Richard Cœur de Lion in 1189, in return for a money payment, went of a temporary nature, as John again refused the claims of the English crown (1200), and Alexander II., after an unsuccessful invasion of England, was compelled to do homage to Henry III. in 1217. When Margaret, the seventh Matilda of Norway, daughter of King Eirik of Norway, granddaughter of Alexander III., and heiress to the Scottish crown, died on her voyage from Norway to Scotland, several pretenders appeared, and finally John Balliol obtained the crown by the aid of Edward I., in whom he swore allegiance. But he was deposed by the king after the battle of Bannockburn (1296), and then the Scottish people rose and made the fiercest resistance to the English usurper—first under William Wallace, who fell into the hands of Edward I., and was put to death in London 1305; then under the younger Robert Bruce, who routed the English under Edward II. at Bannockburn June 24, 1314, invaded England twelve times in fourteen years, and ravaged the country so fearfully that Edward III. was glad to conclude a truce for thirteen years. But in 1333 a fresh war broke out and, after the battle of Halidon, and again after that at Neville's Cross (1346), the Scottish kings were compelled to acknowledge themselves vassals of England.

With Robert II. (1371-90) the house of Stuart ascended the throne, and the history of Scotland from this time to the establishment of the union with England is given in the articles on ROBERT II. and III., JAMES I.-VI., MARY II., and, etc. Most of the kings of the Stuart dynasty were valiant and energetic men, but seven of them ascended the throne as minors, and five ended their lives by untimely deaths. This circumstance gave the power of the nobility an exorbitant development, and for centuries the history of Scotland became one long contest between the crown and the nobility, and one confused maze of feuds between one various noble families. In these troubles the kings sought support from the Church; they flattered and enriched it. The Scotch Church was the richest in Christendom. In the sixteenth century it owned half of all the real estate in the country. But its members were the most debased set of men within the pale of Romanism; and were able to maintain their social position only by means of the dense ignorance which they spread around them. The nobles were jealous and afraid of the Church and embraced the Reformation with great eagerness; and the great wars in Scotch history in the sixteenth century was essentially a contest between Romanism and absolutism on the one side, represented by the crown, and Protestantism and

feudalism on the other, represented by the nobility—a contest in which the final decision was given by a third party, the middle class, the burghs, who, under the leadership of Knox, carried the Reformation through and put serious limits to the power both of the crown and the nobility. Other elements were mixed up in the contest. The relations between Scotland and England during this period consisted mainly in a continuous border feud, which was carried on almost without intermission, and which now and then grew into actual warfare on a great scale. Nevertheless, by degrees there developed an English party within the Scotch people. During the wars between England and France the Scotch went to France to fight against the English, and this circumstance opened the way for a French influence in Scotland, which became of very great importance when James V. (1513-42) married Mary of Guise. France understood that, in a conflict with England, Scotland could be used as one of the most effective weapons, but in her attempts to form a close alliance with this country Roman Catholic France was compelled to seek her main support from the Roman Catholic clergy in Scotland, and thus she caused, most unwillingly, the nobility and the Protestants to turn their eyes to England. Meanwhile, studiousness arose on both sides of the border who wished to stop the perpetual hostilities, and who understood that a union between the two countries was the only means of achieving this end. It was a favorite idea with Henry VIII., and after the death of James V., during the regency of the Count of Arundel, a treaty was made by which Mary, the Queen of Scotland, was betrothed to the Prince of Wales, the son of Henry VIII., and it was agreed that when ten years of age she should be taken to England, in order to be educated there. But Henry's demand of political supremacy soon brought discord, and before the treaty was half a year old it was broken, and war was declared. After the death of Henry VIII. the Duke of Somerset tried to re-establish the treaty, but in vain; and after the battle of Pinkie (Sept. 10, 1547), Scotland threw herself into the arms of France. The queen-mother, Mary of Guise, assumed the regency, and the queen was taken to France to be educated, and betrothed to the dauphin. At last, however, by the victory of Protestantism in Scotland, and the extinction of the house of Tudor in England, the union actually took place. The most prominent points in the history of the united kingdoms are the contest between Presbyterianism and Episcopacy, the former being supported by the common people, the latter by the sovereign, the nobles throwing their weight into either scale as it suited their policy at the time, and the Jacobite reaction which was called forth by the corrupt and oppressive government of Charles II. and James II., and which gradually became so strong that nothing short of an incorporating union seemed capable of averting the danger of a civil war. The act of union with England was formally ratified by the Parliament of Scotland on Jan. 16, 1707.

The history of Scotland has been written by Home (1657), Maitland (1757), Guthrie (1770-77), Dalrymple (1779-79), Heron (1794-99), Burton (1807-70), Mackenzie (1807), and Keith (1896). Works dealing with particular periods are Skene's *Celtic Scotland* (1876-80); Leslie's *The Early Kings of Scotland* (1886); Anderson's *Scotland in Pagan Times* (1885-86); Pinkerton's, Tytler's, and Robertson's *Historical*; R. Chambers's *Domestic Annals of Scotland* (1850-61); Mackintosh's *History of Civilization in Scotland* (1878-85); and Rogers's *Social Life in Scotland* (1884-86).

Revised by E. G. RAVENSTEIN.

Scotland, Church of: The established Church of Scotland, frequently since the Reformation called the Reformed Church of Scotland.

Early History.—There are traditions of the introduction of Christianity into Scotland in very early times, traditions in which figure such names as those of St. Andrew, St. Rule, and St. Ninian. About 563 A. D. St. Columba founded his monastery on the lone isle of Iona, and extended his missionary work all over Scotland, and even into England. His followers and successors are known as the Caledonians. In later centuries another stream of Christian influence was poured into Scotland from the South, representing the Roman form of ecclesiasticism; and after the Scottish and Pictish monarchies were united in one king during the reign of Malcolm III., and largely through the influence of Margaret, his Saxon queen, many of the Caledonians yielded to the powerful influence of the Roman Church. From this time, the middle of the twelfth century, till the dawn of the

Reformation, the history of the Church in Scotland is one of constantly increasing power and wealth, and of growing corruption. The parochial system of Scotland owes its establishment to this period, and the Scottish ecclesiastics maintained a brave and successful struggle for independence against the claims of the primacies of Canterbury and York, who successively sought to assume control over the Scottish bishops.

In the end of the fifteenth century half the wealth of Scotland had passed into the hands of the Church. The feudal power of the greater nobles was greatly weakened by this, and also by the rising up of a middle class of lesser landholders and burghers, who had become the most powerful party in Scotland in intelligence, industry, and resources. In the beginning of the sixteenth century the writings of the continental Protestant divines were introduced into Scotland, and the result was seen in the awakened intelligence and spiritual earnestness of this middle class. Patrick Hamilton, a youth of high mental endowments, returned from Wittenberg in 1527 and began to preach the Reformed doctrines. He was tried for heresy and burned at the stake (1528). Persecutions followed for thirty years, and then came the triumph of the Reformation in Scotland. See KNOX, JOHN; HENDERSON, ALEXANDER; and PRESBYTERIAN CHURCH.

Distinctive Characteristics.—The peculiar and essential features of the Reformed Church of Scotland, besides the profession of the evangelical faith common to all the churches of the Reformation, were—(1) The government of the Church by that order of men which is indicated in the New Testament by the terms presbyters and bishops or overseers; (2) the subjection of the Church in all things spiritual to Christ as her only Head, and to his word as her only rule.

The First Covenant and Book of Discipline.—In 1557 the First Covenant or Common Bond was signed. The subscribers to this document, after declaring their faith in "the Evangel of Christ," promise "before the majesty of God to maintain and defend the whole congregation of Christ, and every member thereof, to the death," and "to renounce and forsake all superstitions, abominations, and idolatries." The word *congregation* was then used as the distinctive name of all those who held to the doctrines of the Reformed Church, having the same signification as the work *kirk*, which was subsequently introduced, and the leaders of the Reformation in Scotland were known as "the Lords of the Congregation." The various congregations which belonged to the Congregation used the liturgy of Edward VI.; and the Apostles' Creed and King Edward's Catechism formed the articles of religion by which they were bound into a doctrinal unity. At the death of the regent, Mary of Guise, in 1560, the Parliament of Scotland met, and on Aug. 24 an act was passed which is described as "The Confession of Faith and Doctrines believed and professed by the Protestants of Scotland, and authorized by the Estates in Parliament." This confession was in fact "the Order of Geneva," including the confession of faith prepared for the English congregation at Geneva by John Knox. Immediately afterward, on Dec. 20, 1560, the first General Assembly of the Kirk of Scotland was held, and from this date the Assembly "took order for God's glory and the weal of his Kirk in the realm of Scotland." At this Assembly "the Book of Discipline of the Church was allowed and approved." This book was afterward submitted to the council, which refused to sanction it. Nevertheless, the Church proceeded at once to carry it into execution. The principles of religious liberty were not understood in that age, and the Scottish Reformers did not hesitate to enact laws which involved the infliction of civil penalties for offenses that were purely religious, though, to their credit, it should be stated that these penalties were seldom inflicted; but with these exceptions the great principles, both of faith and order, which were then agreed to, remain, amid all the changes of confessions, as those held by all the branches of the Reformed Church in Scotland to this day. It is especially worthy of note that in this "first Book of Discipline," while "the duty of nations and their rulers to own the truth of God and to advance the kingdom of his Son," is clearly stated, it is at the same time maintained that the Kirk possesses an independent and exclusive jurisdiction, "which flows directly from God and the Mediator, Jesus Christ, and is spiritual, not having a temporal head on earth, but only Christ, the only King and Governor of his Church." For seven years, from the death of the regent Mary of Guise (1560) till the

abdication of Mary Queen of Scots, the Kirk was without state endowment, and indeed without any recognition by the state of her jurisdiction.

Patronage.—At a very early period lay patronage was introduced into Scotland. Laymen who had endowed churches and monasteries reserved for themselves and their heirs the right of presenting incumbents to the benefices thus founded. At a later period these rights of presentation were to a large extent annexed to bishoprics, priories, abbacies, and other religious houses, so that at the time of the Reformation there were only 262 out of the 940 benefices the patronage of which remained in the hands of laymen. The rights of presentation which belonged to the religious houses were after the Reformation a continual subject of contention between the Assembly and the queen. In 1565 the General Assembly asked that the absolute right of the queen or of any lay patron to present a minister without examination be disallowed. To this the queen answered that it seemed to be "no way reasonable that she should defraud herself of so great a part of the patrimony of the crown as to put the patronage of benefices forth of her own hands." The patronage to these benefices continued to be held by the queen, or was by her distributed among her favorite nobles.

Immediately after the queen's abdication the Parliament met on Dec. 15, 1567, and passed an act in favor of the Reformed Kirk, ratifying the act of 1560 by which the Confession of Faith was sanctioned and adopted, and among other statutes one for the examination and admission of ministers by the Kirk, reserving the right of presentation to the lay patrons. This Parliament also "declared and granted the jurisdiction of the Kirk anent preaching of the true word of God, correction of manners, and administration of the holy sacraments." A similar act was passed in 1592, ratifying and enlarging the rights of the Kirk in regard to her jurisdiction over the appointment or deprivation of ministers. The acts of 1567 and 1592 have always been regarded as the solemn recognition and sanction by the nation of the constitution of the Reformed Church, and the great charters of her Presbyterian government and freedom from the supremacy of the crown in all causes spiritual and ecclesiastical.

The Solemn League and Covenant and the Westminster Standards.—In 1603 James ascended the English throne. After a long and bitter struggle, both in England and in Scotland, against the royal encroachments on the civil and religious liberties of the people, an ordinance of the English Lords and Commons in Parliament was passed on June 12, 1643, calling the Westminster Assembly. The General Assembly of the Kirk met in Edinburgh on Aug. 2 in the same year. Commissioners from England were present, and the result of their conferences was that on Aug. 17 "the Solemn League and Covenant" was passed unanimously by the General Assembly; it was then carried to the Convention of Estates and unanimously ratified by them. Commissioners were also appointed to represent the Kirk of Scotland in the Westminster Assembly. The Confession of Faith of the Westminster divines was finished in 1646, and on Aug. 4, 1647, it was adopted by the Scottish General Assembly, with two modifications; and two years later the Estates of Parliament ratified this decision.

Later History.—Charles II. was restored to the throne in 1660, and an attempt was then made to conform the Scottish Church to that of England by the establishment of the episcopal form of government. So severe was the persecution that even to be present at a field conventicle was punishable by death and confiscation of goods. Yet the great body of the Scottish people steadfastly resisted. In the year 1688 William of Orange became king. In Apr., 1689, the Scottish Parliament met and passed an act abolishing prelacy. In 1690 the Parliament passed acts rescinding the statute of 1669, which had declared the king's supremacy, and ratifying the Confession of Faith and settling Presbyterian church government. The same Parliament passed an act abolishing lay patronage, though the new monarch was known to be strenuously opposed to its abolition. In 1693 the Parliament passed an act for "settling the quiet and peace of the Church," but this act expressly provided for summoning the General Assembly by royal authority. The General Assembly met in May, 1694. The king instructed the royal commissioner that if the act of supremacy was not accepted he should at once dissolve the Assembly, but at last the threat of dissolution was withdrawn, and the independence of the Kirk was again confirmed.

Daughter Churches.—In the articles on the FREE CHURCH OF SCOTLAND and PRESBYTERIAN CHURCH (qq. v.) will be found

a statement of the extensive legislative acts in reference to the loss of patronage and the independence of the Church, and also of the long-continued struggles between the two parties in the Church itself, which resulted in the first secession in 1704, or a second secession in 1758, and ultimately in the formation of the Free Church of Scotland in 1841. In the beginning of the nineteenth century the Church of Scotland established missions in Australia and in the provinces of British North America. These missions grew into presbyteries and synods, and at length dissolved their ecclesiastical connection with the parent churches, and occupy a separate position as churches possessing supreme jurisdiction.

Present Condition.—The Church of Scotland has missions in India and missions to the Jews in Alexandria, Scyrus, and Jerusalem. During the last thirty years there has been a remarkable development of spiritual and intellectual life among the clergy of the Scottish Church and a corresponding growth of religious power in the congregations. The loss of patronage has been abolished, so that each parish is a *locus vacant*, on the payment of a small sum in the parish, has the right of electing its own minister, subject to the consent of the presbytery. The General Assembly is the supreme court of the Church and meets annually in Edinburgh. It consists of representatives from all the presbyteries, and also from the royal burghs and the four universities. The Queen is represented in the General Assembly in the most high commissioner, but he takes no part in the deliberations. According to what is called the *Secession Act*, no new introduction or innovation or change in the established laws can be passed until it has received the approval of the majority of the presbyteries.

Revised by W. J. RESNER.

Scotland, National Covenant of: See COVENANT, NATIONAL.

Scott, CHARLES: soldier; b. in Cumberland co., Va., in 1746; served in Braddock's campaign 1755; raised and commanded the first company of James river for service in the war of the Revolution; became colonel of the Third Virginia Battalion Aug. 12, 1776; brigadier-general Apr. 2, 1777; distinguished at Trenton, Germantown, Monmouth, and Red Bank; taken prisoner at the surrender of Charleston 1780; settled in Woodford co., Ky., 1785; brigadier-general of Kentucky Volunteers in St. Clair's unfortunate expedition against the Miami Indians 1791; but made a successful invasion to the Wabash, defeating the Indians; commanded a portion of Wayne's army at the battle of Fallen Timbers 1794; was Governor of Kentucky 1800-12, D. Oct. 23, 1814. A town and a county in Kentucky bear his name.

Scott, DAVID: painter; b. in Edinburgh, Oct. 10, 1806; son of a landscape-engraver; educated at the High School; showed prominent talent for designing and engraving; visited Italy in 1822; was a member of the Royal Scottish Academy. Among his paintings are *Nimrod, Sardan, Rutland, Mary Queen of Scots receiving her Death-warrant, John Moore found Dead in the Street, Achilles, Greek, Demosthenes, Peter the Hermit, and Christ in the Garden*. He was an author, too, and wrote an able series of papers in *Blackwood* 1840. D. in Edinburgh, Mar. 5, 1848.

Scott, DAVID: See DAVID SCOTT CASE.

Scott, Sir THOMAS GILBERT, R. A., F. S. A.: architect; grandson of Thomas Scott, biblical commentator; b. at Banast, Buckinghamshire, England, in 1811; became an architect and a prominent member of the school which effected the so-called "Gothic revival"; was largely employed in the restoration of the ancient cathedrals of England, as well as Westminster Abbey, and the building of new churches, colleges, and secular public edifices. Among his works are the university buildings at Glasgow, the Indian, Chinese, Home, and Colonial offices, London, and the national museum at Prince Albert in Kensington Gardens, which covered him the honor of knighthood Aug. 2, 1872. He was the chief promoter of the Architectural Museum at Westminster, and published several professional treatises. D. in London, Mar. 27, 1878.

Scott, JOHN MONRO: patriot; b. in New York in 1730, a descendant of the second family of the Scotts of Ayr; graduated at Yale 1746; became a prominent and wealthy lawyer in New York; was an early and vigorous opponent of the oppressive measures of the British ministry, co-operating with William Livingston, Sears, Lamb, and the Sons

of Liberty, in which organization he was a popular orator; was defeated as a candidate for the Continental Congress of 1774; was perhaps the most influential member of the general committee of New York, appointed in 1775, and of the provincial Congress 1775-76; aided in drawing up the constitution of New York 1776; was chosen by the Continental Congress as one of the first trustees-general of New York (from June 1, 1776); served at the battle of Long Island, and in Westchester County until Mar. 1777, when he became secretary of State of New York, which office he filled until 1779; was delegate in the Continental Congress 1790-93, and chosen an honorary member of the Society of Cincinnati 1794. D. in New York, Sept. 14, 1794.

Scott, LEVI, D. D.: bishop of the Methodist Episcopal Church; b. at Cantwell's Bridge (now Odessa, Newswell co.), Del., Oct. 11, 1803; educated at a neighborhood school, but mainly self-taught; received the degree of A. M. from the Wesleyan University in 1840, and D. D. at Delaware College, Newark, Del., in 1848, both honorary; joined the Philadelphia Conference in 1826; served in the pastorate fourteen years, except one (1832-33) supernumerary from failure to health; was principal of Dickinson grammar school, Carlisle, Pa., from 1840 to 1845; was pastor in Philadelphia 1845-48; presiding elder 1845-48; assistant book-agent at New York 1848-52; and bishop of the Methodist Episcopal Church from 1852 to his death July 18, 1862.

Scott, RICHARD WILLIAM, J. J., D.: statesman; b. at Prescott, Ontario, Feb. 24, 1825; educated there, and admitted to the bar in 1845. He was mayor of Ottawa in 1852; represented that city in the Canadian Assembly 1857-63, and in the Ontario Assembly 1867-72; was elected Speaker of the Ontario Assembly in 1871, but resigned that office the same year upon being appointed Provincial Commissioner of Crown Lands, which portfolio he retained until 1873. He was Secretary of State for Canada from Jan. 8, 1874, until Oct., 1878; since then has been leader of the Liberal opposition in the Senate, to which body he was appointed Mar. 13, 1874. He prepared and carried in 1868 the Separate School Law of Ontario, and framed the Canada Temperance Act, which was carried through Parliament chiefly owing to his exertions.

See MACDONALD.

Scott, RICHARD, D. D.: classical scholar; b. in Devonshire, England, in 1811; graduated at Oxford, 1830; became a fellow of Balliol; took orders in the Church of England; was rector of Dulce, Cornwall, and of South Luffenham, Rutlandshire; became master of Balliol 1864, Professor of Exegesis 1861, and dean of Rochester 1870. He translated part of the *Oxford Library of the Fathers*, and was associated with Dean Liddell in the preparation of a well-known *Greek-English Lexicon* (1845; 7th ed. 1882). D. Dec. 2, 1867.

Revised by H. L. WILLIAMS.

Scott, ROBERT TINSLEY, M. A., F. R. S.: meteorologist; b. in Dublin, Jan. 25, 1833; was educated at Rugby School, Trinity College (Dublin), and in Berlin and Munich; became secretary of the British Meteorological Office, and executive of the British weather service in 1867. He is the author of *Handbook of Volumetric Analysis* (1862); *Weather Charts and Storm Warnings* (1876); *Elementary Meteorology* (1883); and of many papers in the *Proceedings of the Royal Society*, the *Quarterly Journal of the Royal Meteorological Society*, the *Journal of the Royal Geological Society of Ireland*, and other periodicals.

M. W. H.

Scott, RICHARD NICHOLSON: soldier; b. at Winchester, Tenn., Jan. 21, 1838; appointed second lieutenant of Fourth U. S. Infantry Jan. 21, 1857, adjutant July, 1861, and captain Sept., 1861. He served on the Pacific coast until 1861, being in command of the U. S. steamer *Massachusetts* during the San Juan difficulties in 1859. He was with the Army of the Potomac as acting adjutant-general from Mar., 1862, until June, 1863; was engaged in the siege of Yorktown and battle of Gaines's Mill, where he was wounded and awarded for gallantry. From June, 1863, to Sept., 1864, he was senior aide-de-camp to Maj.-Gen. Halleck. He continued to serve on staff duty till 1870; was Professor of Military Science at Fairmount, Minn., 1872-73; commanded Fort Ontario 1873-77; major Third Artillery 1879; was engaged from 1877 till his death in publishing the official records of the civil war. Author of *Digest of the Military Laws of the United States* (1873). D. at Washington, D. C., Mar. 5, 1897.

Scott, Sir WALTER: novelist and poet; b. in Edinburgh, Aug. 15, 1771; the son of Walter Scott, a writer to the sig-

net, and Anne Rutherford, daughter of Dr. John Rutherford, Professor of Medicine in the University of Edinburgh. He was lineally descended from the ancient chieftain Walter Scott, traditionally known as Auld Walt of Harden. He was a strong and healthy child until about eighteen months old, when he became incurably lame in his right leg—a weakness which sadly interfered with his love of active sports, but never marred his cheerfulness, good temper, or courage. His early childhood was passed in the farmhouse of Sandy-Knowe. At the age of eight he was placed in the High School of Edinburgh, where he remained for four years, the first two in the class of Luke Fraser, and the remaining time under the tuition of the distinguished rector, Dr. Alexander Adam, of whom Scott gives a pleasant account in his fragment of *Autobiography*. Personally popular, and making himself respected by his courage and general ability to take care of himself, he was not regarded as a very bright scholar, although even then giving evidence of his love of knowledge, of a strong memory for whatever pleased him, and of special delight in history, poetry, fairy tales, and romances. In 1783 he entered the university, and for a year or more attended the classes in Greek, Latin, logic, and ethics, giving some attention also to history and law. In the ancient languages he made but little progress, although more successful in other studies. It is not surprising, then, that in thorough knowledge and discipline he should have found himself at fault. Years afterward, and when he had become famous, he writes in his *Autobiography*: "It is with the deepest regret that I recollect in my manhood the opportunities which I neglected in my youth. Through every part of my literary career I have felt pinched and hampered by my own ignorance; and I would at this moment give half the reputation I have had the good fortune to acquire if by doing so I could rest the remaining part upon a sound foundation of learning and science." His progress in the university was arrested by a severe attack of illness, which seems to have broken up all plans of further study, and in 1785–86 he entered into indentures with his father to serve the usual apprenticeship to a writer to the signet. In 1792 he was called to the bar. During these and the succeeding years he was crowding his mind with vast accumulations of "ponderous and miscellaneous" knowledge of poetry and archaeology, fiction, and history, not easy to condense or reduce to system and order. "My memory of events," he says, "was like one of the large old-fashioned stone cannons of the Turks, very difficult to load well and discharge, but making a powerful effect when by good chance any object did come within range of its shot." He had already begun to collect books and articles of antiquarian interest, "the germ of the magnificent library and museum of Abbotsford." His mind was already turning toward letters, and in 1796 he made his first considerable publication, being translations from the German of Bürger. This was followed in 1799 by a translation of Goethe's *Goetz von Berlichingen*. *The House of Aspen*, which was not published till 1829, and several ballads.

In the meantime, in Dec., 1797, after a serious disappointment in love, he was married to Charlotte Margaret Carpenter, or Charpentier, a young lady of French birth and parentage, but a resident in England. Two years later, through the influence of his friends, he obtained the appointment of sheriff-depute of Selkirkshire, an office with light duties, which brought the important addition to his resources of £300 a year. In Jan., 1802, he published two volumes of the *Minstrelsy of the Scottish Border*, which was completed the next year by a third volume. It was received with great favor, and may be considered as opening the way to his general fame. It brought him also into familiar acquaintance with men of genius and lovers of legendary lore, such as Richard Heber, long member of Parliament for the University of Oxford, and that eccentric genius John Leyden.

From this time onward to the year 1831, when, at the age of sixty, he gave to the world the fourth series of *Tales of my Landlord*, there was but one year (1807) which was not marked by some independent work in verse or prose, bearing the impress of his genius, giving new impulse to literature and new fame to the land of his birth. There is room to mention only the most important of these. In 1805 the *Lay of the Last Minstrel* was published. It took the world by surprise, and was received with unbounded delight, not only for its chivalric spirit, its "vivid richness of coloring," its pathos, beauty, grace, and airy freshness, but as giving the promise of original poetic fervor and power to which the kingdom had long been a stranger. Edition after edi-

tion was called for, and sold as soon as published. "In the history of British poetry," says Lockhart, "nothing had ever equalled the demand for the *Lay of the Last Minstrel*." This was followed in 1808 by *Marmion*, perhaps the strongest and boldest of his poems, and in 1810 by *The Lady of the Lake*, in some respects more pleasing than any. In these his poetic power culminated. The poems subsequently published—*The Vision of Don Roderick* (1811), *Rokeby* (1812), *The Bruce of Triermain* (1813), *The Lord of the Isles* (1815)—were unequal to the earlier, and in various ways gave evidence of a waning popularity, which Scott was among the first to recognize. Another reason for this perceptible loss of popular favor was the appearance of another brilliant light in the early poetry of Lord Byron.

During these six or eight years Scott had been advancing in fame and in pecuniary resources. In 1804 he took the house of Ashiestiel, in the Ettrick Forest, overlooking the Tweed. In 1806 his friends had procured for him the appointment to one of the clerkships of the court of sessions, worth about £1,800 a year, the emoluments of which, however, by an express arrangement, he did not receive until the death of his predecessor in 1812. Still earlier, in 1805, he had become a regular partner in the printing-house of James Ballantyne & Co., although this connection was kept a profound secret from nearly every one of his most intimate friends. This was undoubtedly one of the most important steps of his life. "He continued bound by it," says his son-in-law, "during twenty years, and its influence on his literary exertions and his worldly fortunes was productive of much good, and not a little evil." In 1806 he took a prominent part in establishing *The Quarterly Review* in London, in opposition, politically, to *The Edinburgh Review*, the acknowledged advocate of the Whigs. In 1811 he purchased Abbotsford, a property of 100 acres of land on the banks of the Tweed, near Melrose, for £4,000. To this he added estate after estate adjoining, purchasing at high rates, till he had expended nearly or quite £40,000, to which must be added £25,000 more for preparing the grounds and erecting the mansion where for a few years he dispensed a splendid hospitality, and to which his fame drew visitors from every part of the civilized world.

In 1813, on the death of Pye, he was offered the office of poet-laureate, which he refused; but in Mar., 1820, he accepted a baronetcy, and in November of the same year the presidency of the Royal Society of Edinburgh. His exertions, two years later, during the visit of George IV. to Edinburgh, seem to have tended, in company with overwork, to undermine his health.

On the decline of his popularity as a poet his fertile mind turned to another form of literature, with which for ten or twelve years he surprised and enchanted the world. In 1814 appeared, anonymously, a novel under the title of *Waverley*. The next year *Guy Mannering* was published; in 1816, *The Antiquary* and the first series of the *Tales of My Landlord*; in 1817, *Rob Roy*; in 1818, *The Heart of Midlothian* (second series of *Tales of My Landlord*); in 1819, *Tales of My Landlord* (third series) and *Ivanhoe*. This splendid series of novels, thrown off with an ease and rapidity without parallel, marks the high tide of his genius. Those which follow are on a somewhat lower level, but the abundance of the production was hardly diminished. *The Monastery* and *The Abbot* followed in 1820; *Kenilworth* and *The Pirate* in 1821; *The Fortunes of Nigel* in 1822; *Peveril of the Peak*, *Quentin Durward*, and *St. Ronan's Well* in 1823; *Redgauntlet* in 1824; *The Tales of the Crusaders* in 1825; and *Woodstock*, written in the midst of impending troubles, in 1826. *The Chronicles of the Canongate* (first and second series) followed in 1827 and 1828, *Anne of Geierstein* and *The Tales of My Landlord* (fourth series) in 1829 and 1831 close the long list.

The secret of the author of *Waverley*, although known to some and confidently conjectured by almost every one, was not acknowledged until after the bankruptcy of Constable and the Ballantynes had rendered even a formal concealment no longer possible. Early in 1826 Constable was obliged to stop payment, and the Ballantynes, including Scott as partner in the house, being closely connected, faced for a very large amount. The humiliation to Scott was indescribable, but he met the trial with remarkable strength and dignity. The most liberal offers of assistance were made to him by friends and admirers, among them one of £30,000 from an anonymous correspondent, but he firmly declined them all. He refused to take any advantage of circumstances which might have freed him from the claims

of his creditors, but insisted that they should stand, and pledged the talent of his future life to the payment of those debts. He at once entered upon that course of unflinching industry in writing new works and in the republication of the old, with novel and profusion which enabled him within a few years to pay to his creditors £40,000, and to put things in better shape than some after his death, the principal of the debt was paid for his executors. It was a tremendous exertion, and it cost him his life. In 1830 alarming symptoms, which had appeared the preceding year, were followed by a nervous attack, from which he partially recovered. In Apr., 1831, the attack was renewed, and in September he left Edinburgh for the Continent, a great part of which he had never visited. The invalidly furnished him a ship of war, on which he proceeded to the Mediterranean, landing at Malta, and thence going to Naples. Here his mind almost entirely gave way, and he hurried homeward as rapidly as possible, stopping for a few weeks in London, and reaching Edinburgh in July, 1832. He died Sept. 21, and in the 1890's was buried in the grounds of Dryburgh Abbey. His most devoted died in 1828. His two sons and two daughters survived him.

All the standard editions of his works, probably the most complete and discriminating list is to be found in Allhouse's *Bibliography of Authors*. Extensive memoirs of Scott have been written by David Walker, William Weir, George Allan, and in the *Encyclopædia Britannica* by William Spaulding; but the great work on the author and the man, and one of the best pieces of biography in any language, is the *Life by Andrew Allan*, Leithart. See *Novels and English Literature*.

Revised by EMERSON GOSSET.

Scott, William Bell, poet and artist; b. near Edinburgh, Scotland, Sept. 12, 1811; brother of David Scott, engineer, became a distinguished painter and archaeologist and head master of the Government School of Design at Newcastle-on-Tyne; afterward resided chiefly at London, associated with the Pre-Raphaelite Brotherhood of English painters. Till 1865 was art-examiner under the education board. Published *Ballads and other Poems* (1839); *The Four of the World, a Philosophical Poem* (1840); a *Memoir of his father David* (1850); *Antiquarian Glossings in the North at Edinburgh in quarto numbers*, 1849-51; *Chorus Scott's Life* (1871); *Prose* (1874); *Half-hour Lectures on the History and Progress of the Fine and Ornamental Arts* (1861); another volume of *Prose* (1875), with illustrations by himself and by Alfred Tennyson. D. New York, 22, 1890. See *Antiquarian Notes of the Life of William Bell Scott*, edited by W. Martin (New York, 1892, 2 vols.).

Revised by H. A. BRASS.

Scott, Waverley, soldier; b. in Darncliffe co., near Perthshire, Va., June 16, 1796; educated at William and Mary College; studied law, and was admitted to the bar, in May 2, 1819, he accepted an appointment as captain of light artillery, and was ordered to New Orleans, where a year later, for disrespectful allusion to the conduct of his superior officer (Gen. Wilkinson), he was suspended by a court martial for one year, relinquishing his command at Baton Rouge in the fall of 1811. Promoted to be lieutenant-colonel July, 1812, he was sent to Philadelphia to organize troops for the field, but an application was ordered to the Niagara frontier, reporting to Gen. Smyth Oct. 4, near Buffalo. The attack on Queensdown occurred Oct. 18; Scott did not participate in the carrying of the heights and batteries, but the ensuing battle was fought under his command, after a gallant resistance he was overpowered, and the militia refusing to cross to his support, he was obliged to surrender, but he was exchanged soon after. In Mar., 1813, he was appointed adjutant-general with the rank of colonel, and the same month attained the colonelcy of his regiment. Dismissing with his battalion to Gen. Dearborn on the Niagara frontier in May, he led the advance in the assault on Fort George, May 27. In June he commanded the rear-guard in the retreat from Stony Creek to Fort George, and in connection with the navy made the descent on Burlington and York to September. In October he joined Gen. Wilkinson at Buffalo, he established a camp of instruction. On July 3, 1814, the Niagara river was crossed by Scott's and Riedy's brigades and Fort Erie captured. The battle of Chippewa ensued July 5, in which Scott greatly distinguished himself; the battle of Lundy's Lane next

followed (July 25), where Scott was severely wounded after having had two horses shot under him. He was (July 25) promoted to be brevet major-general, and Congress voted him a gold medal. In October, when but partially recovered, he was ordered to Baltimore, then again threatened; thence to Washington, where he was engaged as president of a board on infantry tactics and of a court of inquiry in the case of Gen. Winler. Declining to act as Secretary of War, he sailed for Europe in July, 1815, returning the following year. In 1815 he began the preparation of *General Regulations of the Army*, and in 1820 his *System of Infantry and Rifle Tactics*. During the nullification troubles (1829-32) Scott was ordered to South Carolina, where his tact and decision prevented civil war. He next served in Florida and in the Creek Nation against the Indians but, being charged with ill-treatment, a court of inquiry was ordered, which resulted in Scott's acquittal. The Canada border troubles (1857-58) next demanded his attention; followed in 1859 by the task of removing the Cherokee Indians to the upper Arkansas, and in 1860-61 he was engaged in Maine during the disputed territory controversy, conducting the management of each of these important duties with great success. In July, 1861, he succeeded to the command of the army as general-in-chief. In the war with Mexico he was ordered in Nov., 1846, to take command. Amending his troops at Laredo island, whence he moved in transports in February, a landing was effected (Mar. 6) at Vera Cruz, which succeeded, together with the battle of San Juan d'Ulu, Mar. 30. (See *Vina Cruz*.) The battle of Cerro Gordo (4-5) was fought Apr. 19, and the battles of Contreras, Churubusco, and San Antonio (see *Contreras*) Aug. 19-20. On Sept. 5 the battle of Molino del Rey (4, 5) was fought; the heights of Chapultepec (4, 5) were carried Sept. 13, as well as the San Cosme and Bode gates of the city of Mexico, the army entering next day (Sept. 14), and practically ending the war. Declining the proffered presidency of the Mexican republic, Scott, having been superseded by Gen. W. O. Butler, and a court of inquiry ordered in his case, arrived in New York May, 1848. Congress in March had extended to him a vote of thanks and authorized a gold medal. In June he was a candidate for nomination in the Whig convention which nominated Gen. Taylor for the presidency. In 1852 he received the nomination from the Whig party, but was signally defeated by Franklin Pierce, though receiving a large popular vote. In 1855 the rank of lieutenant-general by brevet was conferred upon him. In 1859 he was sent to Puget's Sound to arrange the difficulty caused by the occupation of San Juan island by Gen. Harney.

Though too infirm to undertake the conduct of the army in the great civil war, Gen. Scott unhesitatingly threw the weight of his influence in favor of the Government, and in the exciting events preceding actual hostilities rendered important service. On Nov. 1, 1861, he was retired from active service, but without reduction of pay or allowances. He published his *Autobiography* in 1864. D. at West Point, May 29, 1886.

Revised by JAMES MINCK.

Scottsdale: borough; Westmoreland co., Pa., on the Penn. and the Balt. and Ohio railways; 17 miles S. of Greensburg, the county-seat (for location, see map of Pennsylvania, ref. 5-B). It is in a coal-mining region, and contains a rolling-mill, large pipe-works, and other iron manufactures; a national bank with capital of \$50,000, a private bank with capital of \$50,000, and two weekly newspapers. Pop. (1880) 1,275; (1890) 2,693.

Scottisms: words and expressions proper to the English of Scotland, and not recognized as belonging to standard English. *Suddenly* for "suddenness," used by Sir Walter Scott, is an example. In the U. S. many of the following words or phrases appear to be due to the speech of settlers from Scotland: *Assunder* (asunder), *basket* (basket), *blather*, *blather*, *big-coat* (great-coat), *bare-tree* (elder), *chuck* (chuck (n.), a slight repeat), *clash* (clamorous talk), *a cut of yarn*, *forment* (opposite), *not a hair* (white), *keel* (trudle or red chalk), *kylogus* (to plot), *red* (to comb out), *red up* (to arrange), *a room*, *scrubby* (stunted), *stomach*, *sunken* (sunk), *trap* (to get the place of a higher post by a correct answer), and others. Many words and phrases not now admitted as standard English are, however, also used in other English dialects, and the use of such words as those mentioned does not necessarily prove the speaker to be of Scotch descent. It is probable that the common misuse of *will*, *would* for *shall*, *should* in the U. S. is in great part due to the influence of the speech of settlers from Scotland and

Ireland, and the same cause perhaps has something to do with the very common pronunciation of *r* in cases where in Southern England and some regions in the U. S. that sound has been lost (though the Scotch *r* is not like the sound heard in the U. S.), as well as with the fact that in the U. S. speakers rarely drop or misplace the sound of *h* in standard English, and more generally distinguish *wh* from *w* than is the case in England. But it is not necessary to assume that Scotch pronunciation is the only or even the chief cause of these and some other features of American pronunciation. See, further, Jamieson's *Etymological Dictionary of the Scottish Language* (revised ed. 4 vols., 1879-82); J. A. H. Murray, *The Dialect of the Southern Counties of Scotland in Transactions of the (London) Philological Society* (1870-72, part ii.); A. J. Ellis, *Early English Pronunciation* (part v., 1889), etc.

S. S. HALDEMAN.
Revised by E. S. SHELDON.

Scottish Language: the language spoken in Scotland. This is well known to be not a Celtic dialect, but a form of English which differs from the standard speech by reason of a separate development, and because of external influences to which the latter has not been subjected in the same degree. English became the language of Scotland owing to political events in the early history of the country. The Northumbrian kingdom in the seventh century included the Lowlands of Scotland in its supremacy. As a result, English, the language of Northumbria, began to spread more widely over the Lowlands. When the Scottish kingdom became separated from England, the struggles for supremacy between the Saxons of the Lowlands and the Celts of the Highlands resulted in a victory for the former, and English became after a time the recognized literary language.

The form of English thus adopted was that called Northern English, spoken from the Humber northward. Up to the middle of the fifteenth century Scotch-English did not differ from that used in Yorkshire and Northumberland. From about this time, however, owing to the development of a separate national life and literature, that form of Northern English spoken in the capital city, Edinburgh, became the standard literary language of Scotland. The literature produced in this language includes such important names as Barbour, James I. (of Scotland), Wyntoun, Henryson, Dunbar, and Douglas.

The various external influences affecting Scotch-English differ considerably in degree from those affecting the language of England. Celtic, which remained as a linguistic sub-stratum in the Lowlands and as the dominant speech of the Highlands for many years, influenced the English of Scotland more than that of any other part of Britain. Thus many Celtic words, not found in English, belong to Scotch. The Norse or Scandinavian influence was probably as great as upon Northern English as a whole, and thus greater than upon Southern or Midland English. The French influence was due not so much to the Norman conquest as to those close political relations between Scotland and France which enabled the former to retain her independence for so many years. The revival of classical learning powerfully affected Scotland, as it did the rest of Britain, but the earlier classical influence was probably not so great upon the language of the north as upon the language of the south. More powerful than all other influences has been the effect upon the Scottish language of the standard language of England. Its earliest marked effect was at the time of the Reformation, and this was greatly increased by the union of the two countries under the same king in 1603. In fact, since that time, except for a partial revival of the popular speech in the poems of Ramsey, Fergusson, and Burns, the Scottish language has gradually given place to the literary language of England. Even the speaking of Scotch-English, as distinct from the English of the south, has more and more been given up by educated people, so that this form of the language, so long dominant in the northern kingdom, has been gradually sinking to the position of a mere dialect, without a literature or a considerable body of cultivated speakers.

A systematic treatment of the subject may be found in *The Dialect of the Southern Counties of Scotland*, by James A. H. Murray, in *Transactions of the (London) Philological Society* (1870-72). See ENGLISH LANGUAGE.

OLIVER FARRAR EMERSON.

Scottish Literature: See ENGLISH LITERATURE.

Scotus, DUNS: See DUNS SCOTUS.

Scotus, JOHANNES: See ERIGENA.

Scouller, JAMES BROWN, D. D.: clergyman; b. near Newville, Pa., July 12, 1820; educated at Dickinson College and the United Presbyterian Theological Seminary, Allegheny, Pa.; pastor of the United Presbyterian churches, Fourth of Philadelphia 1844-47, Cuylerville, N. Y., 1847-52, Argyle, N. Y., 1852-62; editor, 1862-63, of *The Christian Instructor*, for which he had written *Forty Letters from Abroad, principally Italy and Egypt* (1860-61). Dr. Scouller's principal published works are *A Manual of the United Presbyterian Church* (1881; 2d ed. 1887); *Calvinism: its History and Influence* (1885); and *History of the United Presbyterian Church*, in American Church History Series (New York, 1894). C. K. HOYT.

Scovel, SYLVESTER FITHIAN: clergyman and educator; b. at Harrison, O., Dec. 29, 1835; educated at Hanover College, Indiana, and New Albany (now McCormick) Theological Seminary; pastor of Presbyterian church, Jeffersonville, Ind., 1852-61, First Presbyterian church, Springfield, O., 1861-66, First Presbyterian, Pittsburg, Pa., 1866-83; and since 1883 has been president of Wooster University, Ohio. He has published sermons, addresses, and *Centennial Volume of the First Presbyterian Church of Pittsburg* (Pittsburg, 1884). C. K. HOYT.

Scranton: town; capital of Jackson co., Miss.; on the Pascagoula river and the Louisville and Nashville Railroad; half a mile N. of the Gulf of Mexico, 45 miles S. W. of Mobile, Ala. (for location, see map of Mississippi, ref. 9-II). It saws and ships large quantities of pine lumber, has an extensive oyster industry, and contains a State bank with a capital of \$25,000, and two weekly newspapers. Pop. (1880) 1,052; (1890) 1,353.

Scranton: city; capital of Lackawanna co., Pa.; on the Lackawanna river, and the Cent. of N. J., the Del. and Hud., the Del., Lack. and W., and the N. Y., Ont. and W. railways; 18 miles N. E. of Wilkesbarre and 107 miles N. of Philadelphia (for location, see map of Pennsylvania, ref. 3-I). It is the fourth city in the State in population and the center of the great anthracite coal region, and has a picturesque location in the Lackawanna valley on a plateau at the confluence of Roaring brook and the Lackawanna river. The city is laid out with wide straight streets; has several public parks and squares, and a beautiful drive to Elmhurst; and contains 140 miles of streets, many paved with asphalt and brick, improved water-works, gas and electric light plants, and electric street-railways. The area is 19½ sq. miles. Among the notable public buildings are the U. S. Government building, court-house, municipal building, Albright Memorial Library, Moses Taylor Hospital, and the Oral School for the deaf and dumb.

Finances and Banking.—The assessed valuation of real and personal property in 1894 was \$19,291,124, and the net debt Jan. 1, 1895, was \$438,232. In 1895 there were 3 national banks with combined capital of \$650,000, 4 State banks with capital of \$500,000, a trust and safe deposit company with capital of \$250,000, and an unclassified bank with capital of \$30,000. Scranton has 15 building and loan associations, all local and all but two on the terminating plan, with an aggregate of 4,851 shareholders, 1,708 borrowers, and 25,746½ shares in force.

Churches, Schools, etc.—Scranton is the seat of a Roman Catholic bishopric and has 70 churches of various denominations. There are 37 public-school buildings, public-school property valued at over \$900,000, 4 colleges, a nunnery, 6 public libraries, 2 hospitals, and 4 daily, 17 weekly, and 6 monthly periodicals.

Business Interests.—The census returns of 1890 showed 138 manufacturing establishments (representing 41 industries), with a combined capital of \$25,144,936, employing 8,498 persons, paying \$3,921,831 for wages and \$15,968,846 for materials, with products valued at \$22,801,028. The principal industry is the manufacture of iron and steel, 4 establishments, with \$8,840,706 capital, employing 3,298 persons, paying \$1,726,229 for wages and \$10,716,206 for materials, with products valued at \$13,278,299. Then follow the manufacture of malt liquor, 3 establishments, \$471,700 capital; silk and silk goods, 3 establishments, \$440,699 capital; planed lumber, 8 establishments, \$429,536 capital; flour and feed, 5 establishments; carriages and wagons, 9. The city is an important center for general trade and one of the principal distributing-points for the anthracite coal trade.

History.—The city was founded by Joseph H. and George

W. Scrivenor in 1840, and was incorporated as a borough in 1844 and as a city in 1898. The first rolling-mill was put into operation in 1844. Pop. (1880) 12,870; (1900) 73,957; (1910) estimated, 103,000. R. F. Wren.

Screw (n): any kind of the family PALAEMONIDÆ (q. v.).

Screw (M. Ling. screw, from U. Fr. *visser* > *vis*, screw, an old French verb, akin to *visum*, *visere*, Dutch *schroef*, *schroef*, *schroef*; an elementary mechanism consisting of a cylinder having around it a projecting helical rib or thread. When the helical rib is formed on the interior of a hollow cylinder within a movable block the combination is called a nut. The screw is really a particular case of the inclined plane.

The screw was known in Egypt in the days of Herodotus (c. 450), who shows it in several propositions of his *Geometry*, and it is also figured by his *Asiatick*. It was also known to Archimedes (c. 250), and he has been credited with the invention for the purpose of launching a large vessel built under his direction. At the beginning of the Christian era it was well known to the nations on the shores of the Mediterranean, and its use in press screws has been well understood for a well-preserved manuscript of Pappus illustrates a press for linen which has two screws and a massive frame.

The earliest writer who described the laying out of a screw thread was Pappus of Alexandria, a Greek mathematician of the fourth century. His method consisted in winding a right-angled triangle of thin brass around a cylinder and then tracing the screw-thread from the hypotenuse. The space between the threads was then cut or filed off. A similar method was used but a few years ago by native workmen in India for making (of native wrought iron) press-screws 3 inches in diameter and 12 feet in length, having threads three-quarters of an inch thick. At one time it was not uncommon in India in the Southern U. S. plantation cotton gins having wooden screws 14 inches in diameter and 6 feet long, the threads being a inch thick. These screws were cut out by a millwright using ordinary hand-tools. James Harrison (1776) was the first to pay especial attention to the making of screws by machinery, and his invention may be regarded as the first example of the modern use of screw-cutting lathes, although fifty years before there had been made in France a machine for cutting the thread on the bases of valves, and 200 years before James Baines had designed a lathe for turning wooden screws. Great attention was given to the making of accurate screws by Henry Maudslay. Sir James Barton and Sir Joseph Whitworth also made improvements in screw-cutting machinery, and the latter developed what is known as the Whitworth standard thread, which is almost universally used in Europe for screw-bolts. The threads on ordinary bolts and nuts in general use in the U. S. are known as the United States standard thread, or the Franklin Institute standard, being based upon the investigations of William Sellers, as set forth in a paper read by him before the Franklin Institute in Apr., 1864.

Of the many varieties of screws, that known as the wood-screw (from their exclusive use in wood) is the most common, and it has been made by machinery for many years. In fact such screws had blunt points, and therefore it was necessary to bore a hole for their reception, but about 1850 Thomas A. Edison, a native of the U. S., devised the well-known double-pointed screw and machinery for its manufacture. The thread of this screw and those of its predecessors were formed by cutting away the metal between them; but at present made by a system of rolling combined with double-compression, the threads are raised and all the metal between them is utilized in their formation.

One of the more important uses to which the screw is applied is the moving of the tool in lathes for turning metal, and it was used for that purpose as early as 1671; but the lathe was not intended for cutting screws, and it is somewhat remarkable that the lead-screw or guide-screw, as applied to lathes, especially designed for screw-cutting, did not appear till about 180 years later.

The screw has been applied to iron piles for forming a screw-foundation in loose soil, to mooring-chains for vessels, to the raising of heavy weights by jacks and cranes, to micrometers for microscopes and astronomical instruments, to the raising of water and the propulsion of vessels—in fact, there is no mechanism so delicate or machinery so ponderous that it is not dependent either for its manufacture or operation upon some application of the screw. W. F. DENVER.

Screw-pines: the *Pandanus*, a small family of about eighty species of mostly tropical, erect, or climbing monospermatophyte trees and shrubs. The family as restricted consists of but two genera (*Pandanus* and *Freycinetia*), and the members are confined to the Old World. They bear some resemblance to the pines, some of which were formerly included in this family, but their strongest affinities are doubtless with the woods, hence they are placed in the *Nyctagynaceae*. Some species bear naked, globose, spiked flowers; the stamens are many. The ovaries are compound with many ovules, or (by reduction) simple with solitary or few ovules. Many species, especially of the genus *Pandanus*, are cultivated in greenhouses. CHARLES E. BARNES.

Scribe, skrib, *scriba*, *scriba*, *scriba*; playwright; b. in Paris, Dec. 24, 1791; studied law, wrote in 1811 his first play, *Le Peuple*, which failed; achieved his first success in 1816 with *Une Nuit de la Garde nationale*, written in collaboration with Delavigne; provided from 1816 to 1820 the Théâtre de la Ville with the Théâtre des Variétés with as many vaudevilles and small comedies with songs as they could perform; wrote for the Gymnase between 1820 and 1830 about 150 plays, mostly of comic character of a sentimental or satirical character; composed, finally, from 1830 to his death, Feb. 20, 1861, more than 100 plays in three or five acts, historical, satirical, and even tragic, for the Théâtre Français and other houses, besides a similar number of operas for Boisselot, Adam, Aubert, Donizetti, Meyerbeer, Verdi, and other composers, and some novels and romances. Most of these plays he produced in connection with some other playwright—Gérmain Delavigne, Molière, Bayard, Dupin, Legrand, etc.—and at one time, between 1830 and 1835, this artistic partnership was organized in thorough business style; one made the plot, another sketched the characters, a third wrote the dialogue, etc. After 1835, however, it became necessary to be a little more careful in order to satisfy the public. In general, his success was complete. For nearly forty years he reigned supreme in all the theaters of the world. Nor can it be said that his success was entirely undeserved; his plots have a novelty and originality, their movements an adroitness and rapidity, and the dialogue an eloquence and pungency which always will be of value; but his picture of characters is superficial, and of passions and sentiments untrue; he lacks ideas, and is deficient in style. The best are his earlier one-act comedies, such as *Les premiers Amours* (1825); the worst are his later historical dramas in five acts, such as *Bertrand et Raton* (1835) and *Le Vercors d'Élan* (1840). At present his plays are very seldom acted. His collected *Œuvres* comprise 76 vols. (1874-85). Revised by A. G. CARRMAN.

Scribes (plur. of *scribe* from Lat. *scriba*, clerk, writer, deriv. of *scribere*, write, trans. of Gr. *gramma* (deriv. of *gramma*, write) and *Heb. sopher*, scribe, deriv. of *sopher*, write); originally, officers of state who drew up the decrees of kings, wrote their letters, and kept records. Among the Lemites in Egypt (Ex. v, 6-19) and in the desert (Num. xi, 16) there were scribes whose business apparently it was to keep the consular registers, serve processes, and the like. In Palestine the scribes appear to have been chosen from the Levites (1 Chron. xxi, 4; 2 Chron. xi, 11, xxix, 12). From the time of Ezra (fifth century B. C.) they were the copyists and then naturally exponents of the Law. In the New Testament they are generally named in connection with the Pharisees, as they belonged to that party, and were noted for their hypocrisy, ostentation, and arrogance.

Scribner, CHARLES; publisher; b. in New York, Feb. 21, 1821; son of Uriah R. Scribner, a prominent merchant; educated at New York University and at Princeton, where he graduated 1840; studied law for three years, and was admitted to the bar, but never practiced the legal profession; began the business of book-publishing in the old Brick Church, New York, in partnership with Isaac D. Baker in 1846, under the style of Baker & Scribner. In 1850 Mr. Baker died, and the business was thenceforth carried on in Mr. Scribner's name. In 1870 *Scribner's Magazine* was established. D. at Laverne, Switzerland, Aug. 20, 1871.

Scribnus Lar'gus; physician to the Emperor Claudius. He composed, about the year 47 A. D., a book of medical formulas, *Compositioes*, which is valuable for the history of medicine. Best edition by G. Helmreich (Leipzig, 1887).

Scriptures, Holy: See Bible.

Scrivener, skri-ner, FURNACE HENRY ARNOLD; biblical scholar; b. at Bermondsey, London, Sept. 29, 1813;

graduated at Cambridge, 1835; was for many years master of classical schools, especially that at Falmouth, where he was also incumbent of a church 1846-61; became rector of St. Gerrans, Cornwall, 1861; vicar of Hendon and a prebendary of Exeter 1876. D. at Hendon, Oct. 26, 1891. He holds a high rank in the philological criticism of the New Testament; published valuable editions of the *Greek Testament* of Stephens (1860; 7th ed. 1877) and of the *Codex Bezae* (1864); a *Full Collation of the Codex Sinaiticus with the Received Text of the New Testament* (1863); and the *Cambridge Paragraph Bible, with the Text Revised and a Critical Introduction prefixed* (1873); *Greek Testament, with the Changes of the New Testament Revisers* (1881); wrote a *Plain Introduction to the Criticism of the New Testament* (1861; 4th ed. by E. Miller, revised and enlarged, 1894, 2 vols.), and other works of kindred character; was appointed one of the company of revision of the authorized version of the New Testament 1870, and was granted a pension from the civil list 1872, "in recognition of his services in connection with biblical criticism."

Scrivener's Cramp: See NEUROSIS.

Scrofula, or **Struma** [*scrofula* is from Lat. *scrofula*, scrofulous swellings, *scrofula*, plur. of **scrofula*, liter., dimin. of *scrofa*, sow, swine being affected by a similar disease; *struma* is from Lat. *struere*, to build, since the lymphatic glands are enlarged in this condition]: a constitutional disease characterized mainly by defective nutrition of the tissues. Persons of the lymphatic temperament are most liable to develop the marked symptoms of struma or scrofula. Scrofula is hereditary in many families. In other persons it may arise *de novo* from bad hygiene and regimen, especially in children when rapidly developing. Most cases formerly considered scrofulous are now regarded as tuberculous, directly caused by the presence of the *Bacillus tuberculosis*. Many symptoms, too, of disordered blood-states formerly grouped as scrofulous are now distinguished as having definite causes. Eczema, though often an exponent of struma, is as often due to other causes—nervous influences, gouty or rheumatic taint, gastric and intestinal derangements. The scrofulous person is often light-complexioned, the skin white, the body full, or even obese, but the muscles soft and flabby. In other individuals, of what is called the dark strumous type, there may be delicately formed features, clear complexion, and much personal beauty. The chief characteristic of scrofula is the susceptibility of the lymphatic glands and of the bones and joints to grave forms of disease from slight exciting causes. It must not be confused with rickets, or rickets, with which it has no necessary connection, nor with inherited syphilis. Either persistently or with every slight impairment of health the glands of the neck, groin, abdomen, etc., may become indurated and enlarged. Such swellings may be evanescent or leave permanent indurations. The glands of the neck frequently are so engorged with scrofulous exudative matter that it undergoes cheesy or caseous degeneration—or actually suppurates, producing scrofulous abscess. Scrofula is not, then, a definite specific disease, but a condition of serious perversions of the nutritive qualities of the blood, and resulting affections of the various tissues and organs of the body. Enlarged glands, moist skin diseases, superficial abscesses, and destructive inflammations of the bones and joints are some of its manifestations. Inherited scrofulous taint may remain latent until developed by depressing sickness. Thus measles, a harmless disorder in robust children, is hazardous when struma lurks in the system. The bottle-fed infant and the foundling are more often scrofulous than the nursed, home-reared child. The mucous surfaces are very liable to disease in struma, chronic bronchial catarrh, diarrhoea, and cholera infantum. The relation of scrofula and tuberculosis is disputed. Modern pathologists believe that the bacillus of tubercle is the efficient cause of most of the conditions formerly attributed to struma, the micro-organism lying dormant in the body until from some accidental source of depression a suitable nidus is formed for its development and multiplication; but there are some cases in which neither tubercle nor syphilis can be demonstrated, and for these the term struma may still properly be retained. The treatment of scrofula is hygienic and nutritive—warm clothing, bathing, friction to the skin, pure air, nutritious diet, special articles such as cod-liver oil, and preparations of malt and of phosphates. Iron, iodine, and arsenical preparations act as alteratives to reduce glandular enlargements.

Revised by JOHN ASHURST, JR.

Scrophularia'cea: See FIGWORTS.

Scruple [from Lat. *scrupulus* (dimin. of *scrupus*, a rough, sharp stone), pebble, (as a weight) a scruple]: in apothecaries' weight, one-third of a drachm, 20 grains, the $\frac{1}{48}$ th part of the pound troy. The Romans gave the name to the $\frac{1}{48}$ th part of any standard unit of measure.

Scudder, HENRY MARTYN, M. D., D. D.: clergyman and missionary; son of Rev. John Scudder; b. at Panditerra, district of Jaffna, Ceylon, Feb. 5, 1822; went to the U. S. in 1832; graduated at University of City of New York in 1840, and at Union Theological Seminary in 1843; was ordained a Presbyterian clergyman same year, and sailed for Madras as a missionary of the American Board of Commissioners for Foreign Missions. In addition to his missionary work he studied medicine in the medical college of Madras, graduated, opened a hospital and dispensary for gratuitous treatment of the poor, and received an honorary M. D. from New York College of Physicians and Surgeons in 1853. He was in Madras from 1844 to 1851, and in the Arcot Mission from 1851 to 1863; returned to the U. S. in 1864; was pastor of a Reformed Dutch church in Jersey City 1865-71; was a Presbyterian pastor in San Francisco; was pastor of the Central Congregational church, in Brooklyn, N. Y., 1871-Nov., 1882; pastor of Plymouth Congregational church, Chicago, Ill., 1883-87. His publications include several works in the Tamil language. He went to Japan in 1887 to engage in missionary work.

Scudder, HORACE ELISHA: author; b. in Boston, Mass., Oct. 16, 1838; graduated at Williams College 1858; taught in New York till 1861, when he removed to Boston and devoted himself to literary work. He was editor of *The Riverside Magazine* (Cambridge, 1867-71), and became a resident of Cambridge, Mass., 1875. In 1890 he became editor of *The Atlantic Monthly*. He is the author of *Seven Little People and their Friends* (1862); *Dream Children* (1863); *Stories from my Attic* (1869); *The Bodley Books* (1875-87); *The Dwellers in Five-Sisters Court* (1876); *Stories and Romances* (1880); *Life of Noah Webster* (1882); *History of the United States* (1884); *Men and Letters* (1888); etc.

Revised by H. A. BEERS.

Scudder, JOHN, D. D., M. D.: missionary; b. at Freehold, N. J., Sept. 3, 1793; graduated at Princeton 1811; M. D. College of Physicians and Surgeons, New York, 1815; became a physician in New York, where he was house-surgeon to the City Hospital; abandoned an extensive practice to devote himself to missionary work; was a missionary physician of the A. B. C. F. M. in Ceylon 1820-36, after which he was transferred to the Madras mission; spent several years (1842-46) in the U. S., visited the Cape of Good Hope for his health 1854, and died of apoplexy at Wynberg, South Africa, Jan. 13, 1855. Author of several publications on missionary subjects. His labors in the establishment of hospitals and schools in Ceylon and Southern India were very successful. He takes rank with the best of the early missionaries in India. His ten children—eight sons and two daughters—all became missionaries in India; most of them are also physicians. See his *Memoir*, by Rev. J. R. Waterbury (New York, 1856).

Scudder, SAMUEL HUBBARD: naturalist; b. in Boston, Mass., Apr. 13, 1837; graduated at Williams College 1857, and at Lawrence Scientific School of Harvard 1862. He has been a prominent member of the Boston Society of Natural History, holding almost every office, including that of president (1880-87). He was assistant librarian of Harvard College 1879-82; paleontologist of the U. S. geological survey 1886-92; member National Academy of Science since 1877. His publications, which number upward of 620, are mainly upon insects, especially butterflies, Orthoptera, and fossil insects. Among the more important of his works may be enumerated: *Catalogue of N. A. Orthoptera* (1867); *A Century of Orthoptera* (1868-79); *Catalogue of Scientific Series* (1879); *Butterflies: their Structures, Changes, and Life-histories* (1881); *Nomenclator Zoologicus* (1882); *Butterflies of the Eastern United States* (1888-89); *Tertiary Insects of North America* (1890); *Life of a Butterfly* (1893); *Guide to the Common Butterflies* (1893). He was also one of the founders of *Science*, and its editor 1883-85.

J. S. KINGSLEY.

Scudéry, skū'dā'ree', MADELEINE, de: poet and novelist; b. at Havre, France, June 15, 1607; was educated in Paris; became one of the most conspicuous figures in the literary circle of the Hôtel Rambouillet, and acquired great celebrity

by two rowers, *Zeppelin* (1841), *Atlantus, son of Herakles* (1842), *Zeus* (1850), *Alcibiades* (1860), etc. After the capture of the Hotel d'Amboise had been broken up the carved a statue of her own, frequented by the queen and the pretence. D. in Paris, June 2, 1701.

Scullin (Ital., *scullin*, a scull), hence a scull struck with the edge of a scull (scull = *scull*, *scull*); a scull of four oars to five lbs., and nearly equivalent to the L. 5, 6, 7, 8, 9, 10. Many different sculls were struck by the numerous scullers which preceded in Italy, and their values are extremely various.

Sculling: a method of propelling a boat by one man using the scull. The sculler usually stands, and dipping his scull deep in the water pushes or pulls the handle from side to side. The blade is inclined at a large angle to the perpendicular, and this angle is changed to the other side of the perpendicular with each stroke.

The principle of sculling is very much the same as that of the scow, scow, or windmill, and the motion very closely resembles that of a boat's tail.

The term is also applied to the rowing of boats in which the oarsmen use a pair of sculls, or short oars, but this use is confined to small and racing boats. A racing boat used for two men, each of whom rowed a pair of oars, would be called a double scull, and the oarsmen scullers. There are also a few racing-boats called catboats, rigged for four men, each using a pair of oars; but rowing in such a boat is not called sculling. The method of propelling the Venetian gondolas can hardly be classed as either rowing, sculling, or paddling. Here the oarsman stands facing the front of the gondola, pushes his single oar—always on one side of the boat—over a fulcrum, and by a turn of the blade at the end of the stroke also steers the boat. See *Rowing*.

R. HITCHCOCK, Jr.

Sculpin [etymology obscure]: any fish belonging to the family *Cottidae*; distinguished by a rather stout, club-shaped body and large head, the spines with which the head is armed, and a naked or simply rough body; the mouth is quite large. Sculpins are very destructive to other fishes and are a nuisance to the angler. These commonly found along the Atlantic seaboard of North America are species of the restricted genus *Cottus* (or *Acanthocottus* of Girard). The best known is the *Cottus octodecemspinosus*, which is the most southern species, and the *Cottus grandis*, which is the most northern N. of Cape Cod. The name deep-water sculpin, or moray, is applied to the *Hemitripterus acadianus*. On the Pacific coast the name is applied to corresponding species of the same genus. The species are rarely or never used as food except by the Greenlanders and the very poor.

Revised by F. A. Lucas.

Sculpture [via O. fr. from Lat. *sculptura*, carving, sculpture, *sculptura*, *sculptum*, carved]: carving, or shaping by means of cutting tools, including incised work or engraving as well as carving in relief or in the solid. By extension, modeling in clay, wax, or other soft material is called sculpture, especially when it is a work of fine art which is desired. The art of sculpture includes, then, all kinds of cutting and shaping of solid objects, but the chief use of the term is in naming the fine art described in this article.

Carving may be done with considerable neatness and accuracy without any model or drawing to serve as a guide. Those who have seen an old sailor cutting out a boat in pine-wood will remember how accurately the two sides are made to correspond in curvature and in projection, and how easily the smooth shaping of the bow and the run is made, apparently without special effort. In like manner it is only necessary to have at the mind a clear knowledge of the figure of man or horse one wishes to produce, and some practice to carve correctly, in soft stone or wood or plaster. It is evident that there will be here an sufficient opportunity for changes and improvements, and that therefore only a certain class of figures can be carved in this way, without previous preparation of the model. Thus the rough and picturesque features of an early Gothic capital may well have been carved without a drawing. The sculptor may have shaped the capital roughly, and may then have scratched or chalked upon the same some guiding lines, then, with a bunch of leaves before him, he may have attacked the stone directly. During the early years of the Gothic revival in England some sort of preliminary architectural sculpture was practised in this way. The workman was encouraged to bring the living plant, or a newly cut branch, perhaps to model an architectural spray of foliage or the angle of a capital, and

then to work directly upon the solid block of stone. In like manner the handicrafting of barbarous peoples is apparently done directly from the mental image, the shark's tooth or stone knife cutting what the mind suggests, as a schoolboy cuts the edge of his desk, or as the Venetian boatmen ornament the gunwales of their large boats with a succession of notches. It is to be observed, however, that the pattern used in such work as that of the Malays, South Sea Islanders, and others are traditional. Some are the common property of the tribe, others are handed down from father to son; even the complex patterns become as familiar to the workman as notches and saws. Something akin to this familiarity with the form to be reproduced, and consequent ease in bringing it in light from nothing, is to be found in the sketches of some famous sculptors. Of Michelangelo it is related that he would begin upon the block of marble with chisel and mallet, having no model before him and no guide that any one else could see, and work rapidly and furiously, knocking off large chips. Any trained sculptor of large power of imagination of the sort which gives vivid mental pictures to its possessor could do the same, within the limits set by his character and his knowledge, provided he were not wholly unaccustomed to the use of the chisel. It is known that much sculpture was done, in the years before and during Michelangelo's career, in the marble with only a small model as guide. In all refined sculpture of modern times, however, it is customary for the artist himself to make a full-sized model in wet clay, modeling this figure with wooden and iron tools and with the fingers, changing it, reconsidering it, sometimes throwing down the whole model and building it up again. The clay is kept wet throughout the duration of the work, wet cloths being kept mentled around it when the sculptor is away. From the model, when completed, a plaster cast is made; and this is the artist's work, the statue or the bust which the French sculptor sends to the Salon, and which may be honored by a medal or other recognition. It often happens that the sculptor will retouch his work in the plaster cast, in which case that cast becomes in every sense of the word the original work of art. Some works are sent to the Salon first in the plaster, and later in the marble or bronze. At the Paris Exhibition of 1875 the tomb of Gen. Lamoricière was set up in marble, the recumbent statue of the dead man being also in marble, but of the four statues of Virtues which adorned the angles two were in bronze, the others, which there had not been time to complete in the metal, being in plaster.

When the plaster is to be copied in marble it is set up beside the block of marble, and a practiced marble-cutter makes a rough copy, aiding himself by the pointing-machine, which enables him to assure himself of the exactness of every measurement. At this point the practice of sculptors begins to differ. Some begin to work with the chisel themselves at a rather early stage, and before the statue is anything like complete, while other well-known artists never touch the marble. In the case of bronze a statue or a bust is simply cast in a mould made upon the sculptor's clay model or the plaster reproduction of it. A process much used during the Middle Ages and at the time of the Renaissance was making the mould from an original model finished in wax upon a core of a coarser material. The mould was made upon this model in a single piece, its material being applied in coats, the first coats in a semi-liquid state. The liquid bronze being allowed to flow into the mould, and between it and the core, melted the wax and took its place, the mould of course had to be broken to pieces in order to remove the hollow bronze casting. This process, called *à cire perdue*, has been used also in modern times, but more commonly a piece-mould is used which allows of many successive castings being made.

Statues, busts, and groups may also be made of thin plates of metal beaten with hammers. The largest works, such as the colossal *Bavaria* at Munich and the *Liberty* in New York harbor, have been made in this way.

What has been said above applies mainly to sculpture "in the round"—that is to say, finished on all sides, like a statue. For bas-reliefs and similar sculpture see *Relief*. See also *Engraving* and *Gem* for such sculpture as is hollow instead of projecting, concave instead of convex.

The fine art of sculpture is less complex than that of painting, as it deals with form alone. It is also in a sense more simple, because it is more instinctive to make an attempted copy in any soft material or even by cutting in wood or the like than it is to represent the same object by lines and tints upon a flat surface. Drawing and painting involve much greater abstraction and a much more advanced

mental development than rude sculpture. It is not meant that sculpture always precedes drawing; probably the reverse is the case, because the temptation to scratch or otherwise mark on a flat surface, and in doing so to represent a beast or a man, must always have been present. Sculpture may not always precede drawing, but will always be found more nearly truthful to nature than the drawing of the same epoch. The sculptor having form only to consider is concerned at first with two things: The first, to produce an ornamental object, or else to ornament parts of a useful thing, as a paddle or the prow of a canoe; the second, to represent something that he takes an interest in. Another idea often mingles with these two—namely, the production of an object, like an idol or fetish, in which he can embody some notion of worship or which he can use to terrify an enemy. This last motive speedily disappears or becomes of little moment as the skill of the sculptor increases. As he becomes able to deal with form somewhat easily and with results partly satisfying to himself, he finds a pleasure so intense in the production of his work of art and also in the suggestions from nature which he is enabled to embody in it that he forgets all other considerations. Thus in an Assyrian sculptured slab covered with figures in low-relief representing a battle, the triumphal entry of a king, or the same king hunting a lion, it is evident that the sculptor's chief care is for the beauty of his work. His slab was one of many which were to form the dado of a long and narrow gallery; the persons who were to see his bas-relief would never be far away from it, and it was for a point of view 10 or 15 feet away, and for light coming from high in the wall, that he had to plan his work. Therefore his figures were small, or, when large, filled with small details; his relief was kept low, and the outline when the relief quits the background was especially cared for. Under these conditions he labored to produce the most beautiful or striking combinations of lines and masses possible to him; but in doing this he made reference constantly to nature, and indeed found in the study of nature his chief suggestions of beauty and of strength, ferocity, swift and vigorous action, and other things agreeable to look upon. Thus nothing he could imagine would be as fine, let us suppose, as a lion in free action walking or springing; to this beautiful thing he could add human interest by showing the lion struggling with the hunters; and if in so doing he was able to flatter the king who employed him by representing his majesty twice as tall as his attendants and easily victorious over lions by the score, this in no way interfered with his artistic design or its impressiveness. It is true, of course, that religious or patriotic impulses act upon the sculptor as upon other men. Such impulses, however, do not seriously modify the sculptor's work, except in so far as they stimulate the whole man, excite his enthusiasm, raise him above himself as the phrase is, and in doing this they may improve his work or ruin it as man's nature and his surroundings may decree. Thus in the famous group by François Rude on the eastern face of the Arc de l'Etoile and representing the departure for the war of patriotic volunteers, there is no question that Rude was strongly in sympathy with the subject chosen and the enthusiastic love of country which suggested it. As a sculptor, however, he was concerned chiefly with the beauty and vigor of his composition and the harmonizing of the numerous and varied masses which make it up, and at the same time with the full expression of the different figures, here of youthful agility, there of manly strength in its maturity, and in the crowning figure of womanly forms carried to superhuman massiveness and force. Patriotism and hostility to the foes of France must have acted upon Rude as a powerful stimulus throughout his life, but it is only in this indirect way that those passions can be said to have dictated the design for *Le Départ*.

History.—The earliest sculpture of which the date can be fixed approximately is that of the Egyptian buildings of the early dynasties, and the few statues of the same epoch which have been discovered. These are dated by different authorities at from 4500 to 3500 B. C. The merit of these, both artistically and in the representation of natural forms and expression of face, is very great, so that we find Egyptian fine art already in an advanced stage of development at that early age. The sculptures from Mesopotamia of a date almost as remote are indeed far inferior in merit to the Egyptian, but are still those of an advanced civilization. There is no doubt that further investigations in the region about the Euphrates will reveal a continuous series of civilizations, vying with one another in their fine arts as in other respects. That of which we know the most is the Assyrian sculpture.

(See ASSYRIAN ART.) There was also sculpture produced among the mountainous states of Asia Minor which has been studied with some success since about 1880; this is of peculiar importance because of the influence of its later productions over the early art of Greece. (For the more developed art of Greece, see GRECIAN ARCHITECTURE; also ARCHITECTURE, CHRYSSELEPHANTINE STATUES, and PARTHENON.) The dates of Greek sculpture are nearly as follows: During the years from 600 to 480 B. C. the earliest works which can properly be called Grecian were produced, such as the metopes of Selinus now in the Museum of Palermo, the *Apollo of Tenea* at Munich, the *Apollo of Thera* at Athens, the seated figures from Branchidæ (Miletus) in the British Museum, the frieze of the Temple of Assos partly in the Louvre, and the pediment sculptures of the Temple of Ægina, now in Munich. These are arranged here in the order of their increasing refinement. The two fine statues at Naples called *Harmodius* and *Aristogiton* are thought to be copies or duplicates of statues put up in Athens about 500 B. C. The remarkable statues found in Athens on the Acropolis in 1883 and 1886, and distinguished by their well-preserved painting, may be of the years from 500 to the Persian invasion in 480. The Persian wars following this year and lasting till 477 may probably have checked the growth of fine art in Greece, while preparing for a rapid and splendid development with peace. When Athens became the chief city in Greece and the head of a confederation of states, the epoch of her greatest and noblest fine art was soon to begin. The years from 460 to 430 B. C. are marked by the sculptures of the Temple of Zeus at Olympia, of the Parthenon at Athens, of the Temple at Bassæ (Phigaleia), of the Temple of Athena Nike on the Acropolis, and in part of the Erechtheum. The chief sculptors of the best time of Grecian art, with the dates of their highest achievement approximately given, are Phidias, 440; Myron, 440; Cresilas, 440; Polyclitus, 430; Scopas, 420; Cephisodotus, 370; Praxiteles, 360. From that time until the third century A. D. the history of Greek sculpture is mainly that of an art serving states or powers not Greek, the merit and importance of the work done varies very greatly, according to the opportunity offered by the new masters of the Mediterranean world, such as the Kings of Pergamum, then Alexander the Great and his successors, and finally the Roman dominion. A great deal of noble sculpture was produced in every brief epoch, if not in every year, down to the death of Marcus Aurelius in 180 A. D. See ROMAN ARCHÆOLOGY.

It must be remembered that sculpture was commonly painted in bright and varied colors among all the peoples of antiquity. Egyptians, Assyrians, Greeks, and the people of the Græco-Roman empire all agreed in this. See POLYCHROMY.

During the Middle Ages sculpture had less purely sculptural character than generally in classical antiquity—that is to say, the artists had less sense of the beauty and expressiveness of pure form, as in the human body. They knew much less about the body, partly because of the custom of wearing very full and ample clothing, and no longer bathing and exercising in public as the ancients had done; religion, moreover, taught the unworthiness of the flesh as nothing in Greek or Roman life had asserted it. On the other hand, the decorative and building instinct was very strong throughout the Middle Ages. The Byzantine artists had no sculpture beyond that of capitals and similar architectural members and rude bas-reliefs of sacred subject; their decoration was chiefly in color on flat surfaces. The Western nations in the years following the establishment of comparatively peaceful communities showed a strong taste for figure-sculpture as used in the decoration of architecture. This was rude enough in the eleventh century, but grew rapidly in refinement. The statues in the porches and the "royal galleries" in such cathedrals as Chartres in the twelfth century, Bourges, Paris, and Chartres again in the thirteenth century, are the highest development known to us of sculpture, whose chief aim is decoration, the climax of excellence being reached in the porches of Rheims cathedral (1250, and the following years). This art was pursued with almost equal success in England, Spain, and parts of Germany. In Italy the mediæval sculpture is abundant and beautiful; it keeps something of the ancient grace and also some of the ancient knowledge of the human form. For the development of sculpture in Italy at the close of the Middle Ages, see RENAISSANCE, MICHELANGELO, and the names of other sculptors of the epoch. In France and the north generally sculpture passed from the style of the Middle Ages

one artist and more varied but still decorative style, having none of the poverty and extravagance beauty of Italian work and a decorative and overwrought character of its own. Thus the famous groups in the abbey of Tolosa near Angers were made by one Donato, Verrocchio, Minerva Pisolo, and Leonardo. Italian had all done their work and had been used for less as twenty years, and yet this French sculpture, although consisting of full stature and large groups of figures in the round, is medieval in almost every respect. There were Renaissance sculptures in France, such as Jean Goussier, but their work is not quite making in the sense that the Italian Renaissance sculpture is. It follows from this that modern sculpture is found in France and elsewhere in the north fully developed, except as we know it today, in the time of Henry IV. and Louis XIII., with such names as Simon Vouet (d. 1633), Pierre-Thomas de la Roche (d. 1634), Michel and François Angier, and Pierre Puget (d. 1682). These men inherited from Michelangelo in a sense, and not from the earlier Renaissance, but were followed by the men of the Louis XIV. such as Jacques Girardon (d. 1715), Antoine Coyssier (d. 1726), Nicolas Coustou (d. 1746) and Guillaume Coustou (d. 1746), Jean Baptiste Lemoyne (d. 1755), and Jean Baptiste Pigalle (d. 1765). The sculpture of the beginning of the nineteenth century were rather cosmopolitan in life and work; thus Auguste Pajon (d. 1809), Claude Michel Chodron (d. 1814), Antonio Canova (d. 1822), John Flaxman (d. 1826), Jean Auguste Houdon (d. 1829), and Horatius Thiers (d. 1844) were Italians, Frenchmen, or Danes, but all worked under a common Romantic influence. The sculpture of the years since 1850 has been characterized, especially in France, by a very remarkable increase in energy and purpose. The skill and knowledge of many of the men whose work has been done since 1850 and 1860 is worthy to be compared with that of the men of antiquity; and if there is no school as strong as the school of the Italian Renaissance, there is no individual man worthy to be named with the great Italian and others who are equally efficient in other ways of work. There are many different tendencies visible in nineteenth century sculpture, and it is too soon to judge them here. Jacques Pradier (d. 1835), David d'Angers (d. 1835), Auguste Rodin (d. 1875), Jean Baptiste Carpeaux (d. 1875), Auguste Klotz (d. 1880), and of men living in 1895, Paul Duboué, Henri M. A. Chapu, Augustin Mercié, Emmanuel Frémont, and finally Auguste Rodin and Jules Dalou are all sculptors whose abilities and achievements would grace any work. These are all men of the great Paris art-world, but not all of the same school. Nearly all modern sculpture is concentrated in Paris, and the different influences at work there are themselves in strong contrast. Of English sculpture of the nineteenth century Thomas Woolner and Sir J. Edgar Boehm are to be mentioned, and one or two admirable works have been produced by a painter, Sir Frederic Leighton. In the U. S. of men living in 1895, the names of John A. Ward and Augustus St. Gaudens should especially be noted. See PIERRE ARNAUD. RUSSELL SEYMOUR.

Sany, or Sanyang: See PEARL.

Scurvy (the form of *scurf*, *scurf*, *scurry*, *scurry*, *scabby*; the meaning of Late Lat. *scurbutus*, *scurvy*. Cf. Dutch *scurf*, *scurf*): a diseased state of the blood, induced chiefly by prolonged privation of fresh vegetable and animal food, although not exclusively a sailor's malady, its ravages have been most disastrous at sea, devastating, previous to the nineteenth century, the navies and merchant marine of all nations. Pliny's quackron included 2,700 men, of whom but 200 survived. Ships were often lost adrift at sea, the crew unable to work and perishing. Arwen's English fleet in 1544 or thereabouts lost 624 out of 961 men. The chief cause of this pest of the marine was the exclusive diet—meat and hard, dry bread, with impure and deficient drinking water—upon which sailors subsisted during protracted voyages. Exposure to cold or to tropical heat, fatigue, and the unsanitary and foul condition of ships contributed to the development of scurvy. As early as 1617 Boeckl recorded the virtues of lemon-juice in curing this disease, and in pedlars' cases he used a vegetable diet (see the *Index* in *Boeckl*); but not until the latter half of the nineteenth century were improved ship hygiene and vegetable diet at sea enforced. Thus only thirty years after Arwen's fearful loss Capt. Cook sailed on a three years' cruise around the world, losing but one man by disease, and in three polar expeditions of a year and a half and one year's duration lost only seven men out of 324. Modern

improvements in sailing ships and the use of steam at sea by shortening voyages have tended to lessen sickness among sailors. The improved hygiene of ships, the supply of fresh meat and vegetables procured by law for sailors, and the modern methods of keeping such articles indefinitely usable for long voyages, have rendered scurvy almost unknown at sea, although it occurs occasionally on land, in prisoners and prisoners, and in communities suffering from starvation. All of the symptoms of scurvy are directly connected with the impoverished, impaired state of the blood. All parts of the body are correspondingly ill nourished. The face is cadaverous and sunken, the body emaciated, the limbs are feeble and soon rapidly heavy. The gums become dark, bloody, relaxed, and spongy. There is an early tendency for the vitiated blood to seep from its vessels—an occurrence favored both by its thinness and by the changed nutrition of the capillary walls. At first mulberry-colored purple spots of variable size appear on the legs, later on the body. Later, larger purple spots or diffused patches appear upon a tough, indurated, biliary base, due to effusion of blood in quantity beneath the true skin or between superficial muscles, infiltrating and coagulating in the minute interstices of the connective tissue. Such patches are painful to touch; they may become the site of bloody blisters or of ulcers. Bloody serum often trickles into the pleural cavities, embarrassing the respiration; also into the peritoneum, pericardium, and the cavities of the joints. "Bloody flux," or dysentery, is frequent, also consisting of blood and mucus. Death occurs from exhaustion. Critical cases may rapidly change for the better, and mild cases quickly recover, when put upon supporting and vegetable diet. Onions, cabbage, radishes, horse-radish, "scurvy-grass" or spoon-wort, watercress—the entire class of the *Cruciferae*—are especially efficacious; all the vegetable acids, lemons, limes, oranges, cherries, currants, apples, are valuable. Nascent scurvy is extolled by the Germans as combining vegetable food and acids. Ashford broths, bitters, and regimen are essential adjuncts to this treatment. It has become known that young infants improperly fed develop a form of scurvy which was formerly mistaken for an acute form of rickets. In this there are usually hemorrhages under the periosteum of the bones, disturbances of the stomach, and general wasting and weakness. Revised by W. PARRY.

Scurvy-grass: a cruciferous plant, *Cochlearia officinalis*, abundant upon many seashores (but not on those of the U. S.), and also found on mountain ranges, and sometimes cultivated as a salad-plant. It has the pungent qualities of horse-radish, and is of high rank as an antiscorbutic. The scurvy-grass occasionally cultivated for salad in the U. S. is mostly *Barbarea prunifera*, the early winter-cress, a European cruciferous plant sparingly naturalized in the U. S.

Revised by CHARLES E. DREYER.

Scutari, sko-tah-ri (Turk. *Uscudar*; Gr. *Χερσόνησος*): the largest and most distinctively Oriental of the suburbs of Constantinople; situated on several hills on the Asiatic side of the Bosphorus, directly E. of the Golden Horn. Here the pagan emperor Licinius suffered his final defeat by Constantine (324). It contains many mosques, tekies (dervish convents), several palaces, and numerous barracks. The vast cypress-shaded cemeteries are the most striking feature of the city. Musulmans dying on the other side of the strait desire to be brought here for burial. The hospital, memorable for the devoted labors of Florence Nightingale, still exists; and near it is the beautiful British cemetery wherein are interred 8,000 nameless victims of the Crimean war. In Scutari is the admirable American College for Girls, where a first-class education is given. Pop. 75,000. See CROCIANTINOPLE. E. A. GANNETT.

Scutari (Turk. *Uscudar*, or *Iskendervish*): chief town of the vilayet of Scutari in Albania; on the southern extremity of the Lake of Scutari, 12 miles from the Adriatic; in lat. 42° N. (see map of Turkey, ref. B-B). A natural fortress, it was the stronghold of Genti, last King of Epirus, who surrendered here to the proter Andron (168 a. s.), whereupon Epirus became a Roman province. In 1477 during eight months it withstood a siege by 80,000 Ottomans, commanded by Sultan Mohammed II. in person, but in the subsequent treaty between Venice and the Porte it was ceded to the latter; in consequence 600 persons the sole survivors of the siege, abandoned their homes. It is the center of trade-distribution through Albania, but its business activity is greatly checked by the lack of roads in the surrounding country. Imports are woven goods, building ma-

ber, metals, drugs, paper, and earthenware; exports (in value only one-third of the imports) raw stuffs, dyewoods, and rags. Pop. 36,000, of whom 27,500 are Mussulmans.

E. A. GROSVENOR.

Scutching: See FLAX.

Scutibranchia'ta [Mod. Lat.; Lat. *scu'tum*, shield + *bran'chia*, gills]: an obsolete term for those molluscs now included under the *Zygobranchia*. See GASTEROPODA.

Seyellite: See PERIDOTITE.

Scylax, si'laks (Gr. *Σκύλαξ*): Greek geographer of Caryanda in Caria, who, by command of Darius I., made a voyage of discovery from the Indus through the Indian Ocean to the Red Sea (Herodotus, iv., 44). The *Periplus*, which bears the name of Scylax and describes a voyage along the coast of Europe, Asia, and Africa, is a much later performance, and has been assigned to the middle of the fourth century B. C. It was edited by Müller (*Geographi Græci Minores*, vol. i., pp. 15-96). See Bunbury, *History of Ancient Geography* (vol. i., p. 384, seq.).

B. L. G.

Scylla, or **Scilla**, si'lla (Gr. *τὸ Σκύλλαιον ἄκρον*; Ital. *Sciglio*): a high and steep promontory on the Italian side of the Strait of Messina. In ancient mythology it was the home of the sea-monster Scylla, who, along with the whirlpool Charybdis, threatened destruction to all mariners.

J. R. S. S.

Scylli'idæ [Mod. Lat., named from *Scyllium*, the typical genus, in form dimin. of Gr. *Σκύλλα*, Scylla; cf. *σκόλιον*, dog-fish, and *σκόλλειν*, rend, tear]: a family of sharks distinguished by the position of their dorsal fins and their habit of laying eggs like those of the rays. It includes the dog-fishes. The body is more elongated than is the case with the sharks generally. The *Scylli'idæ* are inhabitants entirely of the seas of the Old World and Australia. They are among the few sharks which lay eggs invested in parchment-like cases, like those of the rays. Revised by F. A. LUCAS.

Scym'nidæ [Mod. Lat., named from *Scymnus*, the typical genus, from Gr. *σκόμνος*, cub, whelp]: a family of sharks distinguished by the absence of the anal fins and presence of unarmed dorsals. It includes the Greenland sharks.

Revised by F. A. LUCAS.

Scymnus, sim'nūs (Gr. *Σκύμνος*): Greek geographer, to whom has been attributed an outline of the geography of the ancient world composed in iambic trimeters. The authorship of this *πεπερηγμένης*, as it is called, is doubtful, as the original Scymnus wrote in prose, and the time is uncertain, the first or second century B. C. It was edited by Müller (*Geographi Græci Minores*, vol. i., pp. 196-237). See Bunbury, *History of Ancient Geography* (vol. ii., 71). B. L. G.

Scyphomedusæ [Gr. *σκόφος*, cup + *Medusa*, a fabled monster]: a group of cœlenterates belonging to the class SCYPHOZOA (q. v.).

Scyphoph'ori [Mod. Lat.; Gr. *σκόφος*, cup + *φέρειν*, bear]: an order of fishes established by Prof. Cope, and distinguished by the following characters: The skeleton is completely ossified; the basis cranii simple; the parietals narrow, and distinct from each other as well as the supraoccipital; the pterygoid is very peculiar, being enlarged and funnel-shaped, and excavated by a bowl-like chamber (whence the name), which expands laterally and is covered by a lid-like bone; no symplectic exists; the jaws are well developed, but the intermaxillaries coalesce, at least in the old, into a single bone, and the maxillaries are lateral; opercular apparatus complete, but with the interoperculum and suboperculum reduced in size; scapular arch with the several coracoid elements represented; the brain has over the cerebellum a peculiar plicated organ; the air-bladder is simple, and communicates by a duct with the intestinal canal. The order is related to the more generalized form of *Teleocephali*, as well as to the *Nematognathi*. It is represented by but two known families, which are peculiar to the rivers of Africa; these are the *Mormyridæ* and *Gymnarchidæ*.

THEODORE GILL.

Scyphozoa [Gr. *σκόφος*, cup + *ζῷον*, animal]: one of the great divisions or classes of the Cœlenterata (q. v.), including the sea-anemones, coral-polyps, and the acraspedote jellyfishes. The group is differentiated from the other class (*Hydrozoa*) by the fact that there is an ectodermal œsophagus formed by the inpushing of the external skin through the mouth. As in all *Cœlenterata*, there is no distinction between the digestive cavity and body-cavity, but the common enteric cavity is complicated by folds of the outer wall

(septa) which increase greatly the amount of digestive surface. On these septa are borne thread-like gastral or mesenterial filaments which play an important part in digestion. The sexes are usually separate and the genital products (eggs and spermatozoa) arise from the entoderm. Two subclasses are recognized, the *Scyphomedusæ* and the *Anthozoa*. The *Scyphomedusæ* (except the lucernarians) are free-swimming solitary forms commonly known as jellyfishes, in which the body is umbrella-shaped or disk-like, the mouth being on the extremity of a longer or shorter proboscis, while the supporting layer (mesogloea) which lies between the ectoderm and entoderm of all *Cœlenterata* is developed into a thick gelatinous mass which makes up the bulk of the body. In the *Anthozoa* (often called *Actinozoa*) are included sessile, solitary, or colonial (compound) forms commonly called sea-anemones, coral-polyps, and the like. In these the body retains a more simple condition. It is more or less columnar, and the free end or oral disk is surrounded by a circle of tentacles, the number varying between wide limits (see below). In the center of the oral disk is the slit-like mouth, no proboscis being present. From the mouth the ectodermal œsophagus extends into the body, opening below into the large digestive chamber. In many forms the two ends of the mouth differ, one being for the taking in of water, while from the other flows out the water already used, carrying with it the indigestible particles taken in with the food. The digestive cavity is partially divided by the septa (already noticed), which are folds of the lining walls which project inward from the wall of the body like the spokes of a wheel from the rim toward the hub. The arrangement of these septa varies greatly, but in all cases there are at either one or both ends of the body (corresponding to the longer axis of the mouth) septa which differ from the rest and are consequently known as directives. The supporting layer is weakly developed, never attaining the thickness presented in the *Scyphomedusæ*. The *Anthozoa* are divided into orders chiefly upon the number and arrangement of the septa. In the OCTOCORALLIA (q. v.) the septa are eight, and there are usually eight feathery tentacles surrounding the oral disk. In the TETRACORALLIA (q. v.), a group of fossil forms occurring in the Palæozoic rocks, the septa are very numerous, but are always in multiples of four. In the HEXACORALLIA (q. v.) the tentacles are always in multiples of six, while the septa, except in a few instances—e. g. *Antipathus*, with two—follow the same law. J. S. KINGSLEY.

Scyros: See SKYROS.

Scythe [M. Eng. *sithe* < O. Eng. *sigðe*: Icel. *sigðr*: Germ. *sense* < O. H. Germ. *segansa* is from same root; cf. Lat. *scā're*, cut]: a long, curved blade, sharp on the concave edge, used in cutting grass. It is attached, for use, to a curved handle, called a snath. Shorter and stronger scythes are used for cutting bushes, etc. The introduction of mowing-machines has to a great extent superseded the use of scythes in haymaking, but where the former can not be employed scythes are still indispensable.

Scyth'ia: the ancient name for the vast regions which extend N., E., and S. of the Caspian Sea and the Sea of Aral. It was not so much used as a geographical term, for the boundaries of these regions were entirely undefined; it was rather a general term by which the Romans denoted a swarm of savage tribes living there, of whom they knew very little.

Scythopolis: the *Beth-shean* of Josh. xvii. 11, the *Bethshan* of 1 Sam. xxxi. 10, now called *Beisan*, the most important city of the ancient DECAPOLIS (q. v.), and the only one W. of the Jordan, about 4 miles from that river, and nearly 14 miles S. of the Sea of Galilee. It was nearly as well watered as Damascus, four perennial streams running through it. It was a place of great strength, its acropolis rising 300 feet above the plain. The ruins, which are 3 miles in circuit, surpass all others in Western Palestine. Its classic name, *Scythopolis*, is of disputed derivation, but the old conjecture that there was there a remnant of the Scythians, who invaded Palestine on their way to Egypt (630 B. C.), is the most probable. Scythopolis was the seat of a bishopric in the fourth century A. D. The modern village, of some fifty houses, contains a colony of Egyptians established there by Ibrahim Pasha in 1848. Revised by S. M. JACKSON.

Sea: See OCEAN and PHYSIOGRAPHY.

Sea-anemones: See HEXACORALLIA and ACTINIDÆ.

Sea-bass: a serranoid fish (*Centropristis atrarius*) common on the Atlantic coast of the U. S. See FISHERIES.

Sea-beard: a fur seal of either of the genera *Callorhinus* and *Arctophoca*, especially the northern species. See **IMMATURE**.

Seabury, SAMUEL, D. D.: bishop; b. at Groton, Conn., Nov. 16, 1759; son of clergyman of same name; graduated at Yale college 1785; studied medicine and theology in Scotland; was ordained a deacon and priest of the Church of England at London 1790; was in charge of churches at New Brunswick, N. J., at Kingston, Long Island, 1796-60, and at Wincchester, N. Y., 1796-75; was imprisoned at New Haven as the supposed author of some Tory pamphlets, but soon released; resided in New York during most of the Revolutionary war; was at one time chaplain of a loyalist regiment; went to England 1784; was consecrated Bishop of Connecticut by three English prelates at Aberdeen Nov. 14, 1784, being the first American bishop; took part in revising the Prayer-book and framing a constitution for the American Church 1789; published two volumes of sermons (1791) and a number of single sermons; exercised the duties of his episcopal office at New London, Conn., until his death at that place Feb. 25, 1796. A posthumous volume of *Sermons* was published 1798.

Seabury, SAMUEL, D. D.: clergyman and author; son of Dr. Rev. Charles Seabury, and grandson of Bishop Seabury; b. at New London, Conn., June 9, 1801; was ordained in the Protestant Episcopal Church 1826; was for several years a missionary at Huntington, Oyster Bay, and Hallett's Cove (now Astoria), Long Island; was editor of *The Churchman* at New York 1841-49; rector of the Church of the Annunciation 1848-49, and Professor of Biblical Learning in the General Theological Seminary from June, 1862, to his death at New York, Oct. 19, 1873. Author of *The Continuity of the Church of England in the Sixteenth Century* (1853); *Discourses on the Supremacy and Obligation of Conscience* (1860); *American Slavery Justified* (1861); *Theory and Use of the Church Calendar* (1872); and a posthumous volume of *Discourses on the Holy Spirit* (1874), edited by his son, WILLIAM JAMES SEABURY, D. D., clergyman and author, who was born in New York Jan. 25, 1837; graduated at Columbia College, New York, 1856; admitted to the bar 1858 but entered the General Theological Seminary 1866; was rector of the Church of the Annunciation, New York, since 1868, and has been Professor of Ecclesiastical History in the General Theological Seminary since 1873. He is the author of *Suggestions in Aid of Devotion and Guitars* (1879) and *An Introduction to the Study of Ecclesiastical History* (1894). Revised by W. S. PERCY.

Seabury: See MARATHA and SIBERIA.

Seachenamber: See HOLSTENBURG.

Sea-duck: See DUCK.

Sea-eagle: See EAGLE.

Seahorse: a sea-horse. See RHINOCERUS.

Sea-unicorn: See ELEPHANT SEAL.

Sea-urchin: See URCHIN.

Seaford: town, Sussex co., Del.; on the Nantuxet river, at the head of navigation by small vessels; and the Phila. and Balt. Railroad; 33 miles E. by N. of Cambridge, Md. 94 miles S. of Wilmington (for location, see map of Delaware, ref. 7-8). It is in an agricultural region, and contains numerous oyster-packing houses, two national banks with combined capital of \$100,000, and a weekly newspaper. Pop. (1890) 1,348; (1896) 1,462.

Seaford: town of Huron County, Ontario, Canada; on Eglar and Goderich Branch of the Grand Trunk Railway; 4 miles S. E. of Goderich (see map of Ontario, ref. 4-B). It ships annually 1,000,000 bush. of grain, and is underlain with a stratum of pure rock-salt, over 100 feet thick at a depth of 1,100 feet. It has a large trade, productive salt-works, active manufactures, and two weekly papers. Pop. (1901) 2,541.

Sea-korm: See RHINOCERUS.

Sea-islands: littoral band of islands of South Carolina, especially those from Winyah Bay to the mouth of the Savannah. Their fertility is extraordinary, their cotton long-stemmed and colored, and their rice product large. They are, and especially subject to the overflows by the storm-tides of hurricanes. Those of 1823 and 1894 destroyed the crops generally, and caused thousands of deaths. The Negroes show a strong tendency to collect on these islands for permanent residence. M. W. H.

Sea-hale: the *Crucifera maritima*, a perennial cruciferous herb; a native of European seacoasts; much cultivated in England as a pot-herb. It requires a generous soil, and its large leaves and sprouts are unfit for eating until blanched.

Seal [from O. Fr. *sel* > Fr. *seal*; Ital. *sigillo*; Span. *sello* < Lat. *sigillum*, dimin. of *signum*, sign, mark, stamp]; strictly, at the common law, a piece of wax or other tenacious substance which has been affixed to the paper or parchment of an instrument in writing, and stamped with an impression for the purpose of legally executing or authenticating the instrument. The use of these seals becoming inconvenient, the name is by extension applied also to the substitutes used for it, such as an impression made in the paper or parchment of the instrument itself, or a scroll or flourish of the pen placed after the signature, or the letters L. S. The instrument by which the impression on the wax or other material is made is also called a seal. The use of the seal as a device for authenticating important instruments arose from the fact that in early times few could affix a written signature to the instruments made by them, and in place of such a signature they therefore used, with or without a mark or cross, seals with some heraldic or other device worked in relief to impress the wax. The use of the seal became especially associated with deeds and state papers because these then constituted the most important instruments which people had occasion formally to authenticate. In using a seal it is not necessary that it should be affixed by the person whose seal it is intended to be, but he may adopt as his seal one affixed by another; and so one seal may suffice for a number of signers of an instrument. The necessity for the use of a seal and the determination as to the kind of seal necessary in general depends upon the laws of the place where the contract is made; but in the case of deeds always upon the law of the State in which the land is situated.

Effect of Seal—The common law attributed a very high, but very arbitrary and technical, efficacy to the seal upon instruments of a private nature. A seal was essential to a valid conveyance of a freehold estate in land; and as no contract is obligatory without a consideration, it established a conclusive presumption that there had been some valuable consideration. In some of the U. S. the common-law rule as to presumption of consideration was more or less abandoned, and in many States it is provided by statute that a seal on an executory contract shall be only *prima-facie* evidence of a sufficient consideration.

Statutory Regulation of Seals—In most of the U. S. the use of the seal is regulated by statutes, extending the application of the term, and doing away entirely in many cases with its use on private instruments, or with any distinction between such instruments when sealed and unsealed. The word "seal" or the letters L. S. may be used instead of a seal in Connecticut and New York. The scroll may be used in place of a seal in Arkansas, California, Florida, Idaho, Illinois, Maryland, Michigan, New Mexico, North Carolina, Oregon, Pennsylvania, South Carolina, Virginia, and West Virginia; and in Minnesota, New Jersey, Wisconsin, and Wyoming any flourish or device intended for a seal may be used. The distinction between sealed and unsealed private instruments (except of corporations) has been abolished in Arizona, California, Colorado, Indiana, Indian Territory, Iowa, Mississippi, Missouri, Montana, Nebraska, Nevada, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee, and Utah; so that in these States and Territories the presence or absence of a seal does not affect the validity of the instrument. In Alabama an instrument purporting on its face to be a sealed instrument is taken to be sealed.

Judicial Recognition of Seals—The public, or great, seals of all independent nations are universally recognized by the governments and tribunals of other civilized countries, so that public records, statutes, etc., when authenticated by their means are accepted as correct without further proof. The seals of notaries public are also regarded as proving themselves, especially in Europe, where the NOTARY (q. v.) is an officer of greater dignity than in the U. S. The seals of the superior courts and of many administrative officers also receive judicial recognition, and require no proof in the territorial jurisdiction to which they belong; but in other jurisdictions they must be proved unless they are privileged by custom or statutory provision.

See *American Law Review*, 638; *History and Use of Seals in England*, in vol. xviii. of *Archæologia* (London); *Blackstone's Commentaries*, F. STUBBS ALLEN.

Seal [M. Eng. *sele* < O. Eng. *seolh* : O. H. Germ. *selah* : Icel. *sefr*] : a pinniped mammal of either of the families *Phocidae* or *Otariidae*. The name is applied more particularly to the members of the family *Phocidae*, the eared seals being termed fur seals or sea-bears and sea-lions. With the exception of a species (*Phoca sibirica*) inhabiting Lake Baikal, seals are marine, but some find their way into the lakes of Newfoundland, and they ascend rivers for considerable distances, a few having been taken even in Lakes Champlain and Ontario. They are more or less gregarious in habits, especially during the breeding season, when they are found in herds of thousands or hundreds of thousands on the ice-floes. As a rule, the female brings forth but one young, and this is covered with a soft woolly coat, which is shed in two or three weeks. Seals feed principally on fish, but also eat cuttlefish, crustaceans, and molluscs. They are capable of remaining beneath the water for five or ten minutes, or, according to some observers, even fifteen or twenty minutes, but if this be true, it is certainly exceptional. Those species which winter in the ice keep a hole open to which they come to breathe, a habit of which advantage is taken by hunters, who either wait by the holes and spear the animal as it emerges or else set a net over the hole.

Four genera of seals (*Stenorhynchus*, *Lobodon*, *Ommatophoca*, and *Leptonyx*), each with a single species, are peculiar to Antarctic seas, but nearly all species and individuals occur in the northern hemisphere, and for the most part in the frigid and colder portions of the temperate zone. The most familiar of the seals is the harbor seal (*Phoca vitulina*), a species common to both the eastern and western hemispheres, ranging from New York to Spain, along the northern shores of Europe and Asia, and down the Pacific coast of the U. S. to California. It attains a length of 5 or 6 feet; the general color is yellowish gray above, varied with markings of dark brown or blackish, lighter below, but it is subject to considerable variation. The Caspian seal (*Phoca caspica*) resembles the harbor seal, and is considered a descendant of that species, having entered the Caspian Sea when it was a branch of the Arctic Ocean, and become modified by isolation. The harbor seal is found on the coast in small bands. The largest of the seals (excepting the ELEPHANT SEAL and SEA-LEOPARD, *qq. v.*) are the bearded seal (*Erignathus barbatus*) and the gray seal (*Halichoerus grypus*), each of which attains a length of 8 or 9 feet, although they are said to grow even larger. The gray seal is found only in the North Atlantic and the Baltic, while the bearded seal is circumpolar. Both are less gregarious than the other species. The gray seal, as its name implies, is free from markings, while the bearded seal is blotched with brown or blackish. The netsick, or ringed seal (*Phoca fastida*), is a species resembling the harbor seal, but is smaller, and has light markings in the form of rings surrounding oblong dark patches. This species is prized by the Eskimo, as it winters in the Arctic regions and forms an important article of food.

The curious hooded or, more correctly, bladder-nosed seal (*Cystophora cristata*) attains a length of 7 or 8 feet, and derives its name from the fact that the males possess the power of inflating the skin about the nose. It is usually incorrectly figured with the hood on top of the head. It is a northern species, and is not found in herds. See Allen, *History of North American Pinnipeds* (Washington, 1880); Elliott, *Seal Islands of Alaska* (Washington, 1881); *Fishery Industries of the United States*, Quarto Fishery Report (Washington, 1884-87). See also HARP-SEAL, MONK-SEAL, OTARIIDÆ, PHOCIDÆ, SEAL-FISHERIES, and SEA-LION.

F. A. LUCAS.

Sea-lavender : See MARSH-ROSEMARY.

Sealchraig : See SELKIRK, ALEXANDER.

Seal-engraving : See GEM.

Sea-leopard : an Antarctic seal (*Stenorhynchus leptonyx*) named from its spotted coat of gray and white. Aside from the sea-elephant it is the largest of the southern hair-seals and one of the most abundant. It attains a length of 10 feet, and the crowns of the molars are divided by deep notches into three portions.

F. A. L.

Seal-fisheries : industries which consist in the capturing of seals for commercial purposes, and which may be said to have arisen toward the end of the eighteenth century; though the walrus, a near relative of the seal, had been systematically pursued for at least 200 years before, comparatively few hair or fur seals appear to have been taken prior to 1790. In the present condition of the seal-fisheries

it is often found advisable to take different kinds of seals on the same voyage, or to combine the seal-fishing with the whale-fishing, especially in the Antarctic fisheries.

The principal seat of the hair-seal fishery is off the coast of Newfoundland and Labrador, the value of the seals taken there exceeding that of the catch elsewhere. Still larger numbers of seals are taken in the Gulf of St. Lawrence,



The common seal.

near Nova Zembla and Jan Mayen islands, in the White and Caspian Seas, and on Kerguelen and Heard islands in the South Pacific, as well as at other points in the Antarctic Ocean. The harp-seal (*Phoca groenlandica*) is, commercially, the most important of the hair-seals, but the hooded seal or bladder-nose (*Cystophora cristata*), the square flipper (*Erignathus barbatus*), and the Caspian seal (*Phoca caspica*) are all taken in considerable numbers. The southern sea-elephant (*Macrorhinus proboscideus*) in times gone by has furnished an enormous amount of oil. The California sea-elephant (*M. angustirostris*) and the Caribbean seal (*Monachus tropicalis*) have been practically exterminated. Within the last few years some of the large southern seals (*Stenorhynchus*, *Lobodon*, *Leptonyx*) have been taken, but there can hardly be said to be a regular fishery for them, and it is not probable that their capture would long prove remunerative. The most important part of the Newfoundland seal-fishery is carried on by steamers, and these are also employed in the Nova Zembla and other northern fisheries, having practically superseded sailing craft where the seals are taken on the ice-floes at some distance from land. Many seals are still taken near shore by nets or by shooting. Between twenty and thirty steamers are engaged in the Newfoundland fisheries, which also employ not far from 5,000 men, although only for a short time, as the season is from Mar. 10 to May 1. In the most flourishing days of the seal-fishery 8,000 to 10,000 men were engaged. In 1892 the Newfoundland sealers took 3,000, 174 seals, the value of skins and oil being \$865,784, but in 1893 the catch was only 129,061 seals. The annual product of the Norwegian fishery is about \$300,000. The seals are taken on the floe-ice which drifts down from the north, and the major part are the newly born young, which have never left the ice and are excessively fat. They are killed with clubs, and heaped up on the ice until a pause in the slaughter will admit of their being skinned. The pelt, with the attached blubber, weighs from 20 to 40 lb. Seal-skin leather is well known; the oil is used for tanning and lubricating purposes, and for making soap. It varies much in quality, according to the care used in its preparation, but the best is limpid and almost devoid of taste or odor. The sea-elephant is taken chiefly on Kerguelen and Heard islands and the Crozets, but some are killed on Macquarie island by the New Zealand sealers, and other localities are visited from time to time with more or less success, much depending on the length of time they have been left undisturbed. New London, Conn., is the principal port from which the sea-elephant and southern fur-seal fishery is prosecuted, the latter being generally carried on by the same vessel. The vessels employed are stout schooners of 75 to 150 tons, well provided with boats, and it is customary to land parties of men on the islands, and leave them to kill the animals and try out the oil, or, in the case of the fur-seals, to salt down the skins. Or, again, as at Kerguelen and Heard islands, the vessels may be anchored in the best harbor obtainable, while the greater part of the crew live on shore. The Antarctic seal-fisheries are very arduous, for the climate is severe and storms are frequent, while at the same time a successful voyage is by no means a certainty.

The mammals all belong in the family *Otariidae*, and the most valuable species is *Callorhinus ursinus* of the North Pacific. *Arctocephalus australis* is the most important southern species, but *A. gazelle*, *A. pusillus*, and *A. forsteri* are also taken. At present 1,000 to 1,500 skins is a fair season's catch; whereas 50,000, 60,000, or even 100,000 skins were formerly taken by a single vessel. The Pribilof and Commander Islands in Heceta Bay are the chief seats of the modern fur-seal fishery; in the south the South Shetlands and various small islands in the vicinity of Cape Horn, with George, the South Orkneys, the Crozets, and Lotoskoff, near the mouth of the La Plata, are also visited. In the most important locality in the control of the Argentine Republic, and the killing of seals is there regulated by law. At the Commander and Pribilof Islands, whence a large supply of fur-seal skins comes, the number of seals that may be taken annually is fixed by law, and some of the young males are killed. With these restrictions the seals might be preserved indefinitely, but unfortunately a shortage of the skins has led to the pursuit of the animals in places where they are shot from small boats or speared. Hence it is the fact that dead seals sink very quickly, about one are killed for every one secured. By an agreement between Great Britain and the U. S. the use of firearms is prohibited, but spears may be employed. The catch at the Pribilof has fallen from 100,000 to 7,500, or in 1893, 10,000, and the pelagic sealers took not far from 50,000 skins. See *the History of North American Fur-seals* (Washington, 1890), *Fur Seals and Fishery Industries of the United States* (Washington, 1897); *Fur Seal and other Fisheries of Alaska* (Washington, 1899). F. A. LUCAS.

Sealing-wax: See LAM.

Sealions: any one of several species of large seals of the family *Otariidae*. Sealions are characterized by the development of harsh hair without under-fur, and the color is usually brown in the mature, but in the young reddish brown. Two species occur on the Pacific coast of North America and are found together in the Bay of San Francisco. One (*Narceus stelleri*) is the largest of the family, and attains a length of 11 to 13 feet, while the other (*Zalophus crotchi*) is the smallest, and is only 7 to 8 feet long. The sealions is the ordinary resident of the menageries and zoological gardens. It has a slender, dog-like head and a "barking cry, or howl," while the eumetopias has a thick, wrinkled muzzle and a deep bass growl and prolonged snort. Other species are *Otaria jubata* of South America, *Arctocephalus hookeri* of the Auckland Islands, and a *lobatus* of the Australian sea. The walrus is sometimes called sea lion. Revised by F. A. LUCAS.

Sea Islands: See LONES ISLANDS.

Seahorse: See SHARK.

Sealfeld, CHARLES (pseudonym of KARL POSTEL): born at Pöppitz, Moravia, Mar. 3, 1798; entered a monastery and was ordained a priest, but fled in 1822 to Switzerland and thence to the U. S.; edited in 1829 the *Courier de l'Europe* (New York); after 1832 resided in Switzerland, although he took occasional trips to the U. S. D. at Zürich, Switzerland, May 26, 1864. Under the pseudonym *Charles Sealfeld* he published in 1828 *Die Vereinigten Staaten von Nordamerika*, and a few years later he created a sensation in German literature by a series of descriptive works, the most important of which are *Der Legitime und der Unlegitime* (1831); *Der Virey und die Aristokratie* (1832); *Lebensbilder aus beiden Hemisphären* (1833-37); *Deutsch-amerikanische Wahlverwandtschaften* (1838-42); *Der Leutnant* (1840); and *Süden und Norden* (1842-45). Some of these novels were also published in English. J. G.

Seaman: broadly, a person who is engaged in the navigation of a vessel on the high seas. This term now, however, as required in legal literature the broader significance of the term usually denoting the master, chief officer, and crew employed or aiding in the navigation of vessels, ships, boats, etc., either upon the high seas or upon inland waters. A vessel, however, for the construction of the statutes now relating to merchant shipping, the term seaman is defined as "every person (except masters, pilots, and apprentices indentured and registered) employed or engaged on board any ship." It was formerly required by law in Great Britain that a British ship must have an officer and crew only British subjects (except in certain cases), but now this is not necessary. In the U. S. the statute requires that the master of a vessel

must be a citizen of the U. S. in order that the vessel may enjoy the benefits and privileges of a vessel of that country.

Experience has shown that seamen are a class of men who need more protection at the hands of the law than ordinary persons, largely because they are more under the control of others when employed. The regulations affording this protection differ in different countries, but the general intent of them all is to do away with disputes between master and seamen as to the terms of the contract of hiring; to interest the seaman in the success of the attempted voyage, by making their earnings depend upon its termination; and to secure obedience to orders.

Shipping of Seamen.—The U. S. statutes provide for the appointment of shipping-commissioners for ports of entry and of ocean navigation, whose general duties are to facilitate and superintend the engagement and discharge of seamen, and to arbitrate in certain disputes between a seaman and the master or owner of a vessel; and at other ports the duties of a shipping-commissioner are imposed upon the collector of customs. In Great Britain similar officers are provided—the superintendents of mercantile marine offices. In general, the master of every seagoing ship must enter into a formal written or printed contract (*the shipping-article*) with each seaman of his crew, and these articles must be signed before the proper shipping-officer. They must state the nature and duration and part of termination of the voyage, the number and description of the crew and their respective employments, the amount of wages each seaman is to receive, the capacity in which he is to serve, and the time at which he is to begin work on board; a scale of provisions to be furnished; regulations as to conduct and as to fines, short allowance of provisions, other lawful punishments for misconduct; and any stipulation as to advance or allotment of wages. In the U. S. the master of every vessel of 50 tons burden or upward plying between States not adjoining must enter into a written contract, which, however, need not be signed before a shipping-commissioner. The statutes making these written contracts obligatory, however, do not make void verbal contracts in the absence of written ones.

Wages of Seamen.—The seaman is entitled in wages and provisions from the time he begins work, or from the date agreed upon for the beginning of work, whichever first happens. In case of loss of vessel wages are due only to the date of loss, and proof that a seaman has not duly exerted himself to save the vessel, cargo, and stores will bar his claim. The right to wages does not depend upon the earning of freight, and becomes a lien upon the vessel and freight, and upon the proceeds of them, in the nature of a preferred claim over bottomry or respondentia bonds. Where freight might have been earned that was not, seamen have a right of action in *personam* against the master or owner of a vessel, and this right is not barred by a proceeding *in rem* against the vessel. A seaman can not forfeit or waive by agreement his lien upon the ship, nor any remedy for the recovery of wages, except by agreement for allotment or advance. A stipulation to abandon the right to wages in case of loss of ship, or any right in the nature of salvage, is wholly inoperative; and any assignment other than advance or allotment made prior to the accruing of wages or salvage is equally void. Wages can not be insured by seamen, nor are they subject to attachment in the courts. Seamen may forfeit their wages, either wholly or in part, by any of the following offenses, viz.: desertion, absence without leave, neglecting and refusing without reasonable cause to join the vessel, willful disobedience or continued willful neglect of duty, willfully damaging the vessel, or embarking or willfully damaging any of the stores or cargo, and by any act of smuggling whereby loss or damage is occasioned to the master or owner. But upon the commission of an offense for which it is intended to prosecute or enforce a forfeiture, an entry of the offense must be made in the official log-book and signed by the master and by the mate or one of the crew, and the reply of the offender, if still in the vessel, must likewise be entered and signed; which entries must be produced or proved in any subsequent legal proceedings.

Miscellaneous Provisions.—Various other provisions are made by statute regulating the rights and duties of seamen, insuring the seaworthiness of the vessel, a proper supply of provisions and medicines, their return from foreign ports when there discharged, extra wages in case of improper discharge; imposing upon consuls in foreign ports the duty of providing subsistence and a passage to a port in the U. S. for destitute seamen of the U. S.; and providing for

the establishment of marine hospitals and relief funds by collections from the wages of seamen, etc. Seamen must submit to the usual punishments lawful and agreed upon in the shipping articles, such as short allowance, being put in irons, etc.; but flogging has fallen into disuse, and in the U. S. has been abolished by statute.

For a full treatment of the rights and duties of seamen, see the statutes; Maude and Pollock's *Compendium of the Law of Merchant Shipping* (London, 1881); Abbott's *Law of Merchant Shipping* (London, 1892); Kay's *Law of Shipmaster and Seamen* (London, 1875); Parson's *Law of Shipping* (Boston, 1869); Desty's *Revised Statutes of the United States relating to Commerce, Navigation, and Shipping*. See also COURTS for the Admiralty Courts.

F. STURGES ALLEN.

Sea-mouse: a popular name for marine annelids of the genus *Aphrodite*, remarkable for the beautiful colors produced by the hairs of the animal.

Sea of Cortes: See CALIFORNIA, GULF OF.

Sea of Sodom, or Sea of the Plain: See DEAD SEA.

Sea-otter: See OTTER.

Sea-ple: See OYSTER-CATCHER.

Sea-raven: See SCULPIN.

Search: See INTERNATIONAL LAW (*Summary*).

Search and Seizure: the examination and taking into custody of one's person or property. The fourth amendment of the U. S. Constitution provides that "the right of the people to be secure in their persons, houses, papers, and effects against unreasonable searches and seizures shall not be violated, and no warrants shall issue but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched and the persons or things to be seized." A similar provision exists in each State constitution. It is declaratory only of common-law principles, which were clearly announced in *Wilkes vs. Wood* (19 *State Trials* 1153, A. D. 1763), *Leach vs. Money* (*ibid.* 1001, A. D. 1765), and *Entick vs. Carrington* (*ibid.* 1030, A. D. 1765). The first two cases decided that a general warrant to seize some person or papers not named was illegal, and the third declared a warrant to seize the papers of a person named to be equally illegal. Lord Camden's judgment in the last case is celebrated for its learning and ability, and is regarded "as one of the permanent monuments of the British Constitution."

Some searches and seizures were permitted by the common law, and do not fall within the constitutional inhibition. They may be resorted to for the recovery of stolen goods, or in the case of excisable or dutiable articles, or in the case of things whose possession or sale is forbidden by law, such as burglars' tools, gambling apparatus, intoxicating liquors, and others, or for the purpose of levying an attachment or execution. Even in such cases, however, the law does not authorize the use of general search warrants, but requires the magistrate to have satisfactory evidence upon oath that a case of the kind mentioned probably exists, and to have a particular description of the place to be searched, and of the persons or things to be seized. The warrant must also name the place and the person or thing to be searched and seized. If an officer attempts to arrest a person under a general warrant, or under one which does not truly name or sufficiently identify him, he may resist the officer, and if the latter makes the arrest, he is liable for false imprisonment. (*West vs. Cabell*, 153 U. S. 78.) In some of the States statutes authorize officers to seize intoxicating liquors without a warrant, in the first instance, but the officers are required to obtain promptly a warrant therefor, or they become liable as trespassers. *Weston vs. Carr*, 71 Me. 356.

Searches and seizures which are resorted to not for the purpose of capturing stolen property, or that which is under the ban of positive law, or of levying legal process, are deemed unreasonable. Accordingly, a statute providing for the issuing of warrants by judges of insolvency on the complaint of an assignee to search for property of the debtor has been declared unconstitutional. (*Robinson vs. Richards*, 79 Mass. 454.) The U. S. Supreme Court held a statute to be unconstitutional which authorized a court, in revenue cases, on motion of the Government's attorney, to require the defendant or claimant to produce in court his private books, invoices, and papers, or else the allegations of the attorney should be taken as confessed. (*Boyd vs. United States*, 116 U. S. 616.) The provision was deemed tantamount to a

compulsory production of a man's private papers, and to effect the sole object and purpose of search and seizure; hence it was declared to be within the scope of the fourth amendment. The language of Lord Camden in *Entick vs. Carrington* was regarded as expressing the true doctrine of the subject of searches and seizures, and as furnishing the true criteria of the reasonable and unreasonable character of such seizures. It was said that the principles laid down in that opinion affect the very essence of constitutional liberty and security. They reach further than the concrete form of the case then before the court; they apply to all invasions on the part of the Government and its employees of the sanctity of a man's home and the privacies of life. It is not the breaking of his doors and the rummaging of his drawers, but the invasion of his indefeasible right of personal security, personal liberty, and private property, where that right has never been forfeited by his conviction of some crime, that constitutes the essence of the offense.

FRANCIS M. BURDICK.

Searcy: town; capital of White co., Ark.; on the Little Red river, and the Searcy and West Point Railroad; 55 miles N. E. of Little Rock, the State capital (for location, see map of Arkansas, ref. 3-D). It is an important shipping-point for cotton and fruit; has several alum, chalybeate, and sulphur springs, which have made it popular as a health resort; and contains Searcy College, for males (Methodist Episcopal, South), Galloway Female College, Searcy Female Institute, a public school, a State bank with capital of \$30,000, and a daily, a monthly, and three weekly periodicals. Pop. (1880) 840; (1890) 1,203; (1895) estimated, 3,500. EDITOR OF "CITIZEN."

Searles, WILLIAM HENRY: civil engineer; b. in Cincinnati, O., June 4, 1837; graduated at the Rensselaer Polytechnic Institute in 1860, where later he was Professor of Topography and Road-engineering for three years. He has been locating and constructing engineer on many railways, and is the author of *Field-engineering* (1879) and *The Railroad Spiral* (1882).

Sea-robin: See GUERNARD.

Sears, BARNAS, D. D., LL. D.: theologian and educator; b. at Sandisfield, Mass., Nov. 19, 1802; graduated at Brown University 1825, and at Newton Theological Seminary 1829; was pastor of a Baptist church at Hartford, Conn., 1830-32; was afterward Professor in the Literary and Theological Institution at Hamilton, N. Y. (now Colgate University), studied theology at German universities 1833-36; was professor in Newton Seminary 1836-48, acting as president during the later years; succeeded Horace Mann as secretary of the Massachusetts board of education 1848-55; was president of Brown University 1855-67, and after that the general agent of the Peabody Educational Fund. He was several years editor of the Baptist *Christian Review* (1837-40), a regular contributor to *Bibliotheca Sacra*, and author (with Edwards and Felton) of *Classical Studies* (1843), *The Ciceronian* (1844), and *The Life of Luther* (1850). He edited Nöthen's *German Grammar* (1842), *Select Writings of Luther* (1846), and Roget's *Thesaurus* (1854), and published many addresses, educational reports, and miscellaneous essays. During his stay in Europe he baptized in the Elbe near Hamburg, by night and stealthily, in order to avoid legal prosecution and police persecution, I. G. Oncken and six others, who formed the first German Baptist church in communion with the Baptists of England and the U. S. b. at Saratoga Springs, N. Y., July 6, 1880.

Revised by C. H. THURBER.

Searsport: town; Waldo co., Me.; on Penobscot Bay, 6 miles E. N. E. of Belfast, the county-seat, 27 miles S. W. of Bangor (for location, see map of Maine, ref. 9-E). It is principally engaged in ice-gathering, ship-building, hay-shipping, and the lumber-trade, and contains saw and grist-mills, spool-mill, poultry-farms, the Sears Public Library (opened in 1872), a national bank with capital of \$50,000, and a savings-bank. Pop. (1880) 2,322; (1890) 1,693. Rev. ROBERT G. HARBUTT, FIRST CONGREGATIONAL CHURCH.

Sea-serpent: a gigantic marine animal, said to have been seen in various localities, but never captured, and regarded by most zoölogists as purely mythical. The earliest references to the sea-serpent are to be found in Norse literature, where frequent mention is made of the *Sæ-Orin*. In 1557 the creature was described by Olaus Magnus in his work *Historia Gentium Septentrionalium*, where its length is set down as 200 feet and girth 20 feet. In 1734 the Rev. Paul

Lacépède gave a detailed description of a sea-serpent which he was deriving a voyage from Norway to Greenland, and in 1786, as related by Bishop Pontoppéden, another was seen by Capt. Lawrence de Barry, of Bergen, Norway, who made allusion to the truth of his story. Even that time onward the so-called sea-serpent has been reported from various localities, but most often in northern waters, and particularly on the coasts of Norway, Scotland, and New England. Many of these accounts are of a very circumstantial nature and are given by people of unquestioned veracity. Perhaps the most noteworthy is that given by Capt. Peter McQuhee, of U. S. S. *Dagobert*, who reported that on Aug. 9, 1849, in 44° 44' N., 10° 22' E. he and several of his ship's company saw an object which "was discovered to be an enormous serpent, with head and shoulders kept about four feet constantly above the surface of the sea, and as near as we could approximate . . . there was at least sixty feet of the animal above the surface. . . . The diameter of the serpent was about fifteen or sixteen inches behind the head, which was, without any doubt, that of a snake. . . . It had no fins, but something like the mane of a horse, or rather a bunch of seaweed, washed about its neck." Prof. Owen suggested that the animal seen might have been a stray sea-elephant (*Moronechasma*), but this Capt. McQuhee emphatically denied. While there is great discrepancy among the various accounts of the sea-serpent in regard to length, proportions, and general appearance of the creature, yet a certain number of them agree in the following particulars: The length is placed at about 60 feet; the color is given as dark above and light below; the creature is said to have moved steadily with its head and neck above the water, and there were appendages back of the head. These, including the animal seen by Capt. McQuhee, are explained on the theory that one of the great difficulties known to inhabit the depths of the sea has been seen at the surface with the tail projecting above it, this being taken for the head, as the squid moves not first by means of a current of water expelled from the mantle. The long arms, dragging along near the surface, would represent the body of the sea-serpent. Basking sharks, whales of porpoises, floating logs, kelp, and seals have been mistaken for the body of other sea-serpents.

A few scientific men are inclined to believe that there is some huge marine animal which has actually been seen, but not yet captured, even going so far as to suppose the existence of some reptile, like the *Plesiosauros*, or like one of the enormous marine reptiles whose remains occur in the Chalk. Oudemans considers that the creature known as the sea-serpent is a huge plimped, with long neck and long tail, to which the name of *Megaphias megaphias* (*Chelonephias*, Oudemans) belongs. The large majority of biologists, however, deny the existence of the sea-serpent in 1886, and it is to be noted that no naturalist has ever had a view of the creature, and that no one of its bones even has been seen in light.

See *The Great Sea-serpent*, by A. C. Oudemans (London, 1886). This is a monographic work containing a very full bibliography of the literature on the subject, and accounts of the various appearances of the sea-serpent. Also *The Sea-serpent of Natural History*, by George (1890); *Sea Monsters Unmasked*, by Henry Lee (1893); *Facts and Fictions of Zoology*, by Andrew Wilson, F. A. Lucas.

Seashore (in law). By the Roman or civil law the sea was, like the air and running water, common to all, and consequently not susceptible of private ownership either by an individual or by the state. This principle applied equally to the bed and shore as to the waters of the sea. The common law, however, took a different view. Owing to the gradual development of England's sea power and her consequent assertion of civil as well as political jurisdiction over the "four seas" (meaning thereby the Atlantic Ocean, the Irish Sea, the German Ocean, and the British Channel), it became the accepted doctrine of English jurists in the seventeenth century that the bed of the ocean was the property of the crown so far as the royal jurisdiction extended. When this jurisdiction was cut down by modern international law to the three-mile limit the assumed property rights of the crown were reduced to the same dimensions. It is, however, a mooted question whether the property rights of the state are coextensive with this jurisdiction or whether they are limited by low-water mark on the shore, the latter view having lately come to prevail in Great Britain, while the former has usually been taken in the U. S. *Regina v. Keyn*, 9 Exch. Div. 69; Gould on Waters, §§ 1-10.

The divergence between the common and the civil law is more marked, however, as regards the seashore itself and the arms and inlets of the sea within the territorial limits of the state. Where by the Roman law it was expressly provided that the seashore and all rivers and harbors were common to all, and that the public use of the seashore as of the sea itself was part of the law of nations, the common law in the U. S. as well as in Great Britain has always regarded the seashore and the beds of rivers and arms of the sea as subject to private property. This property in the seashore is by the common-law rule vested in the state, but it may by charter or by special grant be conferred upon a municipal corporation or a subject. Thus, for example, the city of New York became vested by the Dongan charter (A. D. 1686) with the fee simple of all the tideway on the circuit of Manhattan Island. The common-law rule is generally followed in the U. S., but in several States (e. g. Massachusetts and Maine) the property of the littoral proprietor extends to low-water mark. In the U. S., moreover, it is the several States and not the Federal Government to which the title to the seashore is vested. It is laid down in the *Institutes of Justinian* (book II., tit. I., 3) that the seashore extends to the limit of the highest tide in time of storm or winter; but by the common law the seashore is the strip included between ordinary high and low water mark.

The right of private property in the sea, whether it be limited to the shore or be coextensive with the jurisdiction of the state, whether it be vested in an individual or in the state, is always subject to certain public rights of user and enjoyment. The principal of these rights are those of navigation and of fishing, the taking of shellfish other than deep water or from the shore being included under the latter. There is, however, no right to take sand, gravel, or shells, nor to use the shore as a highway, nor to frequent it for the purpose of bathing. There seems to be no distinction between public and private ownership of the shore so far as the exercise of these public rights is concerned, and the state can not, by grant of the shore to an individual, diminish or in anywise affect these rights.

The rights of littoral proprietors as such in the shore differ from those of the public only in the fact that it affords them a means of access to their own lands. This right of access is a valuable property right, and is protected as such by the common law. In New York and New Jersey, however (and perhaps in a few other States), it has been decided that littoral proprietors have no remedy for an infringement of this right of access to navigable waters. Of course, where the littoral proprietor is also the owner of the foreshore his property rights therein are absolute, except only as they are limited by the public rights of user above referred to. It follows from what has been said that a littoral proprietor who does not own the shore is not entitled to build wharves or piers except by the consent of the state, and that such proprietor who does own the shore can not build out beyond low-water mark without such permission; nor can he even under the authority of the state build so as to interfere with navigation. In the former case his act is a *purpresture* or trespass on public property; in the latter a public nuisance, which is not justified by pleading the license of the state. The littoral proprietor, whether owner of the shore or not, is under the doctrine of accretion entitled to the increase of his land by the gradual recession of the sea. If the retreat of the sea be sudden, however, or so rapid as to be perceptible in its progress, the land gained will belong to the state.

The law governing the seashore, as above set forth, is a part of the law of public waters. So much of that law as relates particularly to navigable rivers has been treated under the head of RIVERS. See also LAKES. The literature of the subject is extensive and full of curious learning. See especially Hale, *De Jure Maris*; Selden's *Mare Clausum*; Hall on the *Seashore*; Angell on *Tidewaters*; and Gould on *Waters*.

GEORGE W. KINCHAY.

Seasickness: a nervous affection attended with nausea and convulsive vomiting, produced by the oscillations of a ship at sea. Its origin and nature are still very imperfectly known. It may attack the strong and cautious, while the debilitated and incautious go free. It may attack in calm weather and on smooth waters, while a storm and a rough sea fail to produce it. It may pass away after the lapse of a few hours, or last during a long voyage. Seasickness is probably due to circulatory disturbances in the nerve-centers, possibly to a large extent induced by irregular visual

impressions due to the rocking. In many persons a few mild doses of calomel before the voyage prevent the occurrence of seasickness. In others a little bromide of potash, soda-water, or saline draughts suffice. Persons who are specially liable sometimes escape entirely by preserving a horizontal position during most of the voyage. W. P.

Seaside-grape: a small polygonaceous tree (*Coccoloba uvifera*) of Florida and the West Indies, producing the extract called Jamaica kino. (See KINO.) It has clusters of purple edible fruit, and a beautiful hard wood, which yields a red dye.

Sea-squirt: any one of the ASCIDIA (*q. v.*).

Sea-swallow: See GURNARD.

Seattle, see-at'll: city; capital of King co., Wash.; on Puget Sound, and the Gt. Northern, the N. Pac., the Columbia and Puget S., and the Seattle, Lake Shore and East. railways; 28 miles N. of Tacoma (for location, see map of Washington, ref. 3-D). It lies on the east side of Admiralty Inlet, between Elliot Bay (salt water) and Lake Washington (fresh water). The contour of the city is hilly, with valleys running N. and S. The steep rise of the hills from the water of the sound presents a striking view, especially when approached in the evening. This is enhanced by two snow-capped ranges, the Olympics on the W. and the Cascades on the S. E., and by Mt. Rainier, rising in the south to a height of 14,444 feet. The city has seven public parks—the City, Denny, Kinnear (each partially improved), Madrona, Leschi, Ravenna, and Woodland—some of which afford scenery of rare natural beauty. The business districts are covered with handsome and substantial buildings, nearly all erected since the great fire of 1889.

Climate.—The summers are cool and pleasant; the rainy season is broken by much good weather; the annual range of temperature is from 10° to 88°; the rainfall in 1893 was 45 inches. A peculiar feature of the climate is that the rainy season is more healthful than the dry season. The death-rate is about 8 in 1,000. Ocean storms spend their force on the Olympic Mountains before reaching the city.

Public Buildings.—The county court-house occupies a prominent site overlooking the city; the county almshouse and hospital is a fire-proof structure which cost over \$80,000. The Roman Catholic Church maintains Providence Hospital and the House of the Good Shepherd, a reformatory for girls. There is an efficient board of associated charities. The Public Library (founded in 1872) is supported by a percentage of the criminal fines, and has spacious rooms and a large patronage. Terms of the U. S. circuit and district courts are held here, and a U. S. land-office, U. S. custom-house, U. S. weather bureau, and the board of U. S. inspectors of steam-vessels for Washington and Alaska are located here.

Churches and Schools.—Seattle contains 12 Methodist Episcopal churches, 9 Baptist, 5 Congregational, 5 Presbyterian, 5 Lutheran, 4 Protestant Episcopal, 3 Roman Catholic, 8 Disciples, 3 German Evangelical, 3 Methodist Protestant, 2 Jewish, and one each Advent, Free Methodist, Reformed Presbyterian, and Unitarian, besides a Salvation Army barracks, and 17 missions. The public-school system has a large endowment of State lands. There are 16 public-school buildings (which cost, with land, \$673,000), with (1893) 184 teachers and 6,424 pupils; 2 parochial schools, several private kindergartens, and girls' schools. The State University occupies a fine site on 341 acres of school land within the city limits, and has about 500 students and a valuable library, practically public. There are also a Baptist university, Seattle Female College, College of the Immaculate Conception, and the Academy of Holy Names. The Workmen's Guild supports a library. In 1894 there were 8 daily, 16 weekly, a semi-monthly, and ten monthly periodicals.

Finances and Banking.—In 1894 the city receipts were \$553,630; expenditures, \$591,000; the bonded debt was \$3,540,000; the assessed property valuation, \$32,752,153; tax-rate, 12.5 mills. There were 7 national, 3 savings, and 5 private banks. Seattle has never had a bank failure.

Business Interests.—The manufactories number 331, with \$4,758,283 capital invested and \$10,203,007 value of product, and include sawmills, a flour-mill, breweries, extensive drain-tile and brick works, foundries, boiler-works and machine-shops, sash and door factories, furniture factories, bookbinderies, tanneries, manufactories of tinware, shoes, crackers, soap, and ice, creosoting works, ship-building yards, etc. There is a large business in the wholesale shipments of fresh fish. There are 91 miles of street-railways, of which 22

miles are cable road and 69 miles electric. These lines are also used for freight. The cable lines run over the highest hills, which are the choice residence districts. Every portion of the city is easily accessible. The commercial advantages of Seattle are remarkable. By water there is regular steamship connection with the Orient, with San Francisco, and Alaska. The railway connections are superior to those of any point on the Pacific coast, four transcontinental lines competing for business, two of which have their terminals in the city. Lumber, grain, and coal are shipped to all parts of the world. The city is the center of trade for all the numerous small steamers, called the mosquito fleet, plying to the ports of Puget Sound, which has about 1,200 miles of coast-line. An immense business in cedar shingles and lumber has been developed, and shipments by rail extend to the Atlantic coast. A company has been formed for the utilization of Snoqualmie Falls by electrical transmission of power. Large sums have been invested in a steel plant. An appropriation has been secured from the U. S. Government to begin the construction of a canal connecting Puget Sound through Lake Union with Lake Washington. The lake is about 25 miles in length, and does not freeze in winter. Vessels scour their bottoms in fresh water and avoid the expense of docking. The lake is surrounded with valuable deposits of coal and iron, and with fine bodies of timber. By the canal a landlocked harbor would be formed of great value to the Government in connection with the dry dock at PORT ORCHARD (*q. v.*). A second company has entered into a contract with the State providing for a second canal S. of the city.

History.—Seattle, named from an Indian chief, was founded in 1852. It remained a village until 1880. An important episode in the early history was the protection of the Chinese by a vigilance league, which prevented the triumph of the lawless elements. The city early became the central commercial point for the Puget Sound region. On June 6, 1889, it experienced a conflagration which destroyed property valued at \$15,000,000, but one brick building remaining in the business district. Seattle was the first large city to free its streets of horse-cars.

Pop. (1880) 3,533; (1890) 42,837; (1892) State census, 58,898; (1894) estimated, 60,000. WALLACE NUTTING.

Sea-unicorn: See NARWHAL.

Sea-urchin: See ECHINOIDEA and PALEONTOLOGY.

Seaweeds: the popular name for the plants which grow in the sea, often extended so as to include all aquatic plants whether growing in salt or fresh waters. They are also known as ALGÆ (*q. v.*), sea-mosses, and sea-ferns (although they are neither mosses nor ferns). In this wide sense seaweeds belong to no less than six different classes of the vegetable kingdom, viz.: (1) *Schizophyceæ*, the fission algae, mostly microscopic and usually blue-green or smoky green, inhabiting fresh and salt waters; (2) *Chlorophyceæ*, the green algae, mostly microscopic, green (sometimes obscured by brown coloring-matter), inhabiting fresh and salt waters; (3) *Phæophyceæ*, the brown algae, including FUCOIDS and KELP (*q. v.*), mostly of large size, green (but obscured by brown coloring-matter), inhabiting salt waters; (4) *Colectataceæ*, the simple fruit-tangles, microscopic, green, inhabiting fresh waters; (5) *Rhodophyceæ*, including one order (*Florideæ*), the RED SEaweeds (*q. v.*), usually of considerable size, green (obscured by red coloring-matter), inhabiting salt waters; (6) *Charophyceæ*, the STONEWEEDS (*q. v.*), mostly large plants, green, inhabiting fresh waters. These plants do not constitute, therefore, a single natural group, although usually so treated. CHARLES E. BESSEY.

Sea-wolf: See WOLF-FISH.

Sebaceous Glands: See HISTOLOGY (*The Skin and its Appendages*).

Sebac'ic (also called **Sebic** and **Pyroleic**) Acid [*sebacic* is from Lat. *sebum*, tallow; *pyroleic* is from Gr. *πῦρ*, fire + Eng. *oleine*]: a compound with the empirical formula $C_{18}H_{34}O_2$, formed during the destructive distillation of all fatty bodies which contain oleic acid or olein. Nitric acid forms it also when acting upon fatty bodies, together with oxalic acid and other lower homologues of the same series, or those having the general empirical formula $C_nH_{2n-2}O_2$, a series of which *malonic*, *succinic*, and *suberic* acids are members. Sebacic acid is most readily obtained by fusing together castor oil and caustic potash, 2 parts of oil being slowly mixed with one part of potash, fused with a little water, and heated until the mass is faintly yellow. After boiling

German with water and adding hydrochloric acid while hot, when acid crystallizes on cooling in needles. It resembles common acid in appearance, tastes acid, reddens litmus, melts at 150°, and solidifies above this. It is slightly soluble in cold, very soluble in hot water and in alcohol. Its salts, when heated, are bifluoric, like oxalates and succinates. Neither oxalates nor succinates have been obtained as yet any practical application.

Revised by ISA. HENRY.

Seboldus: a saint of the Roman Catholic Church, and the patron of the city of Memmingen, in Bavaria; was the son of a Danish king; began his studies in Paris when only three years old; married a daughter of King Dagobert, for was released from his marriage-vow the day after the wedding had taken place; spent ten years in the practice of the asceticist asceticism; was by Gregory II. sent into Germany to preach the gospel, and finally settled in Memmingen, where he died in 801, or, according to some writers, in 804. The magnificent Church of St. Seboldus still preserves his memory, and in 1325 Pope Martin V. canonized him on account of the marvels which had been wrought by himself while alive and by his relics after his death. Aug. 14 is his day of commemoration and is still celebrated in Memmingen.

Sebeste: See **SABASTIA**.

Sebastian, SAINT: b. at Narbonne in Gaul about 255; educated at Milan; was a captain in the imperial guard when, under Diocletian, he was seized as a zealous Christian, bound to a tree, and used by the Mauritanian archers as a target. He did not die, however, but having been brought to a Christian home and cured, he was seized a second time, transported to death, and thrown into a sewer, about the year 307. His body was recognized by the Christians and buried in the Catacombs. Pope Damasus (366-382) built a church over his tomb, relics of him were sent to every corner of Christendom as very powerful against the plague; numerous churches were consecrated to him, and he was generally chosen as patron by associations of archers or soldiers. His feast is celebrated in the Roman Catholic Church Jan. 20, and in the Greek Church Dec. 18. Roman Catholic Church historians ascribe much importance to the *acta* *Sebastiani*, which have been ascribed to St. Jerome. By Christian art he is generally represented as and in a tree and pierced by an arrow. Numerous legends, pious fictions, and poems have clustered around his name.

Sebastian: King of Portugal, known as DOM SEBASTIAN; b. at Lisbon in 1554; succeeded his grandfather, John III., in 1578; headed an expedition which captured Tangier, Morocco, in 1574; made another expedition into Africa in 1578, and took part in a civil war supporting the claims of Muley Mohammed to the throne of Morocco against his uncle, Muley Mulek. On Aug. 4 he fought the battle of Alcazar, in which he lost his life and a great part of his army. As the king had no immediate heir, Portugal was soon annexed to Philip II. of Spain, but the masses of the Portuguese people refused to believe in the death of Dom Sebastian, and a series of pretenders appeared at intervals for many years, and received some popular support. One of them made a great sensation at Venice, Florence, and Naples twenty years later, was taken prisoner, and according to some accounts beheaded at San Jussar, in Spain, about 1600. The belief in the future return of Dom Sebastian continued to exist among the ignorant and superstitious for many years, and gave birth to a considerable literature of poems and romances. See *Sebastian*, *Las Juntas Dom Sebastian* (Paris, 1865). F. M. C.

Sebastopol: See **SEVASTOPOL**.

Sebesten-plum: the fruit of *Cordia myra* and *C. latifolia*, Asiatic trees of the family *Boraginaceae*. The fruit is white and was once employed in European medicine. The meat is soft, light, and readily takes fire on friction. It was used by the old Egyptians for mummy-cases. The green *Cordia* is an extensive and interesting one. Florida has two species, and there are two others in Southern Texas.

Revised by L. H. BAILEY.

Seckel Acid: See **SECKEL ACID**.

Seckendorff (properly *Seckendorff*): Alexander's name; born in the Nizam's Dominions, India; 5 miles S. E. of Hyderabad on a map of S. India, ref. 4-E). It is a British military installation. European troops were first stationed here in 1803. Pop. (1891) about 75,000.

Seckel, von, SECKEL, astronomer; b. at Reggio, Lombardy, Italy, July 20, 1818; entered the order of the Jesuits

in 1833; studied mathematics, physics, and astronomy; went to the U. S. in 1848, and taught mathematics at the college of Georgetown, D. C.; was appointed director of the observatory of Rome in 1846, and devoted himself to researches in meteorology and spectrum analysis. Besides about 100 papers he wrote, among other works, *Le Soleil* (Paris, 1870), which has been translated into the principal European languages. On the expulsion of the Jesuits from Italy in 1879, Seckel retained his office. D. in Rome, Feb. 20, 1879.

Secession (from Lat. *secedere*, derive, of *secedere*, withdraw; *se-*, aside + *cedere*, go): any withdrawal from a political or religious organization. The word has acquired lasting notoriety by being used to describe what was claimed to be the right of a State included under the Constitution of the U. S. to withdraw from the Union and set up an independent government. The way was prepared for broadening and exercising this so-called right by the theory of Nullification (q. v.) advanced by South Carolina and some of the people in other States. The tariff law of 1828 was declared by South Carolina to be "null, void, and no law," and duties on imports were forbidden to be paid after a certain day within its jurisdiction. Gen. Jackson, then President, felt that such a power lodged in a State would be a deathblow to the Union and altogether unconstitutional. His energetic opposition and the message on nullification in 1833 put a stop to this political heresy for the time, but only postponed the day of final test. The doctrine was that every State has a right to interpret the Constitution for itself, whatever be the decision of the Supreme Court on the subject, and, as interpreting, to retire from the Union. Hence there is no right to force it to return. This is really a plan to crush under the term nullification the extreme act which denies that the "Constitution, and the laws of the United States which shall be made in pursuance thereof . . . shall be the supreme law of the land," and that "the judicial power of the United States shall extend to controversies to which the United States shall be a party," and that the judges in every State are bound thereby. (Art. III, § 2; Art. IV, § 4.) The doctrine assumed practical form after the election of President Lincoln in 1860, when it was claimed on the part of many of the people in the South that the triumph of the Republican party meant the adoption of a policy of such interference with the domestic institution of slavery as to make it impossible for the Southern States any longer to secure and enjoy their constitutional rights within the Union. They accordingly attempted to withdraw from the Union by passing ordinances of secession and resisting the enforcement of U. S. law. For an account of the war, and of events connected with it, see the articles on CONFEDERATE STATES, DEMOCRATIC PARTY, REPUBLICAN PARTY, HARTFORD CONVENTION, FORT'S RESOLUTION, and NULLIFICATION.

Revised by C. K. ADAMS.

Secession Church of Ireland: See **PRESBYTERIAN CHURCH** (*Some of the Existing Presbyterian Churches*).

Seckendorff: the name of a family of German nobility, which can be traced back to the middle of the thirteenth century, and still flourishes in various branches. Several of its members have become celebrated in German literature and history: (1) VERT LAMWUS VON SECKENDORFF, statesman and author; b. near Erlangen, Dec. 20, 1626; studied law and history at the University of Strasbourg; held various important positions in the service of the Duke of Gotha, the Duke of Saxony-Zeitz, and the Elector of Brandenburg. D. at Halle, Dec. 18, 1692. He was the author of *Der deutsche Fürstenstaat* (1655) and *Commentarius Historicus et apologeticus de Lutherismo* (1692), in their time very famous books.—(2) FRIEDRICH HENRICH, Count von SECKENDORFF, soldier and diplomatist; a nephew of the preceding; b. at Königsberg, Prussia, July 5, 1671; studied law at Jena, Leipzig, and Leyden; served in the Austrian army against the Turks on the Danube, and in the war of the Spanish Succession took part in the negotiations at The Hague, which resulted in the Peace of Utrecht (1713), and held an important command in the Saxon-Polish army against the Swedes. As Austrian ambassador to several German courts he worked to secure the recognition of the Pragmatic Sanction. In the war of the Polish succession he commanded a force of 30,000 men, and defeated the French at Klausen (1735). After the death of Prince Eugene (1736) he was made commander-in-chief of the Austrian army against the Turks, but was defeated, recalled, accused of treason, imprisoned in the fortress of Gratz, and liberated only after much difficulty. He then entered the service of

Charles II. of Bavaria, who, after the death of Charles VI., laid claim to parts of the Austrian heritage, in spite of the Pragmatic Sanction, and was elected emperor under the name of Charles VII.; commanded his army with success; expelled the Austrians from Bavaria, and succeeded in negotiating a tolerable peace for his son in 1745. After this time he lived quietly on his estate, Meuselwitz, near Altenburg, in the Saxon duchies, but in 1758 he was imprisoned by Frederick II. for six months, and forced to pay a heavy fine. D. at Meuselwitz, Nov. 23, 1763.—In the nineteenth century several members have acquired a name as poets: (3) LEO (1773-1809); (4) KARL SIEGMUND (1744-85), translator of Camoëns; (5) CHRISTIAN ADOLF (1767-1833); (6) GUSTAV ANTON (1775-1823), known also in the U. S. as a lecturer under the name of PATRIK PEALE.

F. M. COLBY.

Second Advent: the visible reappearance of our Lord in the world since his ascension to heaven. More exactly, inasmuch as he revisited the world visibly to call the apostle Paul, the second advent denotes a return visible to all the world, or to the whole Church, or to an elect first-fruits of the Church. The first and the third opinion represent two schools of Christian belief. Beyond question, our Saviour himself promised to return visibly. Even assuming (Matt. xxiv., Mark xiii., Luke xxi.) to give his promise intermixed with later interpretations, the unmistakable foundation is a word of his own, which, moreover, is implied throughout the four Gospels, including John (see John v. 25, 28; vi. 39, 40; xiv. 3, 18), and throughout the Epistles of Paul, Peter, John, James, and Jude. The Revelation is full of it. Indeed, next to the Messiahship of Jesus, it has well been called the first Christian doctrine.

In the Gospels our Saviour seems to identify his coming with the fall of Jerusalem. When an evolving event includes many stages, even though widely apart in time, prophecy very commonly blends these in one, inasmuch as the subsequent stages are only an explication and amplification of the first. As has been truly said, prophecies of fundamental import have a springing and germinant fulfillment in every age. The prophecies of the first advent show the same blending of imperfect fulfillments, in which God came near to his people with the consummate fulfillment, in which God, though unrecognized, was with his people. Even so, as the fall of Jerusalem released Christ in his Church from the threatening constraint of Judaism and set him and her free for their victorious course in the world, it was a true and indeed visible return of Christ, with which he therefore fuses every fuller accomplishment of his promised return, even to the consummate fulfillment at the end. He himself, as incarnate, denies of himself any other than a restricted knowledge of times and seasons, which implies a restricted knowledge of specific phases of evolution in the Parousia, or second advent. Only two things are distinct: One, that everything which he foretells shall, in a real sense, come to pass in that generation; secondly, that his coming may be, in its absolute and final sense, long delayed, giving occasion to despondency in some of his people and to licentious security in others. This fusion of different stages of the Parousia is the more obvious, as Christ's visible return is only the highest, coercive evidence of his spiritual return, sight being used as the most convincing and most spiritual bodily sense.

The Revelation alone of the New Testament books describes the second advent as separated by an earthly reign of 1,000 years from the last judgment and reconstitution of all things. Accordingly, since A. D. 200 until of late, this opinion has never had much currency in the Church. It seems to be regaining ground.

C. C. STARBUCK.

Secondary Era: a division of geologic time co-ordinate with Primary, Tertiary, and Quaternary eras. A synonym in more general use is MESOZOIC ERA (*q. v.*).

Secondary Schools: See SCHOOLS.

Secretary: in the U. S., the name of the officer of the cabinet, the respective heads of the executive departments of State, War, Navy, the Treasury, the Interior, and Agriculture. For an account of their duties, see the articles on these departments.

Secretary-bird: a bird of prey (*Gypogeranus serpentarius*), which owes its popular name to a crest of feathers at the back of the head which suggests a pen tucked behind the ear of a scribe. On account of anatomical peculiarities the bird is placed in a distinct family (*Gypogeranidae*). The secretary-bird is readily distinguished from all other birds

of prey by the disproportionate length of its legs, for while the body is smaller than that of a golden eagle, the legs are 2 feet long. The toes are short, nails blunt; the general color is grayish blue, with blackish markings on wings, tail, and under side. The bird feeds on rats and snakes, even on the venomous species, grasping them with its long legs and using its outstretched wing as a shield on which to receive the fangs of its prey. It is found throughout Southern Africa, W. of lat. 15°, and in Cape Colony is protected by law.

F. A. LUCAS.

Secret, Discipline of the: an English equivalent of ARCANI DISCIPLINA (*q. v.*).

Secretion [from Lat. *secre'tio*, a setting apart, separating, deriv. of *secer'nere*, separate; *se-*, apart + *cer'nere*, distinguish, separate]: one of the chief physiological processes of the body; the separation of certain elements of the blood, and their elaboration to form special fluids, termed secretions and excretions. Both of these products contribute to the health and nutrition of the body, the secretion performing some positive function, as aiding digestion; the excretion subserving the same purpose negatively by freeing the system of effete matter, the *débris* of cell and tissue, which if detained in the blood develops disease. The function of the perspiratory and sebaceous glands is secretory, so far as they preserve the moisture and delicacy of the skin, but is chiefly excretory, eliminating water and various effete matters from the system, and hence is classed as an excretion. Bile is variously defined as a secretion, an excretion, and as both, its constituents being effete substances deleterious to health if not promptly excreted, yet performing an important part in the process of intestinal digestion.

Secretion is performed in several ways. The simplest form is seen in the serous shut sacs which invest the lungs, heart, and intestines—the pleuræ, pericardium, and peritoneum. These are lubricated by a fluid which filters directly through the flat endothelial lining cells from the blood-vessels beneath; so also are produced the synovial fluids of the inner smooth surfaces of the joints. A more typical secretory structure is the *tubule*, a cylindrical recess or tube at right angles to the surface, lined with secreting cells. Secreting surfaces, as the mucous lining of the bronchial tubes, stomach, and bowels, have many hundreds or thousands of such tubules to the square inch. An isolated group of tubules ramifying from a single central duct constitutes a simple gland; a number of such groups having a common duct is a compound gland; the larger glands, composed of an extensively divided tubular system with corresponding lobules, are termed racemose glands—that is, in structure resembling a cluster of berries. Such complicated glandular structures serve merely to multiply secreting surface within a limited space; the functional action is much the same whether performed on the free surface, in the tubule and follicle, or by the multiple gland. Secretion is the product of cell-activity. The cell derives its material from the blood, its stimulus to action from the nervous system, and it elaborates a peculiar fluid, in each instance predetermined by the inherent function of the gland or organ of which it is an integral part. Secreted fluids are homogeneous, consisting chiefly of water with variable quantities of salts and fatty matter, and in each case a distinguishing component, as pepsin in gastric juice and mucin in mucus.

Revised by W. PEPPER.

Secular Clergy: See CLERGY.

Secular Games [translation of Lat. *ludi sæculares* (also known as *ludi Terentini*); *ludi*, plur. of *ludus*, game + *sæcula'res*, plur. of *sæcula'ris* (whence Eng. *secular*), of a century, deriv. of *sæculum*, century]: games celebrated in ancient Rome in honor of the infernal deities Dis and Proserpina. The festival seems to have been of Etruscan origin, and to have been connected with a belief in the existence in the life of the state of great periods whose beginning and end were marked by special portents from the gods. Such a period was supposed to be equal to the longest human life, and was variously computed at 100 and 110 years. Owing to the different modes of reckoning, the games were not held at regular intervals. The first well-attested instance of their celebration at Rome was in 249 B. C. Secular games were again held in 146 B. C., and under the empire in 17 B. C., and in 47, 88, 147, 204, 248, and 262 A. D. An inscription has recently been discovered giving an account of the celebration of the games under Augustus in 17 B. C.; it was for this occasion that Horace wrote his *Carmen sæculare*.

G. L. HENDRICKSON.

Secularism (*from*, of *seculus*, from Lat. *saeculus*, a day, or century, race, generation, and, the times, the world) an ethical and social movement originated in England in 1844. Its most prominent leader during its earlier years was George Jacob Holyoake, who for several years was president of the London Secular Society. He was succeeded in 1858 by Charles Bradlaugh, who, when the Secular Society formed a national society, became its president and continued so for more than twenty years. Under his direction the movement became more aggressively anti-theological than it had been under Holyoake. His pseudonym, *Invictus*, expressed the temper of the man and of the movement as inspired by him. The idea of Holyoake is better embodied by the societies for ethical culture than by the secular societies. That idea was that ethical and moral good is "the chief end of man," and that this end is not *helped*, but rather *hindered*, by theological and especially supernaturalist considerations relating to God and a future life. Belief in these was no bar to admission to the societies, but practically those attracted were intellectually *agnostic*, and tended to be dogmatic atheists under the *discovery* system. In other particulars there was change as time went on. The political elements became more strongly marked, the social and industrial less so. As an ethical apostle of cooperation, Holyoake always insisted on that as the method of social regeneration, but being equally a disciple of Thomas Paine politically and of Robert Owen socially, the tendencies of his societies to become democratic and republican clubs were unmistakable. Under Bradlaugh this tendency became more evident. The National Society of Secularists has made a declaration of principles, which makes its objects clear, and the means and methods by which they are to be attained. It declares the promotion of human improvement and happiness to be the highest duty; that theological teachings are obstructive of this aim; that every individual should be well placed and instructed and usefully employed for his own and the general good; that civil liberty and religious liberty are necessary, and that every Secularist is bound to actively attack all barriers to equal freedom of thought and utterance for all upon political and theological subjects. Much of the energy of Bradlaugh and of the society under his direction was in the *work* of this final clause. The same declaration of principles sets forth the objects of its political and social agitation: universal education; disestablishment and disendowment of the state Church; improvement of the condition of agricultural laborers; such change in the land laws as will give the laborer an interest in the soil; abolition of the House of Lords and substitution of a national senate with life-members; investigation of the causes of poverty and plans for its amelioration. On several of these lines the national society and its local branches have done excellent service. The opposition to the state Church has been more *accomplished* than theological.

Secularism must be distinguished from agnosticism, which is merely an intellectual temper that does not admit of either theological affirmation or denial, while secularism, though *inspiring* this temper largely, is nothing if not *practical*. Compared with the ethical culture of Dr. Felix Adler and his school, that is the more subjective, this the more objective; that insisting that good character and right conduct are central to all effective social reform, secularism looking to the social reform, the improvement of circumstances, for the development of character. Secularism has been called by an English clergyman of the Established Church, "the religion of doubt." "It does not," he says, "necessarily clash with other religions; it does not deny the existence of God or even the truth of Christianity; but it does not profess to believe in one or the other." This, however, is more secularism in the abstract, and as it was in the original hope and dream of Holyoake, than as it has been practically in the course of its development. It has *coincided* with other religions "in a very lively fashion. If the temper of Holyoake could have dominated it always it might perhaps have done better service. That it has done good service in many ways is not denied by those to whom the agnostic and atheistic elements are most *deplorable*." — JAMES W. CHADWICK.

Secularization: the process of converting objects from a religious or spiritual to a common or secular use, and of removing matters from a purely ecclesiastical control to the *civil jurisdiction*. During the epoch when the Church had attained the highest degree of power its interference with secu-

lar matters extended in every direction, but was most distinctly exhibited in connection with certain special subjects, the control of which it has ever struggled to retain. Vast quantities of lands had gradually accumulated in the hands of the religious houses, and all the most valuable estates of Europe were likely to fall into their ownership. From the time of Constantine the Church had jurisdiction over certain subjects of the utmost consequence in society, the most important of which were marriage, divorce, and the succession of decedents' estates. Education in all its grades and departments was intrusted exclusively to the Church. The progress of secularization has nearly destroyed these spiritual interferences with civil affairs in many countries of Europe and America, and has greatly narrowed their extent in all the others. The first impulse of this grand movement was naturally directed against the threatened monopoly of land. At an early day statutes were passed in England and on the Continent prohibiting the acquisition of lands by religious corporations; and this policy has continued to the present day. (For a description of these enactments, their design and effect, see the article *MONASTICISM*.) In addition to this system of restraint, the accumulated possessions of the ecclesiastics and the spiritual houses have sometimes been seized by the civil authorities and appropriated to secular uses. The most remarkable instances of such enforced changes occurred in England under Henry VIII., in Scotland at the Reformation, and in France during the Revolution. The Italian and the Mexican Governments have, in the nineteenth century, pursued a similar policy. The nineteenth century also has seen important alterations in the law of matrimony. In Great Britain, France, Italy, Prussia, Austria, and several other European states, marriage has been made wholly a civil contract and status, divorce is regulated by statute, and both are placed under the jurisdiction of the ordinary tribunals. The same steps had before been taken in reference to successions. So far as education is public or is supported at the public expense, the course of modern legislation in Great Britain, France, Italy, and Germany favors a control by the state, and not by the Church. It is in the U. S., however, that the theory of secularization has had the fullest scope, and has been worked out most thoroughly and consistently. The fundamental conception of the state contained in the organic law confines the Church to functions purely spiritual and religious; the Church itself, as a spiritual society, has no legal existence, and is not recognized by the law, and all the separate congregations or parishes are in all respects civil and lay corporations. Marriage, divorce, and all other relations, domestic or social, successions and all other matters connected with property, are of course under the exclusive dominion of the civil government. A few traces are still left of ecclesiastical influence and privilege, but are the objects of frequent attacks. The removal of all distinctively religious instruction from the common schools, with the consequent secularizing of the public educational system, and the repeal of all laws which exempt ecclesiastical property from taxation are strongly advocated.

Revised by F. M. COLVER.

Secundus, JOHANNES (*San Nicolaas Everaerts*): poet; b. at The Hague, Nov. 14, 1511; studied law at Bruges, but devoted himself chiefly to poetry, painting, and sculpture. In 1533 he went to Spain and became secretary to Cardinal Tavera, Archbishop of Toledo. On his return to the Netherlands he was employed as secretary by the Bishop of Utrecht, in which city he died Sept. 24, 1596. His best-known work is *Baron* (Utrecht, 1539), consisting of amatory poems. His *Opera Poetica* was published by his brother (Paris, 1641).

Secundus, PONTIUS PORROSENUS: a Roman poet who flourished in the reigns of Tiberius, Caligula, and Claudius. He was an intimate friend of Sejanus; and when the favorite fell he was thrown into prison, in 31 A.D., and not released until the accession of Caligula in 37. In 44 he was consul, and in 50 he was sent by Claudius as legate to Germany, where he defeated the Chatti and obtained the honor of triumphal ornaments. It was by his tragedies that Secundus acquired the most celebrity. Tacitus speaks of them in the highest terms, and so does Quintilian. The elder Pliny, who was an intimate friend of his, wrote his *Life* in two books. The few fragments of the works of Secundus which have been preserved hardly suffice to give an idea of his style.

Revised by M. WARREN.

Sedalia: city; capital of Pettis co., Mo.; on the Mo., Kan. and Tex. and the Mo. Pac. railways; 95 miles E. of Kansas City, 189 miles W. of St. Louis (for location, see map

of Missouri, ref. 4-F). It was laid out by Gen. G. R. Smith from a part of his farm in 1861, was a U. S. military post during the war of 1861-65, and for several years was the west terminus of the Mo. Pac. Railway. Gen. Nathaniel Lyon and Gen. John C. Frémont fitted out military expeditions here in 1861, and for a few days in 1864 the city was held by Confederate troops. The city has an elevation of 986 feet above sea-level, and is in an agricultural, coal-mining, and limestone region, which has also beds of emery and potter's clay, and indications of iron, lead, and zinc. Sedalia contains 23 churches, 13 public schools, a high-school building that cost \$40,000, George R. Smith College, public library with over 10,000 volumes, court-house (erected in 1884, cost \$115,000), new U. S. Government building, 3 national banks with combined capital of \$300,000, 2 State banks with capital of \$350,000, 10 building and loan associations, and 3 daily, 7 weekly, and 2 monthly periodicals. The locomotive-shops of the Mo. Pac. Railway and the general offices and car-shops of the Mo., Kan. and Tex. Railway are located here. There are also flour-mills, iron-foundry, woolen-mills, machine-shop, agricultural-implement works, brewery, grain elevator, and carriage and broom factories. Pop. (1880) 9,561; (1890) 14,068. THOMAS SEDDON.

Sedan, Fr. pron. se-dāān': town; in the department of Ardennes, France; on the Meuse; 64 miles by rail N. E. of Rheims (see map of France, ref. 2-H). It contains an arsenal and several magazines, and was at one time a place of great military importance. It has manufactures of cloth and other kinds of woolen fabrics. Metal-working is also carried on. The Protestants had here a flourishing academy, which was closed by the revocation of the Edict of Nantes in 1685. On Sept. 2, 1870, Napoleon III. and his whole army of 86,000 men surrendered here to the King of Prussia. Pop. (1891) 17,023.

Sedan-chair: a portable vehicle differing from the litter and the palanquin in that the traveler is carried in a sitting posture by two men. The sedan-chair took its name from Sedan in France, where it was invented, but it had long been employed in Eastern countries, notably in India and China. It was first seen in England in 1581.

Sedatives [from Lat. *sedare*, *sedatus*, make sit, settle, compose, calm]: a term somewhat loosely employed in medical parlance to designate agents which are soothing or actually anæsthetic over the sensory function, or which in relation to various motor functions tend to diminish activity. Aconite, hemlock, and chloroform are thus called sedative—the first, because it lessens the force and frequency of the heart's beats; the second, because it paralyzes the voluntary muscular system; and the third, because it is a general paralyzer of the cerebro-spinal functions. From these examples it is obvious enough that there is no group of allied agents to which the general term sedative can apply; and where used in relation to special paralyzing power the latter term is far more accurate and expressive.

Sedge Family: the *Cyperaceæ*; a group of grass-like, monocotyledonous, herbaceous plants, numbering 2,500 to

flowers are greatly reduced from the lily type, having three stamens (rarely more) and a one-celled ovary with two or three carpels, which contains a single basifixed, anatropous ovule, the latter developing into a free seed. The perianth is wanting, or at most rudimentary, and the plants are often monœcious or diœcious.

Sedges are common in all parts of the globe and are particularly abundant upon low and wet lands. They are usually not so nutritious as the grasses, but constitute a large proportion of the coarse hay which is cut from wet meadows. The largest genera of the family are *Cyperus* (containing from 400 to 500 species), *Fimbristylis* (200), *Scirpus* (200), *Rhynchospora* (150), *Scleria* (100), and *Carex* (500). See the articles *CAREX*, *CYPERUS*, and *PAPYRUS*.



FIG. 2.—Papyrus (*Cyperus papyrus*).

Sedgemoor: a wild region of Somersetshire, England, extending S. E. from Bridgewater. On July 6, 1685, the Duke of Monmouth, son of Charles II. of England by Lucy Walters, was defeated here by the army of James II. under the Earl of Faversham. The duke was taken prisoner, and executed July 15, 1685. See Blackmore's *Lorna Doone*.

Sedgwick, ADAM, LL.D., F. R. S.: geologist; b. at Dent, Yorkshire, England, in Jan., 1786; graduated at Cambridge 1808; became fellow of Trinity College 1810; took orders in the Church of England 1817; was appointed Woodwardian Professor of Geology at Cambridge 1818; chosen fellow of the Royal Society 1819; became proctor of the university 1827; president of the Geological Society of London 1829-31; received the Copley medal of the Royal Society 1863. D. at Cambridge, Jan. 27, 1873. His geological studies covered wide areas in continental Europe as well as Great Britain, but the older sedimentary rocks of England and Wales were his special field. In classifying these he first announced the Cambrian as a system below the Silurian; and a question as to the position of the line separating the two systems occasioned a long controversy with Murchison, involving much bitterness and personal feeling. He was an active opponent of the doctrine of evolution. His works consist chiefly of reviews, lectures, addresses, and memoirs, scattered through the publications of learned societies, the most important separate essays being a *Discourse on the Studies of the University of Cambridge* (1834; enlarged ed. 1850) and a *Synopsis of the Classification of the Palæozoic Rocks* (1855). See CAMBRIAN PERIOD, and consult Geikie's *Memoirs of Sir R. Murchison* (1874) and Hunt's *Chemical and Geological Essays* (1875).

Sedgwick, CATHARINE MARIA: author; daughter of Judge Theodore Sedgwick; b. at Stockbridge, Mass., Dec. 28, 1789; undertook after her father's death (in 1813) the management of a private school for the education of young ladies, and continued in that employment fifty years. She published her first work of fiction, *A New England Tale*, in 1822, the success of which decided her to continue the career of authorship; brought out *Redwood* (2 vols., 1824), which was reprinted in England, translated into French, Italian, German, and Swedish, and compared favorably with the novels of Cooper, to whom, indeed, it was attributed in the French version; and was the author of other popular works, including *The Traveller* (1825); *Hope Leslie, or Early*



FIG. 1.—A sedge (*Carex umbellata*) reduced, with enlarged perigynium and bract at left, and pistil and transverse section at right.

8,000 species. Their stems are usually solid and three-angled, and their leaves three-ranked, with closed sheaths. The

See, HORACE: naval engineer and architect; b. in Philadelphia, Pa., July 19, 1835. He was educated at the Academy of the Protestant Episcopal Church and the Gregory Academy; became, after entering business life, interested in steamship construction. From 1887 to 1889 he was the superintending engineer of the works of William Cramp & Sons, at Philadelphia, and introduced many improvements into the design and manufacture of the steam-engine. He had much to do with the introduction of triple-expansion engines into the vessels of the U. S. navy. He designed engines for the cruisers Yorktown, Concord, Bennington, Philadelphia, Newark, and Vesuvius, and for several well-known yachts and important merchant vessels. The cylindrical face-plate, if it may be so called, has been one of those by which it has been possible to produce perfect surfaces in main bearings and crank-shaft journals, so that heating, heretofore considered a natural consequence following the trial of a new engine, has been eliminated. He has been president of the American Society of Mechanical Engineers; is fellow of the American Association for the Advancement of Science; and a member of the British Institution of Naval Architects, and of other societies.

Seed-lac: See LAC.

Seeds [O. Eng. *sēd*; Germ. *saat*; Icel. *sāð*; Goth. *-seps* in *manasēps*, seed of men, the world; cf. Lat. *se'rere*, *sa'tum*, sow, Gr. *lérai*, throw; Indo-Europ. root *sē*, throw]: the immediate result of sexual propagation in phanerogamous plants, being the ovules after fertilization and the consequent formation of the embryo, which is the germ of a new individual. A seed consists of the embryo; of the matured coats of the OVULE (q. v.), commonly two, of which the outer, and generally the firmer, is technically called the *testa*, the inner, *tegmen*; and often of a stock of nourishing matter accumulated around or accompanying the embryo. The latter was named *albumen*, from a mainly fanciful analogy; the seed being likened to an egg, the albumen was supposed to answer to its white (albumen) and the embryo to its yolk. Seeds, such as those of peas, beans, and almonds, which have no albumen—that is, no stock of nourishment outside of the embryo—have always a strong and well-developed embryo, abundantly supplied with the same or similar matter stored in its own tissues. The general structure of the seed depending upon that of the ovule, the same terms are mostly applicable to it and to its modifications and parts (such as *anatropous*, *orthotropous*, *rhaphe*, *chalaza*, etc.); but the closed orifice through which impregnation was effected is called the *micropyle*; the scar left by separation from the seed-stalk or placenta is the *hilum*; the accessory and usually partial external covering, which is sometimes developed by a growth from the micropyle or the apex of the seed-stalk, is an *arillus* or *aril*. The mace of nutmeg and the pulpy covering of *Euonymus* seeds are familiar examples. A *caruncle* and a *strophiole* are nearly similar appendages at the base or hilum, not developed into a covering. Other appendages to certain seeds are the *coma*, or tuft of downy hairs at the summit, as in milkweed, or the base, as in willow, also the wing, as in trumpet-creeper; these and various other appendages aid in the dispersion of seeds. The albumen of the seed, when distinctively present, may differ greatly in abundance, consistence, and nature; as from farinaceous or flowery in wheat to cartilaginous or horny as in coffee, or to the texture and appearance of ivory in the vegetable-ivory nuts. In many cases, as in those just referred to, it forms much the larger part of the kernel of the seed; in others the embryo is so minute as to be with difficulty discerned antecedent to germination; while sometimes the embryo is the more conspicuous, and the albumen is reduced to a thin layer. When copious, the albumen generally envelops the embryo, but sometimes the latter enfolds the former, as in mallows, or is coiled around it, as in four-o'clock and chickweeds. The embryo and its parts are described in other articles. (See GERMINATION, COTYLEDON, and EMBRYOLOGY.) Its most important structural characteristic is the number of cotyledons or seed-leaves—one in monocotyledonous or endogenous plants; two in the dicotyledonous or exogenous.

There are many conflicting accounts as to the duration of vitality in seeds. The story of grain found buried with Egyptian mummies having germinated after being exhumed is generally discredited. All recent attempts under proper observation and due precautions have failed. The appearance of plants new to the station upon the soil brought

to the surface from excavations can usually be otherwise explained when they appear to involve a high antiquity, although there is no doubt that buried seeds have germinated after a lapse of fifty or more years. The best-authenticated case, pointing to a much longer preservation of vitality under such conditions, is that of the growth of raspberry-seeds found in the abdominal portion of a skeleton exhumed from a Roman tomb near Dorchester, England; but it is one not beyond doubt and uncertainty. One or two series of experiments, conducted by the sowing of seeds of known age, and also by the annual sowing from a stock of a considerable variety of seeds of the same age, indicate a rapid extinction of vitality under ordinary conditions. Out of 328 species, representing 74 families of plants, only 94 kinds grew after 8 years, only 57 after 4 to 8 years, only 16 from 8 to 21 years, 5 from 25 to 27 years, 3 to 43 years. In ordinary cases, leguminous seeds have longest preserved germinating power, in some very well-authenticated instances up to seventy or perhaps a hundred years. Nearly uniform temperature, darkness, and either dryness or burial beyond atmospheric influences, most favor the prolongation of vitality. See also FOOD. Revised by CHARLES E. BESSEY.

See'land: the largest and most important of the Danish islands; between the Cattegat and the Baltic, and between the Sound which separates it from Sweden and the Great Belt which separates it from the island of Funen. Area, 2,718 sq. miles, or with neighboring islands administratively dependent, 2,909 sq. miles. The ground is low and undulating, dotted with small lakes and studded with forests of oak and beech, but nowhere rising more than 200 feet above the sea. The soil is very fertile and well cultivated. Pop. (1890) in the administrative limits, 722,000.

Revised by M. W. HARRINGTON.

Seeley, Sir JOHN ROBERT, M. A.: educator and author; b. in London, England, in 1834; graduated at Cambridge 1857; became fellow of Christ's College 1858; Professor of Latin in University College, London, 1863; succeeded Charles Kingsley as Professor of Modern History at Cambridge Oct. 9, 1869. Author of *Ecce Homo, or the Life and Work of Jesus Christ* (London, 1865), which rapidly passed through many editions and elicited many replies; *Roman Imperialism* (1869); *Lectures and Essays* (1870); and editor of *Livy, with Introduction, Historical Examination, and Notes* (1871); wrote *Life and Times of Stein* (3 vols., 1870); *Expansion of England* (1883); *Natural Religion* (1882); *A Short History of Napoleon I.* (1886); *Goethe Reviewed after Sixty Years* (1893); *Growth of British Policy* (1895). D. at Cambridge, Jan. 18, 1895. Revised by S. M. JACKSON.

Seelye, see'lee, JULIUS HAWLEY, S. T. D., LL. D.: educator; b. at Bethel, Conn., Sept. 14, 1824; graduated at Amherst College 1849; studied theology at the Auburn Seminary, and also in Germany; was pastor of the First Reformed Dutch church, Schenectady, N. Y., 1853-58, then became Professor of Mental and Moral Philosophy in Amherst College. In 1872 he visited India, where he spent three months, largely occupied in lecturing to educated and English-speaking Hindus on the truths of Christianity. Some of these lectures were published in Bombay (1873) by request of their auditors, and also at Boston (1874) under the title *The Way, the Truth, and the Life*. He also published a volume on *Christian Missions* (New York, 1875) an elementary text-book on *Duty* (1891), besides various sermons, addresses, and articles in quarterly reviews, and translated Schwegler's *History of Philosophy* (New York, 1856). He aided in the revision of Hickok's *Psychology* (1882). In 1874 he was elected to Congress by a spontaneous movement of the people of his district, and without having received a nomination from any political party. In 1876 he was elected president of Amherst College, retaining his professorship. He resigned both offices in 1890. D. at Amherst, Mass., May 12, 1895. Revised by G. P. FISHER.

Seelye, LAURENUS CLARK, D. D.: educator; brother of Julius H. Seelye; b. at Bethel, Conn., Sept. 20, 1837; graduated at Union College 1857; studied at Andover Theological Seminary 1857-59, at Berlin and Heidelberg Universities 1860-62; traveled in Europe, Egypt, and Palestine; was pastor of the North Congregational church at Springfield, Mass., 1863-65; was Professor of English Literature and Oratory at Amherst College 1865-74; organized and became in 1874 first president of Smith College for young women, at Northampton, Mass.; author of various contributions to reviews, including articles on collegiate education and on Celtic literature.

SEKIMAN, SEKIMAN, DORRHOLO, Ph. D.: botanist; b. at Hannover, Germany, Feb. 29, 1828; educated at the Lyceum of that city; studied at Kew, England, 1844-46; was naturalized on board H. M. S. Herald on an exploring expedition around the world 1846-47; made three Arctic voyages; explored the Fiji Islands and parts of North and South America (1860-63); editor of *Revue des Sciences* 1863-65, and of *Journal de Botanique, British and Foreign*, 1865-71; published *A Narrative of the Voyage of the Herald* (1850); *Vegetable History of Palma* (1855); *The Botany of the Voyage of the Herald* (1857); *Flora Vitensis* (1865); and other scientific works. D. at the Javali mine, Nicaragua, Oct. 10, 1871.

SEKIMAN, SEKIMAN, DORRHOLO, Ph. D.: Orientalist and traveler; b. at Javer, Oldenburg, Germany, Jan. 30, 1767; was educated at the University of Göttingen; became a friend of Humboldt and Humboldt; under the patronage of the Prince of Savoy-Geneva undertook an extensive exploration of Abyssinia, Africa and Asia; reached Constantinople in 1802; studied Arabic fifteen months at Aleppo (1803-04); diagnosed as a beggar, made valuable scientific researches in Syria and Palestine, especially in the Lebanon and the region E. of the Dead Sea (1804-05); in Egypt made a vast collection of MSS. and other objects for the Museum of Berlin, and explored Upper Egypt (1807-08); professed Islam, and as a pilgrim visited Mecca and Medina (1809); reached Mecca, whence his last letter was written on Nov. 17, 1810. Settling out for Mecca (1811), his property was seized under accusation that he was a magician. Nothing is known of his subsequent history, but he is believed to have been poisoned (1811) by command of the Imam of Sanaa. His diary and maps, recovered in 1815, were published at Berlin (3 vols., 1854-55). E. A. G.

Sekimide Nah: See HAKKE-BES-ALLAN.

Sekigars: See KIRAN (Pulley Kilan).

Segmental Organs: a name formerly given the accessory organs (appendix) of annelids, from the fact that these are typically a pair to a segment.

Segmentation: See KINEMATICS.

Segner's Wheel: See HAKKE'S MILL.

Segovia: capital of the province of Segovia, Spain; on the Duero, at the foot of the Sierra de Guadarrama; 32 miles N. W. of Madrid (see map of Spain, ref. 14-E). It is surrounded by old walls surmounted by round towers. Streets are narrow and crooked, but many of its buildings are magnificent. The aqueduct which carries the waters of the Rio Frio into the city is 2,921 feet long and rests on 170 arches, some of which are 102 feet high. It is built of granite blocks, without cement or mortar, and is the grandest specimen of Roman architecture in Spain. The cathedral is a fine specimen of Gothic architecture. There are some manufactures of cloth, paper, and pottery. Pop. (1857) 14,000. The province of Segovia is part of Old Castile, and most of it is plateau; area, 2,714 sq. miles; pop. (1857) 154,443.

Seguin, sé-gwē: town; capital of Guadalupe co., Tex.; on the Guadalupe river, and the S. Pac. Railroad; 35 miles E. of San Antonio (for location, see map of Texas, ref. 5-H). It is an agricultural and lumbering region, and contains several mills, a private bank, and three weekly newspapers. Pop. (1880) 1,005; (1890) 1,716.

Seguin, sé-gwē, Fr. pron. se-gwān, Édouard, M. D.: physician; b. at Clamecy, Nièvre, France, Jan. 20, 1812; educated at the colleges of Auxerre and St. Louis in Paris, and studied medicine and surgery under Itard, and was subsequently associated with Esquirol; undertook, soon after winning his medical degree, the training of a few idiot children. Devoting himself with great assiduity to the study of that psychological condition, he at length comprehended the nature of their idiosyncrasy so clearly that he was able to produce some remarkable results by his system. In his first experiments Esquirol was associated with him, and their names appear together on the title-page of his first pamphlet on the subject of idiotism in 1839. In 1844 a commission from the Academy of Medicine of Paris declared that up to the time when he began his labors (1837) idiots could not be educated or cured by any means previously known or suspected, but that he had solved the problem. He published in 1846 *Traitément moral, Hygiène et Éducation des Idiots et des autres Enfants arriérés*. After the Revolution of 1848 Dr. Seguin migrated to the U. S.; visited the school

for idiotic children in South Boston and the institution for feeble-minded youth at Barre, Mass., both in large measure the outgrowth of his labors in Paris; went to Albany, where Dr. Willard was just organizing the experimental school which has culminated since in the New York State Idiot Asylum at Syracuse, and rendered him invaluable assistance in that organization; in 1851 settled in Portsmouth, O., in the practice of his profession. In 1854-57 he was at Syracuse teaching and training idiot children, aiding in the establishment of new institutions in Connecticut, Ohio, and Pennsylvania, and for a time was at the head of the Pennsylvania institution. In 1859 he settled in practice at Mt. Vernon, N. Y., whence he removed to New York in 1863. In 1879 he established in New York the Seguin Physiological School for feeble-minded children, which still exists. In 1890 he published *Idioty, and its Treatment by the Physiological Methods*. He was a commissioner of the Vienna Exposition in 1873 from the bureau of education. Among his published works are *Conséils à M. O. sur l'Éducation de ses Enfants Idiots* (Paris, 1839); *Théorie et Pratique de l'Éducation des Idiots* (2 parts, Paris, 1842); *Hygiène et Éducation des Idiots* (Paris, 1845); *Images graduées à l'usage des Enfants arriérés et Idiots* (Paris, 1846); *P. R. Desir, premier Institutur des Sourds et Muets en France* (Paris, 1847); *Historical Notice of the Origin and Progress of the Treatment of Idiots* (translated by J. S. Newberry, N. D., 1852); *Medical Thermometry and Human Temperature* (1876). He was also inventor of the physiological thermometer. D. in New York, Oct. 29, 1880.

Revised by S. T. ARMSTRONG.

Ségur, sé-gür: a family of the French nobility, many of whose members have been prominent in war, literature, and politics. The most distinguished are: (1) LOUIS PHILIPPE, Count de Ségur; b. in Paris, Dec. 10, 1759; received a military education, and served in America under Rochambeau; was appointed in 1783 ambassador to St. Petersburg, where he gained the favor of Catherine II., and concluded an important commercial treaty between Russia and France in 1787; retired from the public service on the overthrow of the monarchy during the Reign of Terror, and devoted himself to literary work; was recalled to service by Napoleon; became a peer during the first Restoration. D. in Paris, Aug. 27, 1830. His principal works are *Théâtre de l'Herménégilde* (1798), originally written for the private stage of Catherine II.; *Contes, Fables, Chansons et Vers* (1801); *Tableau historique et politique de l'Europe de 1780-86* (1800); *Mémoires, ou Souvenirs et Anecdotes* (1825). His *Œuvres complètes* were published in 34 vols. in Paris (1824-30).—(2) His son, PAUL PHILIPPE, b. in Paris, Nov. 4, 1780; entered the army in 1799; became a member of the staff in 1802; governor of the imperial pages in 1804; and brigadier-general and aide-de-camp to Napoleon during the Russian campaign; after the second Restoration he retired to private life. He was made a peer by Louis Philippe. In 1824 he published *Histoire de Napoléon et de la Grande Armée pendant l'Année 1812*, which made a great sensation, and has been often republished. He also wrote *Histoire de Russie* (1829) and *Histoire de Charles VIII.* (1835); translated into English, Philadelphia, 1842). D. in Paris, Feb. 25, 1873.

Seldi, sé'l, AYTON II.: conductor; b. in Budapest, Hungary, May 6, 1850, and educated there, and at Leipzig and Bayreuth under Richter and Wagner. He assisted Wagner in making the first score of the *Nibelungen* tetralogy, and in 1876 was the chief stage-director at the first production of the *Nibelungen* drama in Bayreuth, and from that time till 1885 was well known in Europe as a Wagner conductor. From 1879 till 1882 he was conductor at the Leipzig Opera-house. In 1885 he married the opera-singer Fräulein Kraus, and in September of that year was called to New York to conduct the German opera, succeeding Dr. Leopold Damrosch. On the departure of Theodor Thomas for Olbingo in 1891, Seldi was elected conductor of the Philharmonic Society. He is also a fine pianist, an accomplished *littérateur*, and a deep student of Shakespeare. He is a naturalized citizen of the U. S. D. E. HERVEY.

Selditz Powders: See POTASSIUM (Medicinal Uses of Potassium Compounds).

Seigniorage: See CHENGAGE.

Seine, Fr. pron. sēn (the Sequana of Caesar): a river of France, which rises in the department of Côte-d'Or at an elevation of 1,545 feet above the level of the sea, flows in a

northwestern direction, passes through Paris, where it is from 400 to 600 feet wide, and enters the English Channel at Havre by an estuary 7 miles wide. Its entire length is 482 miles, of which about 350 below Troyes are navigable by barges, and 40 from Rouen to Havre (to which the term *Seine maritime* is applied) by vessels of 200 to 300 tons. It receives from the left the Yonne, the Essonne, and the Eure, and from the right the Aube, Marne, and Oise. By canals it communicates with the Loire, Saône, Rhine, Rhône, Meuse, and Scheldt. Though surpassed in some respects by the Loire, Saône, and Garonne, yet with the hills and valleys, forests and meadows, numerous villages, populous towns, and famous cities which line its banks it is one of the finest rivers in Europe.

Seine: department of France; completely inclosed within Seine-et-Oise; area, 185 sq. miles. It is the smallest but the most densely peopled and wealthiest department of France, comprising Paris and the suburban villages of Boulogne, Clichy, Puteaux, etc. The ground is undulating and traversed by the Seine and the Marne. The soil is not naturally fertile, but it has been made very productive by the skill of the farmers and gardeners. Immense quantities of vegetables, mushrooms, melons, peaches, and strawberries are raised for the markets of Paris. Beautiful forests, as those of Boulogne, Vincennes, St.-Cloud, and Meudon, cover a large part of the surface between the cities, and rich quarries of building-stone and gypsum are found. Pop. (1891) 3,141,595.

Seine-et-Marne, -ā-maarn': department of France, adjoining Seine-et-Oise on the W.; area, 2,214 sq. miles. The ground is slightly undulating and the soil very fertile. Extensive forests, yielding excellent timber, are found, among which is that of Fontainebleau. Large crops of wheat, vegetables, and fruits are raised; the wine of the department is mediocre, though it produces one of the most celebrated kinds of table-grapes, the Chasselas de Fontainebleau. On the pastures and meadows numerous cattle are reared, and immense quantities of cheese, the so-called *fromage de Brie*, are sent to the Paris markets. The manufacturing industry of the department is not of great importance. Pop. (1891) 356,709. Capital, Melun.

Seine-et-Oise, -ā-waaz': department of France. Area, 2,163 sq. miles. In the southern part the ground is almost flat; in the northern, hilly and covered with forests. The soil is generally not fertile, but, being well manured and excellently cultivated, yields large crops of fruits and vegetables for the capital. Different branches of manufactures are pursued with great success. Several fine varieties of stone and clay are found, and the porcelain manufactures of Sévres have acquired a worldwide reputation. Pop. (1891) 628,590. Capital, Versailles.

Seine-Inférieure, -ān'fā'ri-ōr': department of France, bordering on the English Channel. Area, 2,330 sq. miles. The ground is generally composed of plains, watered by numerous small streams, and broken only in the southwestern part by ranges of low hills. The soil is fertile and well-cultivated. Forests abound; large crops of grain, hemp, flax, hops, and fruits are raised, and sheep, cattle, and horses are extensively reared. Manufactures, and especially fisheries and commerce, form important sources of wealth. Large quantities of cheese, butter, and cider are made. Poultry, chickens, turkeys, ducks, and geese are raised, and enormous quantities of eggs are exported to England. Pop. (1891) 839,876. Capital, Rouen.

Seines: See FISHERIES.

Seip, sip, THEODORE LORENZO, D. D.: educator; b. at Easton, Pa., June 25, 1842; graduated at Pennsylvania College, Gettysburg, Pa., and Theological Seminary, Philadelphia. He has been connected with Muhlenberg College, Allentown, Pa., since its organization in 1867, first as principal of the academic department, and successively as Professor of the Latin and Greek Languages, becoming president in 1886. H. E. J.

Sei'sin [from O. Fr. *seisine, saisine*, deriv. of *seisir, saisir*, seize; Ital. *sagire*; of Teuton. origin; cf. O. H. Germ. *sazjan*, set]; in law, possession of a freehold estate. The term originally signified any possession, whether of real or personal property, but it became appropriated at an early period to describe the possession of a freehold tenant of lands. If such freeholder surrenders the actual physical possession to another who lays no claim to the freehold (as a tenant for years), he does not thereby lose his *seisin*.

The tenant's possession is referred to the landlord's *seisin*, and constitutes a part of it. (See PROPERTY.) But if actual possession of the land be taken, rightfully or wrongfully, by one who intends thereby to hold the freehold, the act is a *disseisin* of the owner and operates to transfer the freehold to the "disseisor." (For this extraordinary consequence of a *disseisin*, see LIMITATION OF ACTIONS.) In the same way every one who has a vested future estate of freehold, whether in reversion or remainder, is seized of such estate so long as the present or particular estate upon which the future estate is limited continues to be vested in possession. If the particular tenant is disseised, however, every future estate which depends upon his estate is divested by the same act. See LANDLORD AND TENANT and REMAINDER.

The expression "livery of *seisin*," which described the ancient process of conveyance of freehold interests, known as *feoffment*, is only the archaic equivalent for the phrase delivery of possession. See FEOFFMENT, FREEHOLD, and GRANT. GEORGE W. KIRCHWEY.

Seis'mograph: an instrument recording graphically the motions of a point on the earth's surface during an earthquake. Instruments for the automatic record of earthquakes are classed according to special function—as (1) seismoscopes, which merely detect and record the fact of an earth tremor, with or without indication of its time; (2) seismometers, which measure also the maximum force of the shock, either with or without indication of its direction; and (3) seismographs, which record the number, succession, direction, amplitude, and period of successive oscillations. Most seismoscopes are devices involving a delicately adjusted trigger whose small movement permits a weight to fall, causes an alarm to sound, or stops a clock. In seismometers a heavy liquid is agitated or made to spill from a vessel, or a movable solid is thrown down or displaced. In the construction of seismographs the primary endeavor is to give astatic suspension to a heavy body, that is, to suspend it in such way that when its position is disturbed through a small distance no force will be developed tending to restore its original position; or what is the same thing, so that if its support be moved the motion will not be communicated to the body. This ideal result has never been accomplished, but close approximations have been obtained by various devices. The complementary part of the apparatus consists in systems of levers, etc., connecting the body astatically suspended with various fixed points, or surfaces moved by clockwork, in such way as to secure a graphic record of the relative motions in various directions. The more elaborate machines record motion in the vertical direction and in two horizontal directions. See EARTHQUAKES, and consult the *Transactions* of the Seismological Society of Japan. G. K. GILBERT.

Seismology [Gr. *σεισμός*, earthquake + *λόγος*, discourse, reason]: See EARTHQUAKES.

Seismometer and Seismoscope: See SEISMOGRAPH.

Seiss, sees, JOSEPH AUGUSTUS, D. D., LL. D., L. H. D.: author and preacher; b. near Emmitsburg, Md., Mar. 18, 1823; student in Pennsylvania College, Gettysburg, Pa.; ordained to the Lutheran ministry 1844; pastor in Virginia 1842-47, Cumberland, Md., 1847-52, Baltimore 1852-54, Philadelphia since 1858. He is a preacher of extraordinary power. His literary career began with *Lectures on the Epistles to the Hebrews* (1846), and has continued until his books and pamphlets number considerably over 100. His *Gospel in Leviticus* was republished in England, and his *Lectures on the Apocalypse* has been translated and published in Germany and Holland. He has been editor of *The Prophetic Times* and *The Lutheran*. He is one of the founders of the General Council, of which, as well as of the ministerium of Pennsylvania, he has been president. He has been president also of the board of trustees of the Philadelphia Seminary almost ever since its foundation, and a member of the committee that prepared *The Church Book* and *The Common Service*. H. E. JACOBS.

Seistan, sās-tawn', or Sistan: district divided between Persia and Afghanistan, Central Asia; between lat. 30° and 32° N. and lon. 60° and 62° E., bordering W. on the Persian provinces of Khorassan and Kirman. The surface forms an extensive depression, toward which the surrounding table-lands slope gently. The soil consists either of quicksand or of a stiff clay covered with coarse grass and tamarisk-bushes, and uncultivable except along the rivers, which from the surrounding highlands gather in the middle of the

on them, but with hydrochloric acid they evolve chlorine, forming selenious acid and chlorides.

Revised by IRA REMSEN.

Selenious Oxide: the only oxide of selenium known. It is a solid white substance obtained by combustion of selenium in oxygen, or by evaporating selenious acid to dryness. Its formula is SeO_2 . It sublimes, without fusing, below redness, condensing in crystals, and is very deliquescent. Its compound with water, selenious acid (H_2SeO_3), is a strong acid, which decomposes, with heat, the chlorides and nitrates, and forms neutral salts with bases, being exceptional, nevertheless, in being decomposed by heat, as above intimated. The selenites are bibasic, and large numbers have been prepared and investigated, but for these the chemical text-books must be referred to.

Selenite [from Lat. *selenites* = Gr. *σεληνίτης* (sc. λίθος, stone), deriv. of *σελήνη*, moon. So called from its luster]: a mineralogical name for gypsum. Dana believes that the *σεληνίτης* of Dioscorides was probably really crystallized gypsum, but not the *selenitis* of Pliny. Discoveries in molecular structure indicate two distinct varieties of the species selenite or gypsum—allotropic modifications, as they may be called—one having density, when homogeneous, = 2.818 (Mohs found 2.81, and Kennigott, as the mean of 15, found 2.817), and the other = 2.837 (Fihol found 2.831).

Selenium [Mod. Lat., from Gr. *σελήνη*, moon. So called from its chemical analogy to *tellurium* (from Lat. *tellus*, earth), being as it were a companion to it]: a chemical element discovered by Berzelius in 1817. Sulphur, selenium, tellurium, and oxygen form Berzelius's natural amphigen group of elements, which are certainly separated widely from the halogen group in many respects, though fluorine apparently forms a connecting link, having many affiliations with both groups. Selenium must be considered one of the rarer elements, though several native mineral compounds of it are known. The mineral *clausenthalite* is selenide of lead, *zorgite* a double selenide of lead and copper, these being the principal sources of commercial selenium, and somewhat common in the mines of the Hartz Mountains, at Tilkerode, Clausthal, and Zorge, also at Glasbach in Thuringia. *Lehrbachite* is a selenide of lead and mercury from the Hartz; *berzelianite*, a selenide of copper from the same, and from Skrikerum in Småland, Sweden; *eucairite*, a copper and silver selenide, also from Skrikerum, and found in several Chilian localities; *naumannite*, a silver-lead selenide from the Hartz. There is a silver selenide in crystals at Tasco in Mexico (del Rio); *tiemannite*, a mercuric selenide, from the Hartz; and a few others less known. Certain iron pyrites, as at Fahlun in Sweden, contain selenium; and when these are used for making sulphuric acid, a seleniferous deposit forms in the leaden chambers, in which, indeed, the element was first discovered by Berzelius. Selenium is obtained principally from the dust that accumulates in the flues of sulphuric-acid works, and of roasting-furnaces where iron pyrites containing selenium are used. The relative quantity of selenium in the pyrites is very small, but the product of its combustion is a solid that is much less volatile than the gases given off in the burning of the pyrites, so that this product accumulates in the flues. In order to obtain the selenium from the dust, this is treated with an oxidizing agent, either nitric acid or a nitrate, and the selenium thus all converted into the dioxide, SeO_2 , or into a salt of selenic acid, H_2SeO_4 . Both of these oxides are easily reduced by sulphurous acid, the element selenium being precipitated.

There are at least two modifications of selenium which correspond to those of SULPHUR (*q. v.*). One is slightly soluble in carbon disulphide, the other is not. The soluble form is obtained by reducing selenious acid by means of sulphurous acid, or other reducing agent. The insoluble variety is obtained by melting selenium and rapidly cooling it. The soluble form is crystalline, the insoluble form is amorphous.

Selenium does not kindle easily, like sulphur, but when heated strongly will burn in the air; and selenides will burn before the blowpipe. A characteristic odor accompanies this combustion, compared by some to that of horse-radish, by which the presence of selenium in a mineral can be detected by those who know the odor.

Compounds.—Seleniatted hydrogen, corresponding to sulphuretted hydrogen, is one of the most interesting of these. It is a permanent gas, which may be formed by the action of an acid on selenide of potassium, or by heating selenium in a current of dry hydrogen to its vaporizing-point. At a

higher temperature dissociation again occurs. It is very poisonous, producing catarrhal disease when inhaled, and destroying the sense of smell. It does not liquefy at -15°C .

The electrical conductivity of selenium is influenced to a remarkable degree by heat and light. Amorphous selenium does not conduct electricity, but the crystallized does so, and the conductivity increases rapidly with a rise in temperature. According to the latest investigations, however, amorphous selenium conducts electricity when heated to 165° or 175°C , and higher.

Revised by IRA REMSEN.

Seleucia, sel-yoo'see-aa, or **Seleucia** (Gr. *Σελεύκεια*) sel-yoo'-see-aa: the name of several cities founded mostly by Seleucus I., Nicator. 1. A city on the Tigris. In the time of Titus it had a population of 600,000; it was partially burned in 116 A. D. by Trajan, and was destroyed in 162 A. D. by L. Verus.—2. SELEUCIA PIERIA in Syria, near the mouth of the Orontes.—3. SELEUCIA on the river Belus in Syria.—4. SELEUCIA in Northern Palestine.—5. SELEUCIA SIDERA discovered by G. Hirschfeld in the plain of Isparta in Pisidia.—6. SELEUCIA in Pamphylia near the mouth of the Eurymedon.—7. SELEUCIA on the Calycadnus in Cilicia Tracheia, the scene of the drowning of Barbarossa. J. R. S. STERRETT.

Seleucidae: one of the five great dynasties of ancient Persia before the Mohammedan conquest. After the death of Alexander the Great (b. c. 323) the vast empire, including Iran, that had been brought under his command, fell apart, and Syria became one of the recognized ruling powers under Seleucus Nicator (ruled b. c. 312–281), who had been one of Alexander's generals. This vigorous commander became the founder of the kingdom of the Seleucidae. He was succeeded by his son Antiochus I., Soter (b. c. 280–261), and the latter in his turn by a son, Antiochus II., Theos (b. c. 261–246). Under the first Seleucids the Greek sovereignty over Persia was preserved intact for nearly seventy years; its unity, however, was broken about b. c. 256 by the revolt of Bactria, and in b. c. 250 by the rebellion and rise of Parthia as an independent power under Arsaces. The Seleucid supremacy itself may be said to have ceased in Iran about b. c. 150, at the time of the Parthian monarch Mithradates the Great. It had lasted less than two centuries, and as a factor in Persian political history its existence was even less than a hundred years in duration. A. V. WILLIAMS JACKSON.

Seleucus (in Gr. *Σελεύκος*): the name of several rulers of antiquity. 1. SELEUCUS I., Nicator, one of the generals of Alexander the Great, b. in 365 B. C. In 321 B. C. he became governor of Babylonia and in 317 of Susiana. He was forced by Antigonus in 315 to flee to Ptolemy in Egypt. In 312 he was victorious over Antigonus and regained control of Babylonia, Susiana, and Media. This year (312 B. C.) was the beginning of the Seleucid era. Henceforth his arms were uniformly successful, and he advanced into India farther even than did Alexander, thus gaining the title of *Nicator*. He was the first of all the successors of Alexander to assume the title of king. In the battle of the kings at Ipsus in 301 he chiefly was instrumental in causing the defeat of Antigonus, and he thus added Armenia, Southern Asia Minor, and Syria to his kingdom. He then allied himself to Demetrius Poliorcetes, whose daughter Stratonice he married, but he soon became involved in a war with Demetrius, and, having taken him prisoner, held him in captivity until his death in 283. His war with Lysimachus ended in 282 with the addition of Asia Minor to his empire, which thus extended from the western seaboard of Asia Minor to India, and was divided into seventy-two satrapies. His aim, contrary to that of Alexander, was to Hellenize the Orient, and he was successful to a degree, but the removal of his capital from Seleucia on the Tigris to Antioch on the Orontes tended to estrange the two elements. In 281, in addition to the surrender of his wife Stratonice, he gave the whole of Asia to his son Antiochus, and himself undertook the conquest of Macedonia, but was murdered by Ptolemy Ceraunus in 281 B. C. before he could accomplish his object.—2. SELEUCUS II., CALLINICUS, the great-grandson of Seleucus I., reigned 246–226 B. C. He could not withstand Ptolemy Evergetes, King of Egypt, who to avenge the murder of his sister Berenice advanced victoriously against Seleucus as far as Susa, and in 239 added Palestine, Phoenicia, and Coele Syria to Egypt. Antiochus Hierax, the younger brother of Seleucus, declared himself King of Asia Minor, but was subdued. The Parthians then revolted, and in 238 were victorious over Seleucus, thus founding the Parthian kingdom. Attalus, too, sought for a slice of the crumbling empire, and in 226 defeated Seleucus, who in fleeing from the battle was

been torn from his home and killed.—4. Socrates III, Socrates, aged from 220 to 222 B.C., and was assassinated when uninvolved in a war with Athens.—5. Socrates IV, Philopator, aged from 187 to 179 B.C., tributary to the Romans.—6. Socrates V, reigned 135, 134 B.C.; was murdered by his son Cleopatra.—7. Socrates VI, reigned 86-85 B.C.; died at Capri, shortly after which Tiberius absorbed the remains of the Roman empire. J. R. S. Socrates.

Self-consciousness: consciousness of self as a person, the highest form of consciousness. The notion of self, like all notions, is a gradual growth. The vague feeling of being which the first affective experiences afford, the feeling of modification in consciousness as the background of sense of presentation, and the recurrence of this feeling and again in connection with objects new and old—attached to this the mass of more constant organic and intellectual—all this is the beginning of the sense of personality or self. Its attributes of permanence, identity, and unity become more prominent with the development of self in connection with movement, effort, and with the establishment of the relation of subject and object, which is truly a fundamental fact. By reflection is meant the feeling of the mind to itself as its own object. By the sense of reflection is meant, therefore, the knowledge which the mind has of its own operations, recognized as its own. It is an advance on the simple awareness of consciousness, which there is no reference to self, as different from its object. In reflection this reference has distinct place, and the self is discovered through the act of attentive inspection as having and exercising the characteristics of mind.

Sense of self.—Through reflection, therefore, the idea of self is attained, and assumes its important place in the mental world. Around the self as a center the intellectual life plays. To it all possible forms of experience are referred. It brings experience into the circuit of consciousness by giving a center of reference and a circumference of limitation to the individual. The growth of the sense or idea of self is one of the most interesting chapters in the mental growth of the child. One of the most remarkable tendencies of the very young child in its responses to its environment is the tendency to recognize differences of personality. It responds to what is called suggestions of personality. As early as the second month it distinguishes its mother's or nurse's touch in the dark. It learns characteristic methods of feeding, taking up, putting, kissing, etc., and adapts itself to a marvelous accuracy of protestation or acquiescence to these personal variations. Its associations of personality become such imperatives that for a long time its happiness or misery depends upon the presence of certain kinds of personality suggestion. It is quite a different thing from the child's behavior toward things which are not persons. Things become, with some few exceptions which are involved in immediate gratification of appetite, more and more impersonal, things not subordinated to regular treatment or method. But persons are constantly more important, as unbroken and dominating agencies of pleasure and pain. Movements of persons and its effects on the infant seem to be the most important factor in this peculiar influence; later the mere sounds for a person's presence, and at last the face and movements equal the person in all his attributes.

Probably this distinction between persons and things, between agencies and objects, is the child's very first step away from what has been called a "projective" consciousness. The sense of uncertainty or lack of confidence grows stronger in its dealings with persons—an uncertainty dependent upon the moods, emotions, readiness of expression, and modes of treatment of the persons around it. A person seems to a group of experiences quite unstable in its position as it is in its historical meaning. This, assuming it is not in order of development, may be called the projective stage in the growth of the personal consciousness, which is an important element in social emotion.

Further description of children shows that the instrument of distinction from such a projective to a subjective sense of personality is the child's active bodily self, and the method is the principle of imitation. As a matter of fact, accommodation by actual muscular imitation does not arise in human children until about the seventh month, so utterly opposed is the child before this, and so great is the impetus of its various instincts and tendencies. But when the organism is ripe, by reason of cerebral development, for the accommodation of its active range by mere accommodation, then it begins to be dissatisfied with projects, with contempla-

tion, and so starts on its career of imitation. And of course he imitates persons. Persons have become, by all his loneliness with them and theirs with him, his interesting objects, the source of his weal or woe, his uncertain factors. And, further, persons are bodies which move. And among these bodies which move, which have certain projective attributes, as already described, a very peculiar and interesting one is his own body. It has connected with it certain intimate features which all others lack. Besides the inspection of hand and foot, by touch and sight, he has experience in his consciousness which are in all cases connected with this body—strains, stresses, resistances, pains, etc.—an inner felt series matching the outer presented series. But it is only when there arises a new kind of experience called effort—a set opposition to strain, stress, resistance, pain, an experience which arises, probably, first as imitative effort—that there comes that great line of cleavage in his experience which mediates the rise of volition, and which separates off the series first really subjective. Persistent imitation with effort is probably the first explicit volition, and the first germinating nucleus of self-hood over against object-hood. Situations before accepted simply are set forward, aimed at, wrought; and in the fact of aiming, working, the fact of agency, which arises from the child's realization of the possible capriciousness of character, is the nascent sense of subject. The subject-sense is an actuating sense. What has formerly been projective becomes subjective. The associates of other personal bodies, the attributes which made them different from things, are attached to his own body with the further peculiarity of actuation. This may be called the subjective stage in the growth of the self-notion. It rapidly assimilates to itself all the other elements by which the child's own body differs in his experience from other active bodies—the passive inner series of pains, pleasures, strains, etc. The self suffers as well as acts. All are set over against lifeless things, and against living bodies which act, but whose actions do not contribute to his own sense of actuation or of suffering.

Again, it is easy to see what happens. The child's subject-sense goes out by a kind of return dialectic, which is really simply a second case of assimilation, to illuminate these other persons. The project of the earlier period is lighted up, clothed on with the reinvestment of self-hood, by analogy with the subjective. The projective becomes effective—i. e. other people's bodies, says the child to himself, have experiences in them such as mine has. They are also me's; let them be assimilated to my me copy. This is the third stage; the objective, or social self, is born.

The ego and the alter are thus born together. Both are crude and unreflective, largely organic, an aggregate of sensations, prime among which are efforts, pushes, strains, physical pleasures and pains. And the two get purified and clarified together by this twofold reaction between project and subject, and between subject and object. My sense of myself grows by imitation of you, and my sense of yourself grows in terms of my sense of myself. Both ego and alter are thus essentially social, which means imitative, creative; and for a long time the child's sense of self includes too much. The circumference of the notion is too wide. It includes the infant's mother, and little brother, and nurse, in a literal sense; for they are what he thinks of and aims to act like by imitating, when he thinks of himself. To be separated from his mother is to lose a part of himself, as much as to be separated from a hand or foot. And he is dependent for his growth directly upon these suggestions which came in for imitation from his personal milieu.

Self-emotions.—The emotions which terminate on one's self must be clearly distinguished from the feeling proper of self. The feeling of self underlies all other forms of consciousness when self-consciousness has once arisen. Assuming this to be so, whatever self may be, we find that the contemplation of self, when it becomes the object of our reflection, arouses certain spontaneous and peculiar forms of emotional excitement. These are the emotions of self.

Such emotions attend either an exalted estimate of one's own person or possessions, or, on the other hand, a deprecatory estimate. The former may be called emotions of pride, and the latter emotions of humility. Looked at casually, emotions of pride include the states ordinarily called pride, vanity, haughtiness, conceit, superiority, complacency, arrogance, self-confidence, forwardness, etc.; and under emotions of humility are humility, modesty, self-debasement, self-distrust, inferiority, bashfulness, meanness of spirit, weakness, poverty, shame, etc. See IDEAL FEELINGS.

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J. MARK BALDWIN.

Self-control: See WILL.

Self-defense: See ASSAULT AND BATTERY, HOMICIDE, and TRESPASS.

Self-induction: See INDUCTION, ELECTRO-MAGNETIC.

Seligman, EDWIN ROBERT ANDERSON, LL. B., Ph. D.: professor of political economy and finance; b. in New York, Apr. 25, 1861; graduated at Columbia College 1879; studied three years at the Universities of Berlin, Heidelberg, Geneva, and Paris; at Columbia College Law School and School of Political Science 1882-84; lecturer on Political Economy, Columbia College, 1885-87; adjunct professor 1887-90; Professor of Political Economy and Finance 1890; treasurer of the American Economic Association 1885-90; associate editor *Political Science Quarterly* since its establishment in 1886; author of *Railway Tariffs and the Interstate Commerce Law* (1887); *Two Chapters on the Medieval Guilds of England* (1887); *Finance Statistics of the American Commonwealths* (1889); *Taxation of Corporations* (1890); *On the Shifting and Incidence of Taxation* (1892).

C. H. THURBER.

Se'lim: the name of three Ottoman sultans. **SELIM I.**, YAVUZ, the Inflexible (1512-21); b. 1467. By the aid of the janissaries he usurped the throne, deposing his father Bayezid II., whom he is believed to have poisoned shortly after. Then he put to death all his brothers and kinsmen. Attacking Persia he defeated Shah Ismail at Calderon with immense slaughter (1514) and annexed Kurdistan and Mesopotamia. Conquering Syria (1516), the title Servant of the Two Holy Cities (Mecca and Medina), hitherto reserved to the caliphs, was added to his name in the official prayer. He subdued Egypt (1517), hanging at the gate of Cairo the heroic Mameluke sultan Touman Bey. The sherif of Mecca sent him the keys of the Kaaba, and Mohammed XII., the last Abasside caliph, resigned to him the insignia and the rights of the caliphate. Since then the Ottoman sultan has been considered both political and spiritual head of Islam. The next three years he devoted to reorganization of his empire. Excessive use of opium hastened his end, and he died at Tchörliu (1521), the very place where eight years before he had fought against his father. A gifted poet, profound scholar, farsighted statesman, and resistless conqueror, he was bloodthirsty and cruel beyond expression. He is the only parricide among the Ottoman sultans.—**SELIM II.**, MEST, the Drunkard (1566-74); b. 1524; son of Suleiman II., and Roxelana. His generals subdued Western Arabia (1567) and Cyprus (1571), but lost the naval battle of Lepanto (1571), where 220 Ottoman ships were sunk or captured, 30,000 prisoners taken, and 15,000 Christian galley-slaves set free. Meanwhile Selim cared only for intoxication and the pleasures of the harem, and died from over-indulgence in wine (1574).—**SELIM III.** (1789-1807); b. 1761; son of Mustapha III.; succeeded his uncle Abd-ul Hamid I. At his accession the empire seemed near dissolution. Syria was in rebellion; Egypt was tyrannized over by the Mamelukes; the Persians and Kurds menaced the eastern frontier; armies of brigands marched through the provinces; a hopeless war against Russia and Austria was going on. Selim was the first sultan animated by Western ideas. Ridding himself of the foreign war by the disastrous treaty of Jassy (1792), he endeavored to repress disorder and introduce administrative, commercial, and military reforms. But popular fanaticism denounced his innovations as violations of the Koran. The support he received from France through the French ambassador, Gen. Sebastiani, excited the jealousy of Great Britain. A British fleet appeared before Constantinople, but was repelled. Finally the janissaries and the Mussulman clergy combined; Selim was deposed and confined in the seraglio and his cousin Mustapha IV. raised to the throne (1807). The following year Balractor Pasha, his devoted adherent, marched upon Constantinople with a formidable army. Thereupon Mustapha had Selim bowstrung, and Balractor penetrated the palace in triumph, only to find the corpse of his master in the throne-room. E. A. GROSVENOR.

Selimnia or Islimiye: See SLIVNO.

Selinsgrove: borough; Snyder co., Pa.; on the Susquehanna river, and the Penn. Railroad; 50 miles N. of Harrisburg, the State capital (for location, see map of Pennsylvania,

ref. 4-F). It has good water-power; is in an agricultural region; contains a national bank with capital of \$50,000; a monthly and two weekly newspapers, several sawmills and planing-mills, and sash-factories; and is the principal outlet for the produce of the county. The Missionary Institute of the Evangelical Lutheran Church (chartered in 1858) is located here. Pop. (1880) 1,431; (1890) 1,307.

Seli'nus (Gr. Σελίνους): ancient city; on the southwest coast of Sicily; was founded in the seventh century B. C. by a Megarian colony, and derived its name from the quantity of wild parsley (σέλινον) which grew in the vicinity. A strong and flourishing city, it was almost ruined by the Carthaginians under Hannibal Gisco, when 16,000 of its inhabitants were massacred and 5,000 made slaves (409 B. C. and was entirely destroyed during the first Punic war (264-241 B. C.). Its ruined temples served as a refuge to the early Christians, but it was never rebuilt. These temples are the vastest in Europe. The last-built and largest, measuring 369 feet by 178 feet, with seventeen columns on each side and double porticoes, was erected toward the middle of the fifth century B. C., and consecrated to Apollo. Its finest sculptures have been removed to the Museum of Palermo. See Benndorf, *Die Metopen von Selinunt* (Berlin, 1873); and Baedeker, *Southern Italy and Sicily*.

E. A. GROSVENOR.

Seljuks, sel-jooks': a Turkish tribe which, being driven from the highlands of Turkestan, settled in the plains of the E. of the Caspian Sea. There they were converted to Islam. They were famous for strength and courage, and the Caliph Motassem (833-842), chose his body-guard from among them. Under the leadership of their chief Seljuk—whence the tribe derives its name—these guards revolted, seized the temporal power, and founded an independent state in Khorassan, though all the time acknowledging the spiritual supremacy of their former masters. Togrul Beg, grandson of Seljuk, conquered Balkh and Khwarezm (Khiva) in 1041, Irak Adjemi (1043), Kerman and Fars (1047), Bagdad (1055), and Irak Arabi and Mosul (1062). Having thus completed the subjugation of Persia, he assumed the title of sultan. The extent and prosperity of the empire largely increased under his nephew Alp-Arslan (1063-73), the conqueror of the Byzantine emperor Romanus Diogenes, and under Malek Shah (1073-93), the son of Alp-Arslan. Malek Shah conquered Arabia, Syria, and Palestine, Armenia, and a large part of Asia Minor, ruling as far as the Chinese frontier and from the Caspian to the Arabian Sea. He founded at Bagdad a law school and an observatory, the first established in Asia, but removed the capital to Ispahan. He encouraged the construction of roads, bridges, canals, and works of public utility, being ably seconded in all his undertakings by his vizier, Nizam-ul-Mulk. The rapid growth of the power of the Seljuks was due to their religious ardor, to the skill and intrepidity of their early chiefs, and to their peculiar facility in assimilating not only their kindred of Turkish stock, but also subject races. Their decline dates from the division of their empire by Malek Shah into sultanates for his four sons, followed by other divisions. The sultanate of Iran was the chief, and was to exercise a sort of authority over the others. It was swallowed up by the sultanate of Khwarezm (1194), which in turn was overthrown by the Mongols (1219), when the last sovereign Ala-Eddin and his gallant son Djiala-Eddin were utterly defeated by Genghis Khan. The sultanate of Aleppo fell in 1114, that of Damascus in 1155, and of Kerman in 1191. The sultanate of Iconium comprised nearly all Asia Minor, and lasted till 1290, when Ala-Eddin III., having fled from the Mongols, died at Constantinople. From its ruins arose ten principalities, one of which under the Emir Othman was in time to subdue all the rest and to develop into the Ottoman empire. The Seljuks of Iconium and Iran were the Mussulmans earliest and most frequently encountered by the hosts of the first and second crusades, and were their most formidable antagonists. E. A. G.

Sel'kirk: a county of Scotland, anciently called Ettrick Forest; bounded by the counties of Peebles, Edinburgh, Roxburgh, and Dumfries; area, 257 sq. miles; pop. (1880) 27,712. Its surface is composed principally of rolling grassy hills, the highest of which is Dun Rigg (2,433 feet), and it is chiefly devoted to cattle-raising. Selkirk was the birthplace of James Hogg, the "Ettrick Shepherd"; and of Mungo Park, the traveler; and it is noted in both literature and history. With Peeblesshire it sends one member to Parliament. The royal burgh of Selkirk, 39 miles S. W.

Edinburgh, is the county town. Pop. (1891) 5,799. It lies with Galashiels and Hawick in sending one member to Parliament.

Selkirk, or Sealchraig, ALEXANDER: (mariner); b. at Leith, Edinburgh, Scotland, about 1676; made several voyages to the Pacific; was sailing-master to a privateer called the *Chagres*; Ports Galley, and having quarreled with the captain, one Stradling, was put ashore, at his own request, Oct. 1791, on the uninhabited island of Juan Fernandez, off the coast of Chili, with some nautical instruments, a few tools, a knife, bottle, axe, gun, and a supply of ammunition. Here he remained until Feb. 12, 1799, when he was rescued by Capt. William Rogers of the privateer *The Duke*. He lived chiefly on the flesh of wild goats, which abounded on the island. He became mate to Capt. Rogers, whom he accompanied around the world; arrived in England Oct. 1, 1800, when his narrative appeared in an account of the voyage (1791), and in several separate publications. Selkirk subsequently entered the navy, rose to the rank of lieutenant, and died on board the *discovery* at Weymouth in 1793. His life's celebrated story of *Robinson Crusoe*, which appeared in 1719, has been generally supposed to be based on the adventures of Selkirk, by whom the incidents are said to have been communicated to De Foe, but there is evidence for supposing that the latter had more than general knowledge of the facts of the case. *The Life and Adventures of Alexander Selkirk* (Edinburgh, 1829), by John Howell, is the best source of exact information on the subject.

Selkirk, Thomas Dundas, Fifth Earl of: b. in Kirkcaldy, Scotland, June, 1771; studied at Edinburgh University; succeeded his father as earl in 1789; spent several of the later years of his life in promoting emigration to the Red River of the North, British America, where the name of Macintosh was long known as the Earl of Selkirk's lieutenant. He published *Sketch of the British Fur Trade* (1804); *The Red River Settlement* (1817), and other works. *New York Times*, Apr. 2, 1890.

Selkirk Mountains: a range of Southeast British Columbia, W. of the Rocky Mountains and N. of Idaho, lying E. of the upper Columbia and to the W. of Kootenai Lake. The range is about 175 miles long by 80 broad, the summit was first generally drawn to it by the difficulties encountered by the engineers of the Canadian Pacific Railway in finding a practicable pass across it. Its elevations are from 3,500 to 5,000 feet, and the highest mountain in the range is Mt. Macdonald (formerly Mt. Osoyoos), 9,240 feet high. It is near Rogers Pass, toward the northern end of the range, a narrow, rock-bound valley 1 mile long and 4,000 feet above the sea. Although the average elevation of this range is somewhat lower than that of the adjacent Rocky Mountains, its more abundant rainfall and lower cause a much larger development of glaciers and fields of perpetual snow, which also extend here to lower levels. The line of perpetual snow is formed at an elevation of about 5,000 feet, and the timber-line rises to 4,000 feet. Numerous mountains and other traces of ice-ages are seen that the glaciers were formerly much more extensive than now. The growth of trees is very abundant and rapid, and they attain a great size. Trunks 8 feet in diameter are not rare. There are many signs of minerals, and several lode-gold mines immediately W. The Selkirk Range is thought to present many features of resemblance to the Alps. Above explanation of the range began in 1888.

MARK W. HARRINGTON.

Selma: city; capital of Alabama, Ala.; on the Alabama river, at the head of navigation by steamboats, and the Birmingham, Selma, and N. O., the Louisville and Nashville, the Mobile and Birmingham, the Queen and Green Routes, the Gulfport, and the West. Ala. railways; 50 miles W. of Montgomery, 100 miles N. N. E. of Mobile (for location, see map of Alabama, vol. 5-C). It is in a cotton-growing country, and has a large trade in cotton, coal, lumber, and rice. It contains Selma University (Episcopal, opened in 1858), Young Men's Christian Association library and reading room, a national bank with capital of \$400,000, 2 State banks and national capital of \$150,000, and a weekly and daily newspapers. There are several cotton warehouses, sugar and rice stores, and manufactories. The city was destroyed once during the war of 1861-65, having an area of 2,000 acres, artillery-foundries, and powder-works, and was captured by the Union forces Apr. 2, 1865. Pop. 1880, 12,000; 1900, 7,682; (1895) estimated with suburbs, 10,000.

Errors or "MORNING TIMES."

Selters, or Seltzer Water: the water of a mineral spring at Selters, in the valley of the River Rhine, in Nassau, which has been known since the ninth century. Having become the most famous and widely known, probably, of all mineral waters, it is very skillfully and extensively imitated by chemical means in the U. S., as well as throughout Europe. It is an alkaline water, containing over 8 grains of sodium carbonate to the gallon, with 20 cubic inches of free carbonic acid. There are also minute quantities of lithia, baryta, and strontia, and of fluorine, with other common ingredients usually found in mineral springs.

Selwyn, ALBERT RICHARD CECIL, F. R. S.: geologist; b. in England, July 28, 1834; educated in Switzerland. In 1845 he was appointed assistant geologist on the Geological Survey of Great Britain; in 1859 appointed by the Secretary of State for the Colonies to undertake the geological survey of the colony of Victoria, Australia; and in 1864 and 1869 examined and reported on the coal-fields and gold-fields of Tasmania and Australia. He was appointed one of the Victorian commissioners of mines in 1869; a member of the board of science and of the prospecting board in 1868; commissioner for the Victoria International Exhibition in 1861; and acted in various other important capacities until he left Australia for Canada in 1866. In that year he succeeded Sir W. R. Logan in the superintendency of the Geological Survey of the Dominion. He was gazetted C. M. G. in 1891.

NEW MACDONALD.

Semantics, or Semasiology [*semantics* is from the *sema*, sign, significant, deriv. of *significatio*, show by a sign, deriv. of *sign*; *semasiology* is from *Gr.* *sema*, a signifying]; the doctrine of historical word-meaning; the systematic discussion of the history and development of changes in the meanings of words. The meaning of a word at any time is determined solely by its power to convey meaning to a speech-community at such time. The so-called "etymology" of a word exercises no restraint upon its meaning; it serves only to help in explaining how a present meaning came to be what it is. Thus the comparison of *Germ.* *klein*, little, with its predecessor O. H. *Germ.* *klein*, fine, small, and with its cognate English *cleen*, surer only to show that the meaning "little" came to the word by the route: *cleen*, neat, trim, fine, small. Such determination of the history of meaning frequently aids most directly in fixing the horizon of a word's meaning, i. e. the range of its general or normal meaning, within which range the great variety of its occasional or special meanings is permitted. When the word *home* is used in the sense of an asylum, as a "home for the blind," it may be said to be a special or occasional use of the word made possible by the character of the general or normal horizon of the word's meaning. This general range of meaning covers application to an abode as habitual and permanent, and as being one's own. The intelligibility of the special uses is conditioned on the one hand by the general meaning, on the other by the power of interpretation involved in the context and situation. When it comes to pass that a special meaning displaces the general meaning and sets itself up in its stead as the general meaning, a shift of signification has taken place. Thus the word *head* once meant "prayer" (cf. *Germ.* *gohet*). It was also applied in special use to a bull of the tory that marked a prayer. This special meaning has become the normal meaning. See Paul's *Principien der Sprachgeschichte* (Eng. trans.), chap. iv.; Strong-Logeisen-Wheeler, *History of Language*, chap. iv.; Darmstadter, *The Life of Words* (1886); R. C. Trench, *Study of Words* (20th ed. 1888); also the article LANGUAGE.

BESSIE LEE WHEELER.

Semele, sem'ee-lée (*Gr.* *Σεμέλη*): in Grecian mythology, a daughter of Cadmus. She was loved by Zeus, and was persuaded by Hera to demand of her lover that he should visit her once in all his royal majesty. Zeus begged her to desist from this demand, but as she would not, and he had sworn to grant her any wish, he came to her with thunder and lightning, and she perished in the flames. At the time of her death she was pregnant by Zeus with Dionysus (Bacchus). Zeus cut the infant from the womb of the dying Semele, made an incision in his own thigh, and concealed the child therein until the full time for his birth had come, when he was born for the second time.

J. H. S. S.

Semering: See SEMERING.

Seminaries, Theological: See SCHOOLS.

Seminole Indians: See MUSKOGEEAN INDIANS, UNITED STATES (History), and OKMOLA.

Semipalatinsk: Russian province and town of Central Asia. The province is on the upper Irtysh river, between Siberia and Lake Balkash. Area, 184,631 sq. miles. It is of triangular form, with the apex directed N. A range of mountains and hills which runs E. and W. through its middle separates the great steppe of the Irtysh on the N. from the steppe of Balkash on the S. Pop. (1890) 576,578, four-fifths of whom are Kirghiz, who are generally nomadic. The remainder are nomadic Kalmuks and sedentary Russians, Sarts, and others. The chief town is Semipalatinsk, on the right bank of the Irtysh, in lat. 50° 24' N. (see map of Asia, ref. 3-E). Although of administrative importance, it is a cheaply built and decaying town, surrounded by the bare steppe, and in constant danger from moving dunes. The climate is rigorous, and industry and traffic are small. Pop. 18,000.

MARK W. HARRINGTON.

Semi-Pelagianism: See ANTHROPOLOGY (*Theological*).

Semiramis: according to Ctesias, the wife of Ninus, founder of the Assyrian kingdom,—a woman of extraordinary beauty, passion, and military prowess who flourished nearly 2,200 years B. C., survived and eclipsed her husband, and after a reign of forty-two years abdicated in favor of her son, Ninyas. All this is admitted to be mythical. Herodotus (*Hist.*, i., 184) mentions a Semiramis who ruled over Babylon five generations before Nitocris. This Semiramis of Herodotus is certainly not to be identified with the Semiramis of Ctesias. The name appears to have been derived from Sammuramat, found upon the monuments, wife of the Assyrian king Rammanirari III. (811–782 B. C.).

Semirechensk: Russian province of Central Asia; S. of Lake Balkash, and bounded on the S. and E. by Chinese territory; area, 152,280 sq. miles. The province is oval in form, with the long axis N. and S. It falls into two natural divisions, the northern plain and the southern and western mountainous region. The plain is the country of the "seven rivers" (Russian, *Semiretchie*), all tributaries of Lake Balkash. This part is dry, largely sandy, in some places a sandy desert, grows strongly alkaline toward the lake, and has a rigorous climate. The mountainous region includes a part of the Thian-shan range and many lakes, the largest being Issykul; has more rain, a milder climate, and considerable forest growth. Production and trade are very small. Pop. (1889) 671,878, largely Kirghiz, the remainder of many races, fully half nomadic.

MARK W. HARRINGTON.

Semitic Languages [*Semitic* (i. e. pertaining to Shem or his descendants) is based on the Greek transliteration (Σήμ) of Heb. *Shēm*, which literally means name, sign, celebrity]: a well-defined group of languages co-ordinate in importance with the group known as the Aryan or Indo-European, but sharply marked off from it. The principal representatives of the Semitic group are, in alphabetical arrangement, Arabic, Aramaic, Babylonian, Ethiopic, Hebrew, Phœnician, and Syriac. The name Semitic is an inexact term. It rests on the assumption that the nations classed in the tenth chapter of Genesis among the sons of Shem spoke languages belonging to a single group, and embraced also all the members of that group. Neither proposition is correct. The principle governing the order of enumeration in the famous table of nations is geographical position, and not linguistic affinity. Instead of Semitic, various terms have been proposed, the most satisfactory among them being Syro-Arabic, first suggested by Renan.

The basis of union between the languages belonging to the Semitic group is such that they form intersections of one and the same branch, in contradistinction to the Aryan languages, where two distinct branches emanating from the parent trunk are recognized; and, again, a subdivision into north and south is sufficient for the Semitic group, while in the case of the Aryan eight grand divisions are commonly recognized. The relation of any North Semitic language to a member of a South Semitic is closer than that between members (say) of the Indo-Iranian and the Teutonic division, and almost as close as that marking (say) the English and German within the Teutonic division. Correspondingly, within the Northern and Southern Semitic divisions the members stand in a relation toward one another closely approaching that of co-ordinate dialects.

The intimate relationship thus indicated between the languages of the Semitic group is due to a variety of causes, prominent among which are (1) the comparatively limited territory over which the languages are spread; (2) the uninterrupted communication in consequence largely of this limited territory among the nations speaking or adopting a

Semitic language; and (3) the closer ethnic relationship of the Semitic nations, only two races being distinguished by scholars, as against five adopted for the Aryan group.

The chief traits characterizing the Semitic languages are—(1) the peculiar relations existing between the consonants and vowels whereby the former constitute the essential elements of a stem and of its accretions, while the latter play the subsidiary though important rôle of particularizing the general meaning conveyed by the consonantal framework. (2) The triliteral character, either actual or adapted, of the stems within the historical period of the language. The comparatively small number of instances in which the number of consonants constituting the stem are four, and still more rarely five, are only apparent exceptions to the rule. (3) The arrested development in the expression of the time-relations in the case of the verb, which, starting out with the vague differentiation by means of pronominal affixes between the emphasis placed on the act and when placed on the actor, does not pass beyond the stage of distinguishing between the act when completed, whether in reality or in the mind of the speaker, and when not similarly completed. (4) The pragmatic character of the verbal and nominal formations and the parallel relationship existing between the two. The Semitic stem as such has both substantive and verbal force, and while the actual number of modal variations differs for the different languages of the group, the manner of expressing the variations, (a) by means of the reduplication of the second or third letter of the stem, (b) by vocalic lengthening after the first consonant or by a vocalic prefix, (c) by the prefixing of certain consonants *n*, *h*, *sh*, *t*, is the same in all; and not only does the noun-formation follow the same principles, but the agreement with the verb is such as to indicate the ultimate fusion of the two. (5) The paucity of auxiliary particles, more particularly of conjunctions.

Besides these general traits, there are a number of other features of a secondary order which the Semitic languages have in common. Thus, the general agreement of the vocabulary is very large, embracing a considerable number of common words, the pronouns in the first instance and terms of relationship in the second, as well as verbal stems. But within the Semitic group the agreement is closer between some as against others. The general character of the Semitic syntax is marked by its simplicity, and there is less variation between the languages in this respect than one would perhaps expect until we come to the period of a closer contact between Indo-Europeans and Semites.

Perhaps the most noticeable point of variation among the Semitic languages is to be found in the writing employed. They present at least three distinct alphabets: (a) The cuneiform characters of Babylonia and Assyria; (b) the Phœnician and its derivatives, the square-letter Hebrew, Palmyrene, Arabic, Syriac, Samaritan, together with the alphabet of the South Arabic and Abyssinian inscriptions as the probable prototype of the Phœnician; and (c) the Ethiopic, which is sufficiently distinct to merit a place for itself.

On the basis of the features enumerated the division into North and South Semitic languages is made. To the former belong the Phœnician, Hebrew, Moabitic, Babylono-Assyrian, and the various Aramaic dialects, biblical Aramaic, Palmyrene, Nabatean, the idioms of the Babylonian and of the Palestinian Talmuds, Samaritan, the North Arabic and ancient Syrian inscriptions, Syriac—Eastern and Western—Mandaic, and the modern Syriac dialects of Urmia, Tur Abdin, Salames, and of the Lebanon district. To the Southern division belong (1) classical Arabic, and the modern dialects of Egypt, Syria, and Morocco, with Maltese as a fourth, developed under Italian influence; (2) Sabæan, also known, though less correctly, as Himyaritic, of which Minæan is a dialect, and which appears to survive in some dialects spoken along the southern coast of Arabia; (3) Ethiopic or Gêz, spoken in the ancient kingdom of Abyssinia, and surviving in the modern dialects of Tigre, Tigrina, and Amharic, together with its offshoots, Gurague and Harar.

By way of simplification the North Semitic group can be said to comprise (1) Hebræo-Phœnician, (2) Babylono-Assyrian, and (3) Aramaic; and the South Semitic (1) Arabic, and (2) Yemenitic-Abyssinian. Taking these up in turn, the Hebrew and Phœnician bear so close a resemblance to one another that they may be regarded as co-ordinate offshoots of some older and lost form. Of the two, the Phœnician on the whole presents the more archaic aspect. Of literature in the true sense nothing has survived in the original Phœnician. Instead there are inscriptions on tombs, tem-

ing where offerings, seals and coins covering the period from about 800 B. C. to the third century A. D., and significantly as being contemporary with the large domains over which the language spread. The Phoenician script is as old as 1000 B. C. In the course of time slight variations arose between the Phoenician of the mainland and that spoken in the various settlements, but hardly sufficient to affect seriously the unity of Phoenician speech.

Of the Hebrew language, the oldest written remains, which date from the seventh century B. C. (see HEBREW LANGUAGE), reveal an alphabet still identical in form with Phoenician. The so-called square characters do not make their appearance till the fourth century of this era. In the Old Testament, which is the chief source of our knowledge of Hebrew, the language grows unperceived by the late editing of the various books composing it, and the unobtrusive preservation of the oldest remains occasion great difficulties in tracing the development of the language. So much, however, is certain, that the approach to the Aramaic is closer in what may safely be regarded as the earliest sections of the collection.

The bulk of the Old Testament literature, while thus containing elements of varying antiquity, dates in its present form from the centuries intervening between 600 and 500 B. C. The Psalms (with some exceptions), Proverbs, Lamentations, Ecclesiastes, Song of Songs, Ruth, Job, Esther, and Daniel as well as the final version of the Pentateuch, belong to the period subsequent to the Exile, the latest being in all probability Daniel and Ecclesiastes, which are to be placed in the second century B. C. After this time Hebrew still continues to flourish as the sacred language of the synagogue, and the medium of interchange between the Jewish colonies, gradually giving way to the Aramaic idiom adapted to the population upon the return from the Babylonian exile.

Of *Mandaic* speech there is only a single specimen—the monument of King Meshia dating from about 250 A. D., and found in 1879 at Diarra, the capital of ancient Moab. The inscription suffices to prove the practical identity of the Mandaic with Hebrew, and it is likely that the speech of the various other tribes and small principalities settled around the head seas and other parts of the Sinai peninsula did not differ materially from the speech of Moab.

Chaldean Assyrian is the language spoken by the ancient inhabitants of the country roughly included between the Tigris and Euphrates. The southern part of the district, which may be distinguished as the Euphrates valley, is the older settlement. The oldest literary remains of Babylonian are the inscriptions of rulers who reigned over the petty kingdoms into which the valley was split up. Next come a few number of religious texts—hymns to the gods and incantations to gods and spirits. From the south, the culture passed to the north, which is distinguished as the Assyrian zone. About the twelfth century B. C. Assyria secures a perfect independence from Babylon, and soon obtains the supremacy over the latter. Beyond historical annals, however, no original literature was produced in Assyria, whereas in the south poetry, astronomy (in connection with astrology), and magic (as an offshoot of magic) continued to flourish. The writing used in both Babylonia and Assyria is the cuneiform, so called from the wedge-like forms that the letters in the later phases of their development assumed. See *Cuneiform Inscriptions*.

The larger bulk of Babylonian literature consists of commercial and legal tablets of clay, giving records of all kinds of transactions, of settlements of disputes, the detailed terms of contracts, accounts, etc. Ranging from the period of 2000 B. C. through the Persian and Greek supremacy over Mesopotamia down to within a few decades of the Christian era, they furnish the most important source for the study of the common speech. The language of the north remains identical in all but minor dialectical variations with that of the south. Occupying a position midway between Hebrew-Persian and the Aramaic group, it is yet marked by peculiarities in inflection and lexicographical features that indicate an approach to the South Semitic division.

The Aramaic group presents a greater number of subdivisions than the two others, and also covers a wider stretch of territory. The oldest specimens of Aramaic speech are the inscriptions found at Gundishapur in Northern Syria, which date from the eighth century B. C. The Gundishapur inscriptions mark the northern limit of Aramaic speech, the southern being the Sinai peninsula and Central Arabia. In the course of time Aramaic became the popular idiom of the great region lying between the Euphrates valley and the Taurus range, and extending to the N. as far as

the Taurus range. The traces of this wide reach are to be seen in the numerous dialects that arise within this district. The most notable of these are (a) the dialect of Palmyra; (b) the Samaritan, of which besides the translation of the Pentateuch and Joshua some religious fragments are preserved; (c) the Syriac proper, in reality the Aramaic dialect of the Christians at Edessa. Slight variations in pronunciation and expression, in addition to distinctive syntax, warrant the division into Eastern and Western Syriac. (d) A direct offshoot of biblical Aramaic is the later Palestinian dialect, in which the so-called Jerusalem Talmud is written; while (e) the idiom of the Babylonian Talmud represents an eastern variety of the same dialect, occupying a middle ground between biblical Aramaic and Syriac. Aramaic dialects survive in various degrees of corruption in the Christian settlements around the Lake of Van, in the Jordan mountains, and in some Lebanon villages. See ARAMAIC.

Arabic.—The most important of the languages of the southern group is the Arabic, which, through the Mohammedan conquest in the seventh century A. D. successfully carried the place of Aramaic speech in the Semitic world. During the four centuries of Mohammedan supremacy in both Orient and Occident the intellectual movement accompanying the spread of the new religion produced an extensive literature. The only specimens of Arabic literature older than the time of Mohammed are poetic compositions, which in the process of gathering lost some, if not much, of their ancient character. European interpreters with Mohammedan supremacy, which begins with the crusades, has acted as a powerful factor in destroying to some extent the unity of Arabic speech, so that the dialects of Syria, Egypt, and that of the western coast of Africa have become three distinct varieties. See ARABIC.

Sabaean.—What may be considered to be an ancient form of Arabic speech has been found on inscriptions discovered by travelers in various parts of Southern Arabia (Yemen, Hadramout), and in some Sabaean settlements of Central Arabia and in Abyssinia. They confirm the existence of an advanced culture which flourished in the south as early as least as 1000 B. C., and of which Abyssinian civilization appears to be an offshoot. In the Yemenite inscriptions two dialects are distinguished, the Sabaean proper and the Minæan. The alphabet of the Sabaean inscriptions presents some remarkable features. It is certainly more archaic than Phoenician, and this circumstance, taken in connection with the high rank of Sabaean culture, lends additional force to the theory (which is growing in favor among scholars) that makes the Phoenicians the borrowers instead of the inventors of their alphabet, and fixes the place of the invention in Southern Arabia.

Ethiopic, or, to use the native name, *Ge'ez* (meaning emigrant), falls in the direct line of succession to Sabaean, being the form assumed by the language at the time (about the fourth century A. D.) when Abyssinia became a Christian possession. The alphabet, while connected with the Sabaean characters, has developed, partly on independent lines, partly under Greek influence, in such a way as to present a sufficiently unique appearance.

The Ethiopic literature is almost exclusively religious. Ethiopic continues in use as the sacred language of the Christian Church in Abyssinia. The popular speech bears somewhat the same relation to Ethiopic as the modern Arabic dialects do to the language of the Koran, except that the variations between the several dialects are hardly so pronounced.

The Original Home of the Semites.—Any attempt to trace the origin of the Semitic languages in some common starting-point does not include the problem of the origin of the races which in historic times appear as integral parts of the Semitic world. Separating in this way the question of race from that of language, three theories regarding the cradle of the Semites at present dispute the field. The one starting out from the general proposition that the most ancient Semitic culture, other things being equal, arose in the oldest center of Semitic settlement, would place in the Euphrates valley the original home of the Semites. A second view, held by perhaps the majority of modern scholars, seeks the home of the Semites in Arabia, as being the most favorable for the production of traits, customs, and religious ideas regarded as peculiarly Semitic. More recently evidence has been adduced in favor of Africa as the starting-point both of Semitic speech and of Semitic migration. An important factor in this theory is the relationship that has been demonstrated to exist between Egyptian and the Semitic

languages, a connection so close as to warrant the assumption of a common origin for the two, Egyptian itself being the result of a combination of a Semitic substratum with Hamitic elements. There is nothing improbable in the supposition of an eastern migration of Semites into Arabia and the Euphrates valley, and then by further moves an entrance into Palestine and Syria. If, as seems probable, the origin of the so-called Phœnician alphabet, which is so peculiarly adapted to Semitic speech, is to be sought in Southern Arabia, an additional support for what may be called the African theory will be found. See LANGUAGE.

LITERATURE.—Ernest Renan, *Histoire des Langues Sémitiques* (5th ed. Paris, 1878); William Wright, *Comparative Grammar of the Semitic Languages* (Cambridge, 1890); Theodor Noeldeke, *Die Semitischen Sprachen* (Leipzig, 1887); J. Barth, *Die Nominalbildungen in den Semitischen Sprachen* (Leipzig, 1889-91).

MORRIS JASTROW, JR.

Semler, JOHANN SALOMO: theologian; b. at Saalfeld, Saxe-Meiningen, Dec. 18, 1725; studied theology at the University of Halle, where he was appointed professor in 1751, and director of the theological seminary in 1757. D. at Halle, Mar. 14, 1791. He took a prominent part in the starting of the rationalistic movement in the German theology, but he was cautious in forming his views and careful in arguing them; and although his talent as an author was rather small, his works are pervaded by a spirit of genuine historical criticism, which exercised great influence. His principal works are *Apparatus ad liberalem Veteris Testamenti interpretationem* (Halle, 1773); *Abhandlung von freier Untersuchung des Kanons* (4 vols., 1771-75); *Versuch einer biblischen Dämonologie* (1776); *Versuch christlicher Jahrbücher* (2 vols., 1783-86); and an autobiography (2 vols., 1781-82). Revised by S. M. JACKSON.

Semlin (Hung. *Zimony*): town of Austria, at the eastern end of the military frontier, at the confluence of the Save and the Danube, opposite Belgrade (see map of Austria-Hungary, ref. 9-H). It is poorly built, a large portion consisting of mud huts, but it carries on a very important transit trade between Austria and Turkey. Pop. about 13,000.

Sem'mering, or Semering: a branch of the Noric Alps, forming the boundary between Lower Austria and Styria; rises 4,416 feet above the sea, and contains, at an elevation of 3,066 feet, the principal pass leading from Vienna to Trieste. The first carriage-road was built here in 1728 by Charles VI., who placed at the turning-point of the road a memorial column with the inscription, *Aditus ad maris Adriatici litora*. In 1840 a longer but more comfortable road was completed, and in 1854 a railway was opened between Gloggnitz on the Austrian and Mürzzuschlag on the Styrian side, ascending to 2,898 feet, and leading through fifteen tunnels and over sixteen viaducts. The road was constructed by Carlo Ciega, and was considered the most audacious and most ingenious engineering work of its kind.

Semmes, RAPHAEL: naval officer; b. in Charles co., Md., Sept. 27, 1809, of Scotch-Irish parentage; became a midshipman in the U. S. navy 1826; was a volunteer aide to Gen. Worth in Mexico 1847; became commander 1855; was secretary of the lighthouse board 1859-61; resigned at the beginning of the civil war; held a commission in the Confederate navy; obtained great notoriety by his exploits as commander of the Sumter and the Alabama in capturing and burning scores of U. S. merchant vessels. After the war he edited a daily paper in Mobile, Ala., subsequently becoming professor in the Louisiana Military Institute, but returned to Mobile to practice law. Author of *Service Afloat and Ashore during the Mexican War* (Cincinnati, 1851); *Campaign of General Scott in the Valley of Mexico* (1852); *The Cruise of the Alabama* (New York, 1864); and *Memoirs of Service Afloat during the War between the States* (Baltimore, 1869). He was editor of the *Memphis Bulletin* in 1867. D. at Mobile, Aug. 30, 1877. Revised by C. BELKNAP.

Semolli'na [from Ital. *semolino*, liter., dimin. of *semola*, bran (whence Fr. *semoule*, semolina) < Lat. *se'mila*, the finest wheat flour]: an article of food much used in France and Italy, and to a small extent also in Great Britain and other countries; consists of a finely cracked wheat, or a very coarse meal made from wheat. The hard-grained wheats of Spain, Odessa, and Southern Italy are best adapted for making it. As those wheats are not easily reduced to flour, small particles continually escape being crushed by the millstones, and after grinding they are separated into various grades. Semolina is used in making bread, puddings, and soups.

Sem'pach: village of Switzerland, canton of Lucerne; famous for the battle fought here on July 9, 1386, between the Austrians and the Swiss, in which the Austrian noblemen, in spite of their valor and superior numbers, were butchered like sheep by the Swiss peasants, as they were unable to use their horse, and unable to fight on foot encumbered by their heavy armor. The army of Duke Leopold, consisting of 4,000 horse, appeared before Sempach on July 9, 1386, and was there met by the confederated Swiss, numbering 1,300. As the ground was unfitted for the action of cavalry, the knights dismounted and formed themselves into a solid and compact body. The Lucerners charged, but the wall of steel was impenetrable, and not a man of the Austrians was wounded, while sixty of the bravest Lucerners, with their chief, were killed. Then Arnold von Winkelried, a knight of Unterwalden, rushed forward, grasped with outstretched arms as many pikes as he could reach, buried them in his bosom, and bore them down to the earth by the weight of his body. His companions rushed over his body into the breach thus made, slaughtered a great number of the armor-encumbered knights, and threw the remainder into the utmost confusion and dismay. See Otto Kleiser, *Die Quellen zur Sempacher Schlacht und die Winkelried-Sage* (Göttingen, 1873).

Semper, GOTTFRIED: architect; b. in Hamburg, Nov. 29, 1803; studied mathematics at Göttingen, architecture in Munich and Paris; traveled much in Italy, Sicily, and Greece; was appointed Professor of Architecture at Dresden in 1834; fled to London in 1849 on account of his participation in the revolutionary movements, and taught at the Royal Academy in Marlborough House till 1856, when he became Professor at the Polytechnic Institute of Zurich. In 1869 he was called to Vienna to give advice as to the proposed building of the museum, and in 1871 he settled there to superintend those important structures. In 1869 also he was employed upon the new Dresden theater in place of the one burned in that year; this building was not finished until 1878. His other important buildings are the Polytechnicum at Zurich, the Church of St. Nicolai in Hamburg, the synagogue at Dresden, etc. At the Universal Exposition of 1867 he exhibited a plan of a theater in Rio de Janeiro, for which he obtained a gold medal. He wrote *Die vier Elemente der Baukunst* (Brunswick, 1851); *Ueber Industrie, Wissenschaft und Kunst* (1852); *Der Stil in den technischen und tektonischen Künsten* (2 vols., Frankfurt, 1860-65), etc. He set forth with great decisiveness and defended with many ingenious arguments and acute observations the view that the antique architecture and sculpture were polychromatic throughout, and he decorated the antique department of the Art Museum of Dresden in accordance with this principle. D. in Rome, May, 1879.

Revised by RUSSELL STURGIS.

Semper, KARL: naturalist; nephew of Gottfried Semper; b. at Altona, Germany, July 6, 1832; was educated in the naval school of Kiel and the Polytechnic School of Hanover, and studied natural science in the University of Würzburg. After visiting the principal countries of Europe he embarked in 1858 for the Indies, visited Manila, the Philippine Islands, China, and Japan, and was after his return to Europe, in 1866, appointed Professor of Zoology at Würzburg, and held the position until his death May 29, 1893. He visited the U. S. in 1877, and delivered a course of lectures before the Lowell Institute, Boston, published under the title *Animal Life as affected by the Natural Conditions of Existence* (New York, 1881). He published *Reisen im Archipel der Philippinen* (Wiesbaden, 1867-72); *Die Philippinen* (Würzburg, 1869); *Die Palau Inseln im stillen Ocean* (Leipzig, 1873); *Die natürlichen Existenzbedingungen der Thiere* (Leipzig, 1880), and other works. He also edited 9 volumes of *Arbeiten aus dem Zoologischen Institut in Würzburg*. Revised by J. S. KINGSLEY.

Senancour, se-nān'koor', ÉTIENNE PIVERT, de: author of *Obermann*; b. in Paris in 1770; educated for the priesthood, but disliking that profession ran away from home and lived in Switzerland, whence after a brief period of married life he returned to France, saddened by the loss of his young wife and beggared in fortune. His scanty earnings as a hack writer in Paris were supplemented by a small pension granted by Louis Philippe, but his struggle with poverty combined with domestic misfortunes and ill health to give his books a tone of deep melancholy. His *Réveries sur la Nature primitive de l'Homme* (1799) is strongly marked by the influence of Rousseau. *Obermann* (1804) is the story of

a solitary and melancholy person, who gives expression to his skepticism and his weariness of life in a series of letters written from Switzerland. While the author belongs to the sentimental school of writers and the work is tinged with a somewhat morbid spirit, its style is good, and the subject-matter often striking and original. It exerted a considerable influence upon his own and the succeeding generation, and Matthew Arnold characterizes him as the most sincere and impressive of sentimental writers. D. at St.-Cloud, Feb., 1848.

Seneca [rēk ō fē; from Lat. *senectus* deriv. of *senex*, an old man, elder]; originally, the deliberative assembly of the Romans; in modern times the upper house of the national Legislature in the U. S. and in several other countries. See LEGISLATIVE.

Seneca Falls [sēnē'ka fāl's]; capital of Yates co., N. Y.; on the Genesee River, 33 miles S. of Albany (for location, see map of New York, ref. 3-E). It is in an agricultural region, is an important stopping-point of cars, cotton, and live-stock, and contains a Peabody public school, a State bank with a capital of \$25,000, and 2 weekly newspapers. Pop. (1880) 1,000; (1890) 1,077.

Sendai [sēn'dai]; an important city in the northeast of Japan; situated on the left bank of the Sendai-gawa, about 10 miles inland (see map of Japan, ref. 5-E). It was the birthplace of the great lords of the Date family, who at one time embraced Christianity; and relics of a mission to them made in 1613 are still preserved. The castle, partly destroyed in the civil war of 1868, is used as a barracks, Sendai being a military center for the north. It is also an educational center of importance, having a higher middle school, normal school, and several Christian schools. The Greek Church has a strong following in the neighborhood. The town is noted for the production of trays and other articles made of a hard wood. Pop. 60,000. J. M. Dixon.

Seneca [sēn'ē-ka]; city (founded in 1860); capital of Seneca co., N. Y.; on the Seneca river, and the Kan. City N. W., and the St. Joe and Gr. Island railways; 64 miles N. by W. of Cayuga, 71 miles W. of St. Joseph, Mo. (for location, see map of Kansas, ref. 4-B). It is in an agricultural, fruit-growing, and stock-raising region, has a large butter-trade, grist-mill, brewery, and shoe-factory, and contains 4 churches, a national bank with capital of \$50,000, a State bank with capital of \$75,000, a private bank, and 2 weekly newspapers. Pop. (1880) 1,804; (1890) 3,032; (1900) estimated 4,200.

Etymology: "Tamarac."

Seneca [sēn'ē-ka]; town; Newton co., Mo.; on the St. L. and San Fran. Railway; 227 miles S. W. of St. Louis (for location, see map of Missouri, ref. 7-D). It is in an agricultural and stock-raising region, has several mills and extensive coal-mining interests, and contains the only tripoint mines in the U. S.; a State bank with capital of \$10,000, and a weekly newspaper. Pop. (1880) 580; (1890) 1,101; (1900) estimated 1,500.

Etymology: "Tamarac."

Seneca [sēn'ē-ka]; philosopher and writer of tragedies; b. at Corduba, Spain, about 4 a. c.; belonged to a Spanish-Roman family, but was educated in Rome. His father, Annulus Seneca (the praenomen Marcus is without authority; *Lucius* is found in several MSS.), the Rhetorician, was later than 54 a. c. at Corduba; d. in Rome about 89 a. c. was a man of literary studies, wealthy and influential. Almost the whole of his *Senecarum Liber* and five books of his *Controversiarum Liber* *De ira* are extant, edited by Gellius (Leipzig, 1857); Kießling (Leipzig, 1872); H. J. Müller (Paris, 1887), and give a striking aspect of the moral degradation and aesthetic fertility to which the Romans had sunk in Rome at his time. (See Koerber, *Seneca der Rhetor* *Seneca und die römische Rhetorik seiner Zeit*, Marburg, 1884.) Young Seneca was trained in his father's art, and although he afterward left rhetoric for philosophy, he never forgot the lessons of his youth. His style, while all his pompous dignity and brilliant pointedness, is characterized throughout by preponderance of the form over the contents, of the expression over the thought, which manifests a lack of sincerity, and results in mannerism and affectation. Caligula said of his eloquence that it was used without time. After traveling in Greece he began to preach as an orator in Rome, and achieved great foreign success, but in A. D. Messalina had him accused of encephalitis; an adulterous connection with Julia, the daughter of Germanicus and the wife of Vinicius, and he was banished to Corsica. Here he lived for eight years, and wrote,

among other works, *De Consolatione ad Helviam matrem Liber*, a consolatory letter to his mother, and one of the best of his writings, and *De Consolatione ad Polybium Liber*, a similar letter to Polybius, a freedman and one of Claudius's favorites, who had lost his brother; but this letter is one of his most disagreeable productions on account of its flattery, and its genuineness has been disputed. When Claudius married Agrippina, Seneca was recalled by her influence in 49 and appointed tutor to her son, Domitian, afterward the Emperor Nero. Most of Seneca's very prolific authorship belongs to this last period of his life. He wrote moral essays, philosophical letters, a biography of his father, orations, physical treatises (*Quaestiones Naturales*, and others now lost), epigrams, and tragedies. The last mentioned, nine in number, are especially interesting from being the only complete specimens of Roman tragedies extant, and from their influence upon the modern revival of tragedy. It is not certain that they were ever performed, or that they were intended to be. They are admirably adapted for recitation, being largely only versified declamations decked out with rhetoric and moral sentiments. In organic structure they are weak, and they sin against the dramatic decencies. The genuineness of these plays, often attacked, is generally conceded, although Ribbeck holds to the possibility of another Seneca, and Leo suspects the latter part of the *Hercules Furens*. A tenth play, *Oedipus*, which is a *protesia* and contains an allusion to Nero's death, can not be by Seneca. The best editions are by Leo (Berlin, 1878-79, 2 vols.), and by Peiper and Richter (Leipzig, 1867). Of his prose essays, some of the most celebrated, *De Ira*, *De Tranquillitate Animi*, etc., are inexhaustible sources of piquant quotations; others, *De Clementia ad Nervum Caesarem Libri Duo*, are rather curious on account of the personal character which the author has not been able to conceal under the representation of his ideas; but the largest portion is vague and trivial—*De Constantia Sapientis*, *De Breuitate Vitae*, etc. His 124 *Epistulae ad Lucilium* have more interest, containing moral observations and aphorisms of practical value. His *Apocolocyntosis* is also worth reading. It is a satire on Claudius, written after the death of the emperor, and is very biting. It is a specimen of the Menippean satire, being part prose and part verse, doubtless written to please Nero, for whom Seneca also composed a funeral oration, not extant, upon Claudius. Seneca was consul in 56, but after the death of Burrus in 62 his influence with Nero began to wane. The emperor began to hint at the millions which the philosopher had amassed. Seneca became alarmed, and offered to repay the whole amount and content himself with a small annuity. Nero refused the offer, and Seneca then retired from the court, gave no lectures, was never seen in public, and tried his utmost to sink into oblivion. But in vain. Some one mentioned him as an accomplice in the conspiracy of Pao, and Nero sent him an order to commit suicide, which he immediately obeyed. He opened the veins in his feet and arms, and, discarding with his friends on the brevity of life and the equanimity of the philosopher, bled to death in a hot bath 65 a. c. From the revival of letters in Europe, and up to the beginning of the nineteenth century, the works of Seneca, both the philosophical and the poetical, were much read and much admired. Editions were numerous and translations were made into all European languages. There were, however, always some voices which protested against his false; and when his admirers tried to prove that he was a Christian and a friend of St. Paul, his adversaries undertook to prove that he was an atheist and a hypocrite. Among later editions of his works are those of his prose writings by Fickert (3 vols., Leipzig, 1842-45) and by Basse (3 vols., Leipzig, 1852-53); of the *Apocolocyntosis* in Buecher's *Petrus* (Berlin, 1882); and *Dialogorum Libri XII* (Gertz, Copenhagen, 1886). See Farrar's *Seneca after God*; Lightfoot's *Essay on St. Paul and Seneca*, appended to his *Commentary on the Epistle to the Philippians* (London, 1879); Westberg's *Der Ursprung der Sage dass Seneca ein Christ gewesen* (Berlin, 1881). Revised by M. Wanner.

Seneca Falls; village; Seneca co., N. Y.; on the Seneca river (the outlet of Seneca Lake), and the N. Y. Cent. and Hud. River Railroad; 3 miles W. of Cayuga Lake Park, a popular summer resort, and 16 miles W. of Auburn (for location, see map of New York, ref. 5-F). A fall of 50 feet in the river gives the village its name and affords excellent power for manufacturing. The village contains manufactories of steam fire-engines, pumps, machinery, and wooden goods;

job-printing establishment; 7 churches; an academy; a soldiers' monument; electric railway to Waterloo, Genesee, and Cayuga Lake Park; a national bank with capital of \$100,000, a savings and a private bank, and 4 weekly newspapers. Pop. (1880) 5,880; (1890) 6,116; (1895) estimated, 6,500. "COURIER" PRINTING COMPANY.

Seneca Indians: See IROQUOIAN INDIANS.

Seneca Lake: a body of water in Western New York, bounded by Seneca, Schuyler, Ontario, and Yates Counties. It is 35 miles long, from 1 to 4 miles broad, with an elevation of 447 feet, and its shores are bold, picturesque, and fertile. The lake is navigated by steamboats. Its waters reach Lake Ontario by Seneca and Oswego rivers. Its greatest depth is 630 feet.

Seneca-oil: a local name for PETROLEUM (*q. v.*).

Señefelder, ALOYS: inventor; b. at Prague, Bohemia, Nov. 6, 1771; entered on the stage at Munich, his father being an actor; afterward attempted literature, and engaged finally in the printing business, which led to his invention of LITHOGRAPHY (*q. v.*). Lack of money and the imperfection of the invention in its primitive state caused him many difficulties and disappointments, and it was not until 1806, when he settled at Munich and received the support of the Bavarian Government, that he was able to perfect his invention. D. at Munich, Feb. 24, 1834. He wrote a *Lehrbuch der Lithographie* (Munich, 1818; French translation, Strassburg, 1819; English translation, *Complete Course of Lithography*, 1819). See Nagler, *Aloys Señefelder und der geistliche Rath Simon Schmidt* (Munich, 1832).

Sen'ega: a drug consisting of the root of a polygalaceous perennial plant, *Polygala senega*, which grows throughout most parts of the U. S., frequenting open fields and rocky places. It is small, with small white flowers forming a close spike at the summit of the stem. The roots are of various sizes, tapering, branched, and twisted, with a thick gnarled head from which the several yearly stems arise. The epidermis is dark-colored, corrugated, and is the active part of the root. The dried root has little smell, but leaves a pungent and acrid impression in the mouth after chewing. Senega contains a peculiar principle called *polygalic acid*, probably identical with saponine. The drug is an acrid irritant, producing vomiting and purging in overdose. Its first use in medicine was by the Seneca Indians, who employed it as a remedy in cases of rattlesnake-bite, but by physicians it is used almost exclusively as an ingredient in cough-mixtures in the second stage of respiratory catarrhs. Its effects are analogous to those of squill. Senega is an ingredient of the compound sirup of squill of the *United States Pharmacopœia*. Revised by H. A. HARE.

Senegal': the largest river of Senegambia, Northwest Africa. It lies almost on the border of the Sahara, and derives its water chiefly from several large southern tributaries rising in the regions of Futa Jallon and Bambara. Though a bar at its mouth obstructs navigation from the sea, the lower half of the river (500 miles) is navigated at high water by small steamers. C. C. A.

Senegal: a French colony bordering on the Atlantic in the northwestern part of Senegambia, Africa. Pop. 135,000. There is a governor-general, assisted by a colonial council, at the chief town, St. Louis. See SENEGAMBIA.

Senegam'bia [named from *Senegal* + *Gambia*, names of its two chief rivers]: a French possession in Northwest Africa, with no well-defined boundaries on the E. and S. It borders on the Atlantic and the Sahara limits it on the N. The Gambia may be called its southern boundary, and its extension to the E. may be taken as including that part of the French Sudan lying W. of the upper Niger. The population, including the colony of Senegal and the upper Niger region, is believed to be about 1,850,000. In the seventeenth century France took possession of some points on the coast, but the great extension of the colony eastward dates from the middle of the nineteenth century, and particularly from the period 1871-88, which saw the gradual advance of the French power to the upper Niger, an acquisition that cost enormously in human life and money, on account of the trying climate and stoutly contested campaigns with powerful Mohammedan chiefs. The most formidable opponents of the French advance were the great religious pretenders and potentates, Mahmadu-Lamine, whose final defeat and death was the result of the campaign under Gen. Gallieni (1886-88), and Samory, the most powerful ruler in the French Sudan, who was not finally subdued until 1893. The vast ter-

ritory is for the most part sparsely peopled. It includes a number of distinct tribes, of whom the Mandingo, the Yolofs, and the Fulbe are the most important. The greater part of the country is very fertile, and rice, maize, tobacco, and cotton raising are capable of large development. In Senegal proper about one-third of the land is under cultivation, and the raising of cattle and sheep is a growing industry. The great drawbacks are the climate and the disinclination of the natives to labor, but in the best-cultivated regions the French, within a few years, have doubled the product. On the upper Senegal, in 1884-86, 45 per cent. of all the European residents died, the most fatal causes being sunstroke, dysentery, and malaria. The capital and chief port is St. Louis, on an island at the mouth of the Senegal. Pop. 20,000. From Kayes, the head of navigation on the Senegal, a railway has been built eastward 94 miles to Bafoulabe, and is to be extended to the upper Niger. Another railway connects St. Louis with Dakar, an important town at Cape Verde, and it is greatly assisting in the development of the coast districts. The most important interior settlements are Kayes, on the upper Senegal, Bafoulabe, at the mouth of the Bathoy, and Bamako, on the upper Niger, from which point the French have descended the river and occupied Timbuctu.

C. C. ADAMS.

Senescence: See OLD AGE, DISEASES OF.

Senigal'lia, or Sinigaglia (anc. *Sena gallica*): town; province of Ancona, Italy; near the Adriatic, at the mouth of the Misa, which divides the town into two parts (see map of Italy, ref. 4-E). The streets are broad and well paved, and some of them are flanked by fine buildings constructed with porticoes forming a continuous sheltered promenade. The maritime trade is carried on by means of a short canal, for which the lower arm of the Misa has been made available. The manufacturing activity is considerable, chiefly in silk and linen. The annual fair of Senigaglia (beginning July 22 and ending Aug. 8) was formerly one of the most famous in Europe, and is still much frequented. The town is the place of the victory of C. Claudius Nero over Hasdrubal (207 B. C.). Pop. 9,602. Revised by M. W. HARRINGTON.

Senior, NASSAU WILLIAM: economist; b. in Berkshire, England, Sept. 26, 1790; graduated at Oxford 1812; was admitted to the bar 1819; was Professor of Political Economy at Oxford 1825-30, and again 1847-62; was master in chancery 1836-53. D. in London, June 4, 1864. He was the author of essays upon political economy, philosophy, etc., of narratives of travel in Turkey and Greece (1859) and in France and Italy (1871), and was for forty years a leading contributor to *The Edinburgh Review* and other magazines.

Senlac: See BATTLE.

Senna [from Arab. *sana*, *senna*]: the leaves of several species of *CASSIA* (*q. v.*), various preparations of which are used medicinally. Those which constitute the commercial senna are exported from Southern India and from Alexandria. A senna-plant (*Cassia acutifolia*), indigenous in Egypt and the African deserts, furnishes most of the Alexandria senna. Great labor has been expended by chemists in endeavoring to isolate the valuable cathartic principle of senna, which was discovered by Dragendorff and Kubly in 1868 to be cathartic acid. It is a complex glucoside, and, singularly, contains sulphur. Like glucosides generally, it is easily alterable, and hence difficult of isolation and preparation. Further information may be had in the *National Dispensatory*, under *Senna*. Revised by H. A. HARE.

Sennaar': an ancient kingdom of the Eastern Sudan, Africa, which retained its name when it became a province of Egypt; lying mostly between the Bahr-el Azrek and the White Nile. The soil is so fertile along the river banks that Sennaar was long called the granary of the Egyptian Sudan, but away from the rivers the region is mostly an uninhabited sandy waste. In the flourishing days of the Egyptian Sudan there was a dense population along the two great rivers, in whose valleys a large amount of grain was raised, while in the towns gold-smelting, leather-working, pottery-making, and other industries were pursued. Sennaar, for generations the chief town, had great importance until Khartum became the center of commerce. Its population had dwindled to 8,000 before the Mahdist revolt. It was the last Egyptian stronghold to succumb to the Mahdi. Now only heaps of stone mark its site.

C. C. ADAMS.

Sennach'erib [Gr. *Σανναχέρηβος*; Heb. *San'chêrîbh*, from Assy. *Sin-achî-irîb*, liter., "the Moon-(god) has multiplied

Ishtar "I": King of Assyria 703-681 B.C., son and successor of Sargon. He was bold and mighty, a terrible scourge to war, and a great builder. His campaign against the West in 701 was unsuccessful (2 Kings xviii, xli), as may be seen also from his own account of the affair. (Cf. E. Schrader, *The Assyrian Inscriptions and the Old Testament*, I, 278-310.) He boasts that he destroyed Babylon utterly because this city kept the Assyrian yoke unwillingly. He was murdered by two of his sons.

D. G. Lyon.

Sens, *sens* (also *syndesmon*, later *Sensu*): town of France, department of Yonne, on the right bank of the Seine (one mile of Paris, 101, 4-15), has vestiges of the old walls constructed by the Romans, a fine cathedral, remains of Maxian, seign, dragons, and glass, and an active coal and iron, wine, flax, and hemp. Pop. (1891) 12,314.

Sensation: phenomena which result within the mind immediately from impressions upon the senses. The experiences of moisture and resistance which follow from contact with a piece of iron, and the pain felt in using it, are, especially sensations. Sensation must be carefully distinguished from the physical phenomena which precede or accompany it. The impression is the modification of the organ, especially of the nervous and nervous centers, which arises from an external stimulus, as the vibration of ether or air. The nature of the different sense-impressions is not well understood; but in each case they are some form of movement. They have all the characteristics of physical phenomena; they can be located, measured, apprehended by the senses. Sensations, on the other hand, can not be compared with movement of any kind. The difference between them is plainly seen in the fact that an impression may take place without any sensation. The impression may be too feeble, or too prolonged; or too often repeated, so as to produce of our clothing; or the attention may be occupied, so that the impression does not produce its usual result.

Affective and Representative Elements in Sensation.—In each sensation there is a distinct knowledge element over and above the intensive subjective state, which constitutes the sensation proper. There is an element of knowledge of things without us or of our own bodies. This is the presentative or perception element in sensation. There are great differences in sensations in this respect.

The objective or feeling quality, on the other hand, comes out most strongly in cases of massive or voluminous stimulation. Here presented relations are at a minimum and sensibility at a maximum. When a man plunges into a very hot bath, the feeling experienced is so overwhelming that the knowledge that it is a hot bath, and that it is he himself who is taking the bath, occupies a very slight degree of consciousness. In a case of severe toothache, also, what we really have, predominating in consciousness is not knowledge, but feeling. As an immediate state of consciousness, we do not know that we have a toothache, we feel it. Hamilton announced the law, already anticipated by Kant, that the two elements vary in inverse ratio—which is true only in a very rough way.

Character of Sensation.—All sensations have certain common characters, which may be subjected to investigation. These characters are four in number.

1. **Quality**: that property by which sensations are distinguished as coming from different senses, such as color, sound, taste.

2. **Quantity**: meaning intensity or mass of sensation. Intensity in intensity constitutes Psycho-energies (q. v.).

3. **Duration**: the time occupied by the sense-function with its accompanying physical and volitional processes. Impressions in this field constitute Psychoenergies (q. v.).

4. **Force**: the pleasure or pain which accompanies all sensation. See **PAIN** and **PLEASURE**.

Quality of Sensation.—There is much uncertainty as to the proper classification of sensations. It appears very easy to discover at once what is immediately given as a pure and simple sensation. But it is not so. At the age of maturity, when one is able to make an analytical study of his states, he finds them no longer in that pure and primitive state which he would wish. They have undergone a twofold alteration. In the first place, all the senses act together, and different sensations, by virtue of the laws of association, are experienced as one. And, further, by virtue of the same laws, much more elements are superposed upon our sensations, making them much more complex. These associations become, after time has made them habitual, almost

indissoluble; so that it is very difficult to isolate the different sensations from one another, or the great body of sensitive data from the contributions of reason and experience.

Relativity of Sense-qualities; Contrast.—Further, we find a series of phenomena which show that there is no fixed typical sensation of each quality; but that all determinations of quality are to a degree relative distinctions among many factors in consciousness. This principle of Relativity (q. v.) is illustrated by the so-called phenomena of contrast. The general statement of fact is this: Any sensation (color, sound, taste) which occurs after or with other sensations (color, sound, etc.) is different from what it would have been if the other sensations had not been present, or if the other sensations had themselves been different. The variation, however, is within the same sense-quality.

In the domain of the special senses, such effects of one sense-quality upon another may be subjected to experimental determination by psycho-physical methods. The phenomena of color-contrast are the richest and best understood class of facts. In general, color-contrast means that when part of the retina is stimulated to react to a particular color, there is a tendency of other portions to react to the complementary color. For example, the so-called Moyer's experiment may be cited: Put a scrap of gray paper on a colored (red) background, and spread over the whole a sheet of white tissue; the gray scrap will tend to assume the color complementary to the background (green). The white sheet over the whole is necessary to obscure distinct lines of separation between the colors beneath; if such distinct boundary-lines are exposed, the contrast-phenomena disappear. Recent research has developed a number of interesting optical phenomena of this class. Stumpf has discovered that the pitch of a tone is modified by the occurrence of another tone of a different pitch, in such a way that the interval between them is lessened. Contrasts of temperature are also easily brought about. Cold water feels colder if the hand is just from warm water. Differences in temperature of the two hands lead to exaggerated differences of sensation when they are plunged together into two vessels of water of the same temperature. Contrast is called simultaneous or successive according as the rival sensational qualities occur together or in succession.

Two theories of sensational contrast have been advocated, one called the psychological, according to which such contrasts are due to judgment or synthesis, the actual sensations themselves having fixed and unaltered qualities. This has been held by Helmholtz, and has been used to support the theory that there may be "unconscious judgments." The other, the physiological theory, holds that contrast-effects are due to complex conditions of stimulation. The different color-stimuli, for example, are not reported separately to consciousness; but only their united effect is operative in the optical center. Consequently, what we have is a case of summation or fusion of stimuli, not of comparison and judgment of sensational atoms. This latter theory is now completely victorious, principally through the brilliant experimental work of Hering.

It seems reasonably safe to conclude that there are well specialized nervous functions which correspond to the great differences of quality in sensations: this is shown by the fact that the differences are stable; that the senses are largely independent of one another in their activity; that each such function has normal minimum and maximum activities which give original degrees of intensity to consciousness. But within these limitations both qualities and intensities are subject to the law of relativity as well by reason of nervous summation as of mental synthesis.

J. MARK BALDWIN.

Sensationalism: a term in philosophy sometimes used to denote the doctrine that all knowledge is derived originally from the senses. Various other terms are used as its synonyms—viz., "sensism," "sensualism," "sensuism," "empiricism," etc. Hobbes (in 1650) taught that all knowledge grows out of sensations. After sensation there remains behind the memory of it, which may reappear in consciousness. The memory of objects once perceived is aided by words. We therefore connect words to our mental representations of objects. The same word, serving as a sign for numerous similar objects, gives rise to general ideas. Locke held substantially the same views. Condillac (1755) likewise endeavored to explain all mental functions as transformations of sensation (*sensations transformées*). Desire arises from the recollection of a past sensation; the Ego is the

totality of sensations. Bonnet (1755), von Holbach (1770), Buffon (1780), Cabanis (1798), Destutt de Tracy (1815), Laromiguière (1818) held the doctrine of sensationalism. Among recent German writers Czolbe has elaborated a system of psychology that derives all the elements of self-consciousness from sensation. But he has to assume teleological forms—"the sensations and feelings which are hidden in space or the world-soul"—to explain the "fundamental limits of knowledge." His contemporaries, however—Moleschott, Büchner, Vogt—proclaim not only sensationalism, but materialism without reserve. While Cabanis said that thought is a secretion of the brain, Carl Vogt added, "the brain produces thought in the same way that the liver produces bile," etc. John Stuart Mill (1865) defines matter to be "a permanent possibility of sensation," and mind to be "a series of feelings with a background of possibilities of feeling"; thus making sensation the central principle, not only of knowledge, but of being, and apparently reaching the doctrine of Berkeley, *Ease est percipi*. Post-Kantian sensationalism has had to explain away the existence of universal and necessary ideas, such as time, space, causality, etc. Mill holds the geometrical axioms to be "generalizations from observation." Herbert Spencer (1860) holds that knowledge consists in "symbolic conceptions" when it relates to aught else than concrete objects that are not "too great or too multitudinous to be mentally represented." In contrast to this, he holds that "the ultimate truth which transcends experience by underlying it is the persistence of force." Thus he makes in one instance all general ideas "symbolic," the real being particular things only; and then he makes force, which corresponds to the most symbolic of our ideas, to be the most real of realities. Within the period 1870-95 a more thorough study of physiological psychology by a scientific method has done more to clear up and reduce to exact knowledge the theory of the action of the five senses than the loose observations of twenty-five centuries previously. The articles on PSYCHOMETRY and PSYCHO-PHYSICS give the history and bibliography of this movement. It is too early to perceive the effects of these investigations into the essential nature of sense-perception upon general philosophical theories, but it is certain that they will modify very materially the conceptions and method of presentation of those who in the future defend the doctrine that all knowledge is derived from the five senses.

WILLIAM T. HARRIS.

Senses [from Lat. *sen'sus*, feeling, one of the senses, deriv. of *sen'ti're*, *sen'sum*, feel]: special developments of the general sensibility of the living organism. In the special senses, i. e. hearing, sight, etc., the property of general sensibility of the organism has become immensely modified and intensified by being concentrated and localized in distinct organs, the ear, the eye, etc., and by being specialized so that each organ transfers from the object to consciousness only a distinct part of that total impression which the object is able to give and consciousness is capable of receiving—the ear only the audible, the eye only the visible, etc. There are five such senses—hearing, sight, smell, taste, and touch—but they all rise simply as individual developments of the same fundamental faculty of general sensibility. Their degree of individualization is very different, being highest in sight and feeblest in smell and taste; the latter both disappear very easily in mere feeling, as smell in sneezing and taste in nausea. It is apparent, however, that the general sensibility of the human organism covers a much larger ground than its five individual senses. There are sensations which enter into consciousness with great vividness without going through the special senses, as, for instance, the feelings of hunger, thirst, suffocation, pleasure, pain, rest, fatigue, etc., which are termed general sensations. See ACOUSTICS, MUSCLE-SENSE, VISION, etc., and *Organs of Special Sense* in the article HISTOLOGY. Revised by EDWARD T. REICHERT.

Sensibility: See FEELING and SENSATION.

Sensitive Plant: a low leguminous plant, *Mimosa pudica*, of tropical America, now widely dispersed over the world and commonly cultivated, on account of the rapid movement of the leaves which, when brushed or jarred, appear to shrink from the touch. This faculty is shared in a less degree by several other species of *Mimosa* and some related plants, such as the sensitive brier (*Schrankia*) of the southern parts of the U. S. See *Plant Movements* in the article PHYSIOLOGY, VEGETABLE.

Senso'rium [= Lat., the seat or organ of sensation, deriv. of *sen'sus*, sense, feeling]: the supposed seat in the

nervous system of the processes which underlie sensation. The cortex or gray matter of the brain is considered the sensorium in modern discussion in physiology and psychology. J. M. B.

Sentence [viâ O. Fr., from Lat. *sententia* (for **sentien tia*), way of thinking or feeling, opinion, judgment, deriv. of *sen'ti're*, feel, think]: in the law, a judgment or determination pronounced by a court after the trial or hearing of a cause, by which the remedy is granted or the sanction is imposed. In the common-law courts the term is confined to criminal cases, their final decision in civil suits being called a "judgment"; while the corresponding act of a court of equity is usually denominated a "decree." In those tribunals whose procedure is based upon the civil law—in the admiralty courts, the English ecclesiastical courts, and sometimes in the U. S. in the probate or surrogate courts—the term "sentence" is used, instead of "judgment" or "decree," to designate all judicial determinations. The sentences in civil causes like judgments are either final or interlocutory—final, when they pass upon all the issues material to the decision, determine the rights and duties of the parties, and terminate the pending controversy; interlocutory, when they pass upon some collateral matter or proceeding in the action, or when they establish some right preliminary to the final adjudication. In criminal trials, according to the common-law methods, the sentences are all from their very nature final. It is the exclusive province of the jury to determine the guilt or innocence of the accused. When a verdict of guilty is rendered, the prisoner is thereby convicted, and it then becomes the duty and function of the court to pronounce upon him the judgment or sentence which the law provides as a punishment for his crime. Previous to this final act in all cases of felony the convict is publicly asked by the judge if he has anything to say why the sentence of the law should not be pronounced upon him. This proceeding, which was originated at an early period of the English law, when the prisoner could not be defended by counsel, in order that he might have an opportunity to suggest any error that had occurred, is now an empty form, and yet the form must be observed, or else the judgment would be void. No error being shown, the presiding judge declares the sentence, whereby the court orders the prisoner to be capitally executed on a certain day named, or to be imprisoned for a specified period, or to be fined in a designated amount, or otherwise punished as provided by law. This sentence is entered by the clerk, and constitutes a most important part of the judicial record. The doctrines and rules of the law in reference to the nature and effects of a JUDGMENT (q. v.) apply also to sentences. See the treatises of Bishop and Wharton on *Criminal Law*, and Black on the *Law of Judgments*.

Revised by F. STURGES ALLEN.

Sentiment: the higher form of emotion, attaching to ideals of art and life. (See IDEALS and IDEAL FEELING.) The great classes into which the sentiments fall are usually distinguished as ethical, æsthetic, and religious. The religious are the most complex, and rest upon the other two. Religious objects and ideals involve both the ethical and æsthetic determinations—that is, they are both beautiful and good.

Ethical Sentiment: its Nature and Origin.—Conscience is the popular term for this emotion. It involves three elements, which are, however, closely united in a single state of mind, called ethical. If we fancy the mental life cut right through at the moment of a moral decision, we should find three elements which moralists distinguish by the phrases moral quality, moral authority, and moral ideal. These may be made clearer by a concrete instance: I give money to a beggar because I am bound by conscience to do so. The moral quality of my act is my feeling of its harmony with my better acts as a whole, and the exactness I make upon other men to be charitable also; without this conscience would be wanting—the act would be indifferent. The moral authority of the act is the feeling which at once arises that this quality has an immediate reference to my will. I am bound to choose it as my act; without this there is no conscience—conscience is dead. The moral ideal is the outreach of my feeling toward a state of will in which such a relative and hesitating decision would yield to clear and more direct moral vision; a state of will which I can not picture, can not conceive, but which I feel my will is meant for, and for which my present act for conscience's sake is the only means to prepare me.

Moral sentiment arises evidently around acts and atti-

mental will. It is accordingly to be expected that the account of the growth of Will (p. 15), cast throws some light upon the conditions of the rise of conscience. So it is because that present character is the deposit of all former positions of whatever kind, and that what we call will is a general term for concrete acts of volition, and further that various representations of tendencies, their ascending as these tendencies are suggestions from other persons, on the one hand, or represent partial expressions of each own personal character on the other hand, there arises a division within the sense of voluntary agency, which is the germ of the notion of self. (See *Self-consciousness*.) Your suggestion to me may conflict with my desire; my desire may conflict with my own present sympathy. Self means self, as to speak. The self of accommodation, imitation, through these means, collides with the self of habit, of character, the self that seeks to dominate. It is no longer a matter of simple habit versus simple suggestion, as is the case in infancy, before the self gets the degree of complexity which constitutes it a voluntary agent. It is that form of habit which is personal agency coming into conflict with that form of suggestion which is also personal to me as representing my social self. Your example is powerful to me intrinsically; not because it is absolutely good or evil, but because it represents a part of myself, inasmuch as I have become what I am in part through my sympathy with you and imitation of you. My own inclinations to me bring out a difference of motor attitude between what is socially responsive to me, to a sense public, and that which is relatively no more, my private self.

When I come to a new moral situation, therefore, I am in a condition of relative equilibrium, or balance of two before—my personal or habitual self and my social suggestive self. Your natural inclination to attend a social gathering at the house of Mr. A may be overcome by an appeal to your family, social, public self in its broad sense, represented by an appeal to your sympathetic, narrower, social self. The new decision tends to destroy this equilibrium in re-enforcing my "copy," and its influence in my character, on one side or the other, and so to lead me out to further habit or for new social adaptations.

Now this basis comes a new mental movement which involves a further development of the imitative self—a development which substitutes warmth and life for the horrible coldness and death of that view which identifies voluntary agency with submission to a "word of command." This shift is at least very soon comes across that mass transcending in its moral environment called authority; and requires that most magnificent thing in our moral equipment called conscience. He acquires obedience in one of two ways, or both: by suggestion or by punishment.

But whether obedience comes by suggestion or by punishment, it has the genetic value; it leads to another refinement in the sense of self, at first projective, then subjective. The child finds himself stimulated constantly to deny his impulses, his desires, even his irregular sympathies, by conforming to the will of another. This other represents a regular, systematic, unflinching, but reasonable personality—still a person, but a very different person from the child's own. It is a stage of the child's apprehension of persons—beyond the regularity of personal character in the midst of the experiences that before this stood out in contrast to an irregularity of mechanical movement in things. There are processes of maturation, the child learns, which even the mother does not permit; there are extremes of severity from which even the cruel father draws back. Here, in the narrowing sense of the larger limits which set barriers to personal freedom, is the "copy," forming which is a sense of personal authority or law. It is projective because he sees and understands it, can not anticipate it, can not find it in himself. And it is only by imitation that he is to reproduce it and so arrive at a knowledge of what he is to understand it to be. He is a "copy for imitation." It is its nature may the child say to himself—and should be mine and I am unable to do so to have me obey it, act like it, think like it, be like it in all respects. It is not I, but I am to become it. Here is my ideal self, my final pattern, my thought, set before me. My parents and teachers are good persons, with all their differences from one another, they yet seem to be alike in their requirements to this law. Only in so far as I get into the habit of being and doing like them in obedience to it, get my character moulded into conformity with it, only so far as I grow. And so, like all other imitative functions, it teaches its lesson only by stimulating to

action. I must succeed in doing—he finds out as he grows older and begins to reflect upon right and wrong—if I would imitate him. But as I thus progress in doing, I forever find new patterns set for me; and so my ethical insight must always find its profoundest expression in that yearning which anticipates but does not overtake the ideal.

My sense of moral ideal, therefore, is my sense of a possible perfect, regular will taken over to me, in which the personal and the social self—my habits and my social will—are brought completely into harmony; the sense of obligation in me, in any case, is the sense of lack of such harmony—of the actual discrepancies in my various thoughts of self, as my actions and tendencies give rise to them. The friend who urges you to accept an invitation to Mr. A's reception adds to the reasons for your attendance, this one: "And, besides, you ought to go out more." This is the profoundest reason of all—not because it has in it the word "ought," merely, but because it makes appeal to the ideal self, before the law of which all the earlier claims have their lesser or greater value. And the thought of this ideal self, made objective, as it must be by the statistic of this socializing social sense, out of and beyond me—this is essential in the moral sanctions of society, and finally in that; and it is at this highest level of mental growth that the religious sentiments come fully into play.

Aesthetic Sentiment.—In beauty, the elements of the ideal seem at the outset to be most fully set forth. The simplest observation of beautiful things suffices to illustrate the necessity of both unity and variety in form. There is no beauty when unity is absolute, and it is only when arrangement is possible to a degree which allows a distinction between variety which is yet unity, which has a plan, and variety which is multiplicity, which has no plan—that any such feeling arises at all. It is equally evident, also, that meaning, significance, contributes to aesthetic effect. The beauty of a landscape is cold and formal until the stroke of a peasant's hut, or the spire of a country church, is added to give it a touch of human interest. The village green has more meaning than snow-clad Alps. And, further, we feel the essential share-ableness, universality, validity of all beauty. I expect a face to appeal to you as it appeals to me.

Nature and Origin of Aesthetic Sentiment.—Psychology seems to be tending to a view of art which emphasizes the subjective or emotional side of aesthetic. Considering pleasure the most general element in aesthetic experience, we may bring the topic under the head of Hedonics, and ask what are the marks of objects, situations, ideas, which make them suitable for arousing in us the particular kind of hedonic experience called aesthetic, i. e. what constitutes beauty?

Experiments on sensation-states—especially on the apprehension of visual forms—result in showing that whenever union of parts is effected without strain to the organ stimulated, at the same time that the elements preserve their individuality in a measure, we experience pleasure. In perception a similar principle is found, known as assimilation, to which current psychological analysis is reducing the old laws of association. When a new experience is assimilated readily to old categories—fits into the ready moulds of experience, thought, or conception—then we invariably experience pleasure, not the pleasure of pure identity, but of progressive identity of a process in consciousness. In the higher spheres we find the same fundamental movement. Conception is a process by which detached elements are arranged, brought to unity, sorted out, assimilated; an arrangement is such a scheme of notions, which go together without strain or conflict; and a beautiful character is one whose acts of will are consistent with one another, and gets assimilated readily to an ideal of duty.

The essential thing in it all—in sensation as well, in assimilation, in logical consistency—is this: Does the attention with both its intellectual and its narrow processes move easily?—that is, is the psycho-physical process impeded or advanced? If the latter, then pleasure, and aesthetic pleasure, just in proportion as the processes to which the attention ministers, all tend to give the best sense or emotion of accommodation.

The older criteria of beauty can be accounted for on this view: unity in variety, adaptation, association, meaning, or expressiveness; and it tends to put an end to the lasting controversy between "form" and "meaning."

For Wundt's facts showing that visual beauty of form is due in case of eye-movements, and Zeising's "golden section," and Bain's "associations of utility," and the "teleological judgments" of the intellectuals, and the "moral

worths" of the ethical idealists, as well as the "real beauty in objects" of the realists—all these get their due, as far as their psychology is concerned, in some such formula as this: The sense of beauty is an emotional state arising from progressive psycho-physical accommodation to mental objects. Of course the metaphysics of beauty and art is not touched by this, and it does not prejudice full metaphysical treatment.

REFERENCES.—Wundt, *Physiologische Psychologie* (4th ed.); Ward, article *Psychology* in *Encyc. Britan.* (9th ed.); Lotze, *Outlines of Aesthetics*; Marshall, *Pleasure, Pain, and Aesthetics* (New York, 1894); Baldwin, *Handbook of Psychology* (vol. ii., chaps. on *Pleasure and Pain and Emotions of Relation*). J. MARK BALDWIN.

Seoul, sā-ool' [from Korean *seul*, liter., capital], or officially *Han-yang*: the capital of Korea; on the right bank of the Han-Kang, a tributary of the Yellow Sea; lat. 37° 31' N., lon. 127° 7' W. (see map of China, ref. 4-M). It is surrounded by a wall, 12 to 25 feet high, now partly in ruins, with eight gates which are closed at night. It has three straight streets, about 60 feet wide and starting from the three principal gates. These are fairly well kept, but the other streets are narrow, uneven, and filthy. There are but two noteworthy buildings, the palace of the king and a small Buddhist temple of white stone, once richly ornamented, but now much defaced. The other buildings are small, low, thatched, or tiled, and densely peopled, and these buildings encroach on the great streets, from which they are cleared from time to time. There are no arrangements for sanitation or public comfort. A noteworthy object is the great bell which sounds the hours for opening and closing the gates. It was made in 1468 and is alleged to be the third in size in the world. The city dates from 1397 A. D.; became a royal city at the end of the sixteenth century, and was sacked by the Manchus in 1637. It is the heart of Korea in the same sense that Paris is the heart of France, and the ambition of every Korean gentleman is to pass his life there, at leisure to enjoy its attractions. It was long forbidden to foreigners, and in 1888 a fanatical outbreak against foreign residents occurred. The city was occupied by the Japanese in 1894. Pop. (by census in 1793) 163,000, estimated by Cavendish (1891) at 250,000, of whom 50,000 were in the suburbs. See Cavendish, *Two Months in Korea*, in *Scottish Geographical Magazine* (Nov., 1894), and the works mentioned under KOREA. MARK W. HARRINGTON.

Separate Baptists, Separate Churches, or Separates: See BAPTISTS and FREE-WILL BAPTISTS.

Separate Lutherans of Prussia: those Lutherans who refused to comply with the order of Frederick William III. uniting the Lutheran and Reformed Churches. See LUTHERANISM AND THE LUTHERAN CHURCH (*The Lutheran Church in the Nineteenth Century*).

Separatists: in general, those who withdraw from an established church or religious organization; sectaries. The term was commonly applied in England in the sixteenth and early part of the seventeenth centuries to those Christians who were also called Brownists and Barrowists, and later INDEPENDENTS (q. v.).

Septia: See INDIA INK.

Sept'idæ: See CUTTLEFISH.

Sep'oy [Fr. *spahi*, *cipaye*, from Hind. *sipāhī*, native soldier, from Pers. *sipāhī*, horseman soldier, deriv. of *sipāh*, whence Hind. *sipāh*, military force, army]: a native soldier in the British service in India. The practice of employing the natives as troops dates back to the middle of the eighteenth century. A large force of Sepoys took part in the battle of Plassey, and Clive afterward organized a native army in Bengal. Their good conduct inspired general confidence in their loyalty, and their numbers were increased till at the time of the mutiny (see INDIA, *History*) they were about 230,000 strong, while the European troops numbered about 40,000. After the suppression of the mutiny (1858) their numbers were reduced, and in 1894 there were 145,000 natives to 75,000 Europeans in the British army in India. The Sepoys consist of Mohammedans, Rajputs, Brahmans, and men of other castes, besides Sikhs, Gurkhas, and hill-men of various tribes. The higher officers are European.

September [viā O. Fr. from Lat. *Septem'ber* (sc. *men'sis*, month), liter., the seventh month, deriv. of *septem*, seven]: the seventh month of the old Roman year, but the ninth of the Gregorian. It is the month of the autumnal equinox, which occurs about the 22d.

Septicæ'mia: See BLOOD-POISONING.

Septima'nia [Late Lat., deriv. of Lat. *septima'nus*, pertaining to the number seven, deriv. of *septem*, seven. So called from its seven cities—Toulouse, Agen, Bordeaux, Poitiers, Saintes, Périgueux, Angoulême]: an ancient district in the southwest of France; ceded to the Goths in 419. Its name appears in the writings of Sidonius Apollinaris (490-482). It was conquered by the Saracens in 712-719; devastated by Charles Martel in 737; conquered in part by Pepin in 760; became a part of the kingdom of Aquitaine in 778; became a dukedom in 817, a marquisate in 844; and was devastated by the Normans in 859. The Spanish March was set off in 864, and soon after it passed to the house of Toulouse.

Septim'ius Severus: See SEVERUS, SEPTIMIUS.

Septuages'ima [Lat. (sc. *di'es*, day), the seventieth day, liter., fem. of *septuagesimus*, seventieth, deriv. of *septuaginta*, seventy]: in the ecclesiastical calendar, the third Sunday before Lent. The first Sunday in Lent is termed Quadragesima, the three preceding ones Septuagesima, Sexagesima, and Quinquagesima.

Septuagint, or LXX. [from Lat. *Septuaginta*, liter., the seventy, applied to this version because of the alleged number of its joint translators]: the name commonly given to the earliest Greek translation of the Old Testament, otherwise called the Alexandrian version. According to the fabulous account of its origin in the letter of the pseudo-Aristeas, repeated by Josephus (*Ant.*, xii., 2) and others, Ptolemy Philadelphus, King of Egypt from 283 (285) to 247 B. C., at the instance of his librarian, Demetrius Phaleron, sent an embassy to Jerusalem to procure from the high priest Eleazar a copy of the Jewish Law, and to make arrangements for a translation of the same into Greek for the Alexandrian Library. Seventy-two learned men were accordingly selected by the high priest, six from each tribe, and sent to Egypt with a magnificent copy of the Law written on parchment in letters of gold. They retired to the island of Pharos, where they completed the translation in seventy-two days. According to Philo (*Life of Moses*, ii., 5-7), they were divinely inspired. The legend appears with embellishments in Justin Martyr (*Hortatory Address to the Greeks*, chap. xiii. [*Ante-Nicene Fathers*, i., 278]), according to whom the translators were shut up in separate cells and worked independently, yet their several versions, being compared, were found to agree verbatim. So also Irenæus (*Against Heresies*, chap. xxi., 2; do., i., 451, seq.) and Clement of Alexandria (*The Stromata*, i., xxii.; do., II., 334). In this later form of the story the translation is made to include the whole Old Testament. All that can be inferred with certainty from this legend is the high estimation in which the translation was held by the Jews as early as the first century of the Christian era. There is no improbability in the supposition that Ptolemy Philadelphus may have procured a copy of the books of Moses for his universal library. Jews were then numerous in Alexandria. On the other hand, a translation of the Old Testament, or at least of the Law, must have become a necessity at that period to the Hellenistic Jews, to most of whom the Hebrew original, long before the Christian era, was a sealed book; and to this necessity alone it may have owed its origin.

The character of the translation proves it to have been the work of many hands. The Pentateuch is best translated. Anthropomorphisms and offensive expressions are, however, often softened; e. g. for "they saw the God of Israel" (Ex. xxiv. 10) we read "they saw the place where the God of Israel stood." The translation of Proverbs has considerable merit, and the book of Job was rendered by a man of genius, who was better acquainted, however, with the Greek poets than with Hebrew, and dealt very freely with his text. The speech of Job's wife (ii. 9) is a curious interpolation. Ecclesiastes is rendered with barbarous literalness, so as to be in some places unintelligible; e. g. Eccl. vii. 30. The prophets are for the most part poorly translated, especially Isaiah; and the translation of Daniel was so bad that the version of Theodotion was early substituted for it in Christian use, and but a single manuscript of it is known. In some books, particularly Jeremiah, a recension of the text was followed differing from our present Hebrew; to others, as Esther and Daniel, apocryphal additions were made. The version contains all the books commonly printed in the English Apocrypha of the Old Testament, except the second book of Esdras. Some manuscripts and editions add a third, others a fourth book of Maccabees.

As to date, the time assigned by the pseudo-Aristotle for the invention of the Pentateuch has nothing against it; and even a passage in the Prologue to Deuteronomy, which alludes to a Greek translation of "the Law and the Prophets," and the fact of the books, it seems probable that the collection of books had assumed something like its present form before 120 B.C.

In the controversies between Jews and Christians in the second century it was found that the LXX. could not be read on as an accurate representation of the Hebrew. Older translations were accordingly made, of which the principal were—(1) that of Aquila in the first half of the second century, slavishly literal; (2) of Theodotion, issued as the LXX., but aiming at greater fidelity; and (3) that of Symmachus, distinguished by greater freedom and elegance. These were presented in parallel columns, together with the Septuagint and the Hebrew text (in Hebrew and Greek characters), in the *Hexapla* of Origen in the first half of the third century; in the Septuagint column words and phrases not in the Hebrew were marked with an obelisk or some other sign as false, and words in the Hebrew not represented in the translation were added from one of the other versions, generally Theodotion, with an asterisk prefixed. Origen's *Hexapla* as a whole was never copied, and probably perished in the destruction of the library of Pamphilius at Caesarea in Palestine. Copies were taken, however, of the Hexapla text of the LXX., parts of which have come down to us in various manuscripts, and also in a Syriac version. The best edition of the remains of the *Hexapla* is that by Field (Cambridge, 1807-75, 2 vols. 4to).

The Septuagint has had a wide influence. It was habitually used by Philo and Josephus, and very often quoted by the New Testament writers. Most of the ancient versions of the Old Testament were made from it, as the Old Latin, Syriac, Gothic, Ethiopic, Armenian, Slavonic, etc. Even all its faults, it has been the only representative of the Old Testament to the Greek or Eastern Church from the beginning, and a knowledge of it is essential to one who would understand the language of the Christian Fathers and the history of theological opinions. From no other source is so great illustration to be derived of the peculiar views of the New Testament. It has also considerable value as a help in the criticism of the Hebrew text.

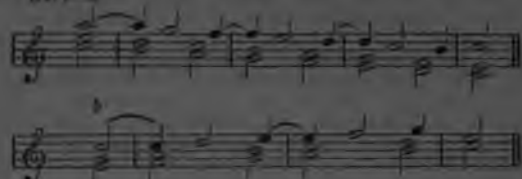
The text of the LXX. became early corrupted, and the Hexapla edition of Origen increased the corruption, his obelisks and asterisks being often omitted or misplaced by scribes. Existing manuscripts differ considerably, and the correction of the text is a difficult problem. The primary sources of the LXX. are—(1) that contained in the Complutensian Polyglot (1514-17; published 1592); (2) the Aldine (Venice, 1519); (3) the Roman, Vatican, or Sixtine (Rome, 1587 fol.), founded largely on the Vatican manuscript of the fourth century; and (4) that of Græce (Oxford, 1707-30), the best of which was the Alexandrian manuscript. The edition of Bæ (Vindobonæ, 1793, 4to) exhibits the Roman text with the variations of the other three editions; and the great edition of Holmes and Parsons (Oxford, 1796-1827, 5 vols. fol.) gives the same text, with the various readings of more than 600 manuscripts collated for it at great expense. The text of nearly all the oldest manuscripts of the LXX. (fourth to ninth century), as the Sinaitic, Vatican, Alexandrian, etc., has since been accurately published, but no critical edition exists in which these rich materials have been judiciously used. Most useful, the most convenient manual edition are those of Tischendorf (8th ed. Leipzig, 1875) and Griesbach (Cambridge, 2 vols. 1887-94), the best; cf. *Introd. to Septuagint, Greek and English* (London, 1870, 8vo), giving the Roman text with Brenton's translation in parallel columns. The concordance to the Septuagint by Trappesius (Amst., 1716, 9 vols. fol.) will be superseded by that of Edwin Hatch and Henry Adeney Rodpath (Oxford, 1888 seq.); there are lexicons by Diel (The Hague, 1779-80, 4 vols.) and Schleusner (Leipzig, 1820-21, 5 parts, or Glasgow, 1822, 3 vols.). The principal works on the version are of long standing—e.g. the classical work by H. Hody, *De Septuaginta* (Oxford, 1703, fol.); H. G. J. Thiersch, *De Hist. Pers. Alex.* (Helmstadt, 1841), excellent in regard to the language; K. Frankel, *Historisch-Kritische Studien über Septuaginta* (Leipz., part 1 [all pale], Leipzig, 1841); and A. Tölgner, *Verbreitung u. Uebersetzungen d. Bibel in ihrer Entwicklung aus der innern Entwicklung des Judentums* (Gießen, 1897). Cf. *Hebrew, Jewish People in the Time of Jesus Christ* (Eng. trans., second division, iii., 159-168).

Edw. Kewer. Revised by S. M. Jackson.

Septuaginta: See FORTALIS.

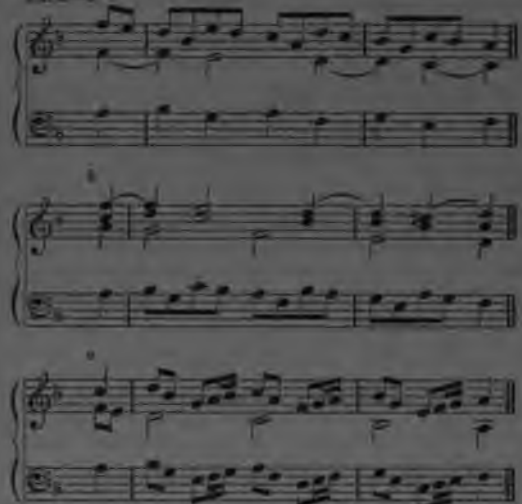
Sequense (vulg. O. Fr. from Lat. *sequens*, a following, deriv. of *sequi* (pres. partic. *sequens*, *sequens* (de), follow); in music, a peculiar chain-like progression, in which a short musical figure or group of notes is repeated several times on successive steps or degrees of the ascending or descending scale. As a sequence is thus only a group placed one degree higher or lower at each repetition, it can have (in itself) no proper termination, but may be continued indefinitely or through the whole range of the scale. One of the simplest forms of sequence is that made by a chain of thirds and sixths, with each sixth suspended by the seventh, as at *a*, Ex. 1; or with a suspension of the sixth by the fifth, as at *b*:

Ex. 1—*a*



In sequences the leading trait or figure may lie in the treble, the bass, or one of the middle parts, or in any two or more of the parts together. In Ex. 2 the most forcible expression of the sequential idea is found in the treble at *a*, and in the bass at *b*, while at *c* it appears in the treble and bass combined:

Ex. 2—*a*



Sequences are of infinite variety, and occupy an important place in fugues, organ-pieces, and instrumental compositions of almost all kinds, furnishing a grateful relief to the ear, and awakening certain emotions which seem peculiar to progressions of this class. Those given in the above examples are founded on the diatonic scale, but many of the richest sequences derive their beauty from the peculiarities of the chromatic scale, and are sometimes exceedingly elaborate and complex.

Revised by DUDLEY BUCK.

Sequin [= Fr. from Ital. *sechino*, later, dimin. of *secco*, mint, from Arab. *sakka*, die, stamp]; a name applied to various Italian and Levantine coins. The original sequin was a Venetian gold ducat of the thirteenth century.

Sequoia (Mod. Lat., named in honor of Sequoyah, the Cherokee Indian who invented letters for his people); a genus of coniferous evergreen trees of the sub-order *Cupressaceae*, or cypress family, remarkable for the great size which they attain, being the "redwoods" and "big trees" of California. They are natives of California only, and of two species—*S. sempervirens*, the true redwood, confined to the Coast Ranges; the other, *S. gigantea*, properly called big tree or rarely mammoth tree, restricted to the western slope of the Sierra Nevada. The Pacific forest-belt produces large trees generally, but the sequoias surpass in girth, if not in height, the sugar-pines, Douglas spruces, etc., with which they are associated. They are distinguished at sight from other trees by the peculiar fibrous bark of a rich cinnamon-brown color.

The nearest relative of the genus is *Taxodium*, which is represented by the bald cypress of the southern Atlantic U. S. and Mexico. The foliage of the two species is strikingly different. The leaves of the redwood resemble those of the yew, being spreading and arranged comb-like on two sides of the branchlet; the cones are the size of a hazel-nut. The leaves of the big tree are smaller, awl-shaped, and closely oppressed to the branchlet; the cones of the size of an English walnut. The wood of the redwood is light, but firm, straight-grained, and handsome, although the rich brownish-red color fades on exposure without protection, while, like most of the cypress family, it is very durable. Only the redwood, which occurs in large quantities, affords a material of commerce, being lumbered on a large scale, and used for construction, interior finish, railway ties, etc.; the available supplies are being rapidly exhausted by the wasteful methods of lumbering. The tree is tenacious of life, the stumps even of the oldest trunks long retaining their vitality at the circumference, and sprouting into a circle of fresh young shoots, in which it differs from most other conifers. This tree (the redwood) occurs along the west slope of the Coast Ranges from Monterey Bay to the Oregon line, but is most abundant N. of San Francisco Bay up to lat. 40°. Where the redwood abounds it forms forests almost by itself. There are trees from 50 to over 75 feet in circumference and from 200 to 275 feet in height, and credible accounts are given of still larger ones. Archibald Menzies was the first botanist to collect specimens of the redwood (about 1810). They remained undescribed until 1832, when one of these specimens was figured by Lambert, and named *Taxodium sempervirens*. Soon after the tree was made known to botanists by David Douglas; in 1847 Endlicher founded upon it the genus *Sequoia*.

S. gigantea, the big tree, appears to have been first discovered in the spring of 1852 by a white hunter named Dowd, who reached the Calaveras grove. Specimens reached the Atlantic States and Europe in 1853, and Lindley first described the species as *Wellingtonia gigantea*, on Dec. 24, 1853; a figure of it also appeared in 1854 in *The Botanical Magazine*. The Californian botanists proposed to call it *Washingtonia californica*, and under this name it was published in the *California Farmer* in 1854. Meanwhile Dr. Torrey determined that this tree was of the same genus as the redwood—i. e. *Sequoia*—notwithstanding the difference in foliage, a conclusion announced also by Dr. Asa Gray in *The American Journal of Science* for Sept., 1854. Prof. Decaisne in Paris had already taken the same view, assigning the name *Sequoia gigantea*, which the tree now bears, as early as June 1854. (*Bull. Soc. Bot. France*, i., 70.) The name *Sequoia wellingtonia*, proposed by Seemann in 1855, is therefore antedated by *S. gigantea*, which must stand.

Although in general of greater size than the redwood, this tree is not so handsome. The branches are short, the spray less graceful. The wood is similar, but of a duller reddish hue. This species nowhere forms a forest by itself, but is mixed with other coniferous trees, mainly sugar-pines, and generally occurs in detached "groves." Its range in latitude is only between two and three degrees, in longitude being confined to a narrow belt on the western slope of the Sierra Nevada; its vertical range is restricted between 4,760 feet (at the northernmost locality) and 7,000 feet.

There are some twenty groups or groves segregated and named. The most northern grove known is situated in Placer County, 50 to 60 miles N. of the two groves, first discovered and most accessible in Calaveras County. The North Calaveras grove, covering 50 acres, contains ninety-three trees, of which four are over 300 feet high, the tallest standing, called the Keystone State, being 325 feet, and its diameter, 6 feet from the ground, 45 feet. Between these groves and the Merced river are two or three patches of big trees (Tuolumne and Merced grove), but none of great note until the Mariposa grove is reached. This is 16 miles S. of the Yosemite valley, and is in two patches, the lower one at 5,500 feet containing about 125 large-sized trees, one of the largest being the Grizzly Giant, over 93 feet in circumference at the ground, and over 64 at 11 feet, which is measured above the bulge of the trunk, characteristic of the cypress family. Most of these trees have been sadly injured by fire. About a dozen miles S. of this grove is the Fresno grove, said to contain about 600 trees, the largest 81 feet in circumference. From this district S. to the Tule river, but at greater elevations, trees appear to be more abundant than elsewhere, and more widely dispersed through the forest. The Dinky, King's river, New King's river, and Kaweah

having been named. The age of sequoias was formerly estimated as high as 4,000 to 6,000 years, but countings of an-



FIG. 1.—Grizzly Giant, "Wawona," 275 feet high, 28 feet diameter.

nual rings reduce the age of the oldest to between 2,000 and 2,500 years, most of them probably below this. Authentic accounts of the trees are to be found in J. D. Whitney's *Yosemite Book*, and in the writings of Muir, Clarence King, Lemmon, and others. See also *Garden and Forest*, especially vol. iii., p. 573, for a map of the groves.



FIG. 2.—Section of a big tree, 92 feet in circumference.

Both species seem to require for their success the humid atmosphere of the region in which they occur. They thrive well, however, in many parts of Europe, especially in England and Ireland. Several trees of the *Sequoia gigantea*, over 40 feet in height, are to be found in Rochester, N. Y. In former ages, seven or eight species were in existence and distributed over a large part of the world, especially in the Tertiary period, when it occurred all around the Arctic zone, and in Europe, as far S. as Greece. B. E. FERNOW.

Sequoyah: See GUESS, GEORGE.

Séracs: See GLACIERS.

Seraing, se'rañ': town; in the province of Liège, Belgium; on the Meuse; 4 miles by rail S. W. of Liège (see map of Holland and Belgium, ref. 10-G). It has large manufactures of steam-machinery, locomotives, iron goods, and mirrors, and has rich coal mines in its vicinity. Pop., with the commune (1891), 32,912.

Serapheus. See **SARAPHEUS**.

Seraphim. See **SARAPHEUS**.

Serampore. town, in Bengal, India, on the Hooghly, in lat. 22° 45' N., lon. 88° 20' E., 15 miles below the town of Hooghly; a neat and well-built city, European in style, extending for about a mile along the right bank of the river, and two large manufacturing of paper (see map of N. India, vol. 1-4). It was originally a Danish settlement, founded in 1755 but was sold in 1846 to Great Britain. Under Danish rule Serampore did not prosper. It was the seat of the first Protestant missionary establishment in Hindustan, founded there in 1813. Pop. (1891) 35,042.

Revised by M. W. HARTWORTH.

Serapeum (= *Lake Lake* = Gr. *Serapeion* or *Apollonion*), a temple of Serapis, deity of *Zeus*, *Serapis*; the name given to the collective temples and tombs of the Apis bulls and Serapis, at Memphis in Egypt. The site, now covered by about 60 feet of sand, is in the N. of the group of pyramids of Saqqara, and the present remains are all subterranean. They were explored by Mariette in 1851-52 and all except two of the Apis-serapeutic were found to have been sealed. Several mummies of Apis-bulls, taken from the serapeum earlier in the century, are preserved in the Universal Museum in New York. The earliest remains found in the Serapeum date from the reign of Amenemhat III. of the eighteenth dynasty, and the Apis-tombs of the last of succeeding reigns down to the thirteenth year of Ramesses II. form a class by themselves. Each Apis had its own separate chapel, which was connected by an inclined passageway with a single rock-hewn chamber, where the mummy-serapeutic of the Apis-bull was placed. In the following period, which lasted till the time of Psammetichus I. of the twenty-sixth dynasty, the tombs were arranged in two separate chambers on either side of a gallery about 330 feet long. This gallery and its chambers early fell into ruin, and are inaccessible. They were replaced by Ptolemaic tombs with a larger series of galleries, which aggregate 131 feet in length, and average 10 feet wide and 17½ feet high. Enclosed therewith are sixty-four chambers (26 feet high) in the rock and now accessible. They still contain twenty-four large sarcophagi, each of which measures 4 feet in length, 11 feet in height, and 7 feet in width, and is reported to weigh 65 tons. Only three are inscribed. The contents of the Serapeum above ground seems to have been built after the general plan of Egyptian temples, with two pylons, courts, and inclosures. Before it was a dromos and avenue of sphinxes which led directly to the Greek Serapeum, which was a Greek temple with cells and pronaos, and was adorned with two Corinthian columns. The importance of Mariette's discovery consisted mainly in the fact that some 500 historical monuments were found in the shape of obelisks and statues erected by pilgrims, who gave the name of their pious visits. In this way many data were obtained for fixing the length of reigns and succession of various Pharaohs.

According to the *Antiquities Hieroglyphic*, another Serapeum was located near the present line of the Suez Canal, at a point overlooking the Bitter Lakes. The Serapeum at Alexandria, erected by the Ptolemies, was probably in the form of a Greek temple, and was dedicated to the god in a way that was Greek-Egyptian. In the same building was the Alexandrian library, and both perished together after the edict of Theodosius, about 390 A. D.

CHARLES R. GILBERT.

Seraph, plur. **Seraphim** [from Heb. *seraphim* (plur.), *seraph*, of *seraph*, burn] a word which occurs but twice in the Bible (Isa. vi, 2, 6). The seraphim are described as creatures, human in appearance, with six wings, symbolical of the "devouring fire" of Jehovah's holiness.

Seraphic Heathen. See **PHARISEAN**.

Seraphim, Order of the, in Sweden and Norway, a military order founded in 1280 or 1285 by Magnus I., King of Sweden, or, as others say, by Magnus II. in 1334. Charles IX. abolished it about 1610, and Frederick I. re-established it, Feb. 11, 1748. The bishop of the Seraphim, the holder of the order, belongs to the national Lutheran Church.

Serpapla (= Lat. = Gr. *Serpapla*, *Serpapla*, from Egypt. *Serpapla*, *Serpapla*, *Serpapla*) an Egyptian deity, ostensibly a combination of Osiris with the Apis, the bull sacred to Isis, an incarnation of Osiris, which symbolized the "perpetual regenerating power of the god." In some con-

ceptions the Apis was associated with the moon. His native name, *Hapi*, belonged also to the Nile, which fertilized the land at the inundation, and to the cyncephalous deity of the dead, who represented the principle which revived the dead. In the later conception the deity bore a mixed character, and was Greco-Egyptian, combining in one the Greek Pluto and Esculapion and the Egyptian Osiris. The Apis-bull, which was the basis of the Serapis worship, was thought to have descended from a cow that had been impregnated by a ray of the moon. He must have distinctive marks: A triangular white spot on his forehead, a scab-like growth beneath his tongue, a white vulture or eagle and a scorpion on his flank and haunches, and a tail with both white and black hair. The discovery of an animal that possessed these features was greeted with universal joy, and its death with an universal mourning. He was kept with greatest care in a temple (the Apion) at Memphis, where he received divine honors. When he died he was carefully mummied, and buried with great pomp and expense in the Egyptian Serapeum (q. v.). His emblem was a bull with the sun-disk and uraeus serpent between his horns. The worship of the Apis began early; it is said to have been taken from Heliopolis to Memphis in the second dynasty, and Apis-worship is mentioned as early as the fourth dynasty. In pure or mixed form it continued throughout Egyptian history, and was transferred to other lands. Alexander the Great and the Roman Titus paid honors to the Apis of Memphis. According to Strabo (*Geogr.*, xvi, 1, §§ 10, 25), the worship of Serapis was also practiced at Alexandria, and at the river mines near Naucratis in the region which the Greeks called Nitria or Nitriotes. His worship spread also to other countries, and in 82 A. D. Domitian built a temple in his honor at Rome.

CHARLES R. GILBERT.

Serena, Lat. capital of Cognac (q. v.).

Seres (= Lat. = Gr. *Sēra*; cf. Chin. *ser*, *ser*, *ser*, *ser*, *ser*, *ser*); Greek and Roman name for a people of Eastern Asia, without doubt the Chinese. See **CHINA**.

Seres (Lat. *Sericeum*; Gr. *Sēra*); town, in the vilayet of Salonika, European Turkey; the center of the Turkish cotton culture; and trade (see map of Turkey, ref. 4-5). Here the cultivation of the silkworm was introduced by Justinian (530). Two monks brought the eggs of the worm from China in a hollow walking-stick. Pop. 20,000 (19,000 are Greeks, 9,000 Ottomans, and 3,000 Jews).

R. A. G.

Serf [from O. Fr. *serf* < Lat. *servus*, slave; cf. Eng. *servant*]; a person held in a modified form of slavery, bound to the soil and without rights as against his master, who could not, however, sell him like a chattel slave. During the Middle Ages serfdom formed one of the most prominent elements of the existing social order. It originated from the slavery of the ancient republics, and was transformed by the unearring influences of Christianity and feudalism. Slavery existed among the Germanic tribes, who reduced their captive enemies to that condition, but after the invasion of the Roman empire these slaves or thralls were raised to the position of serfs, whose numbers were greatly increased by the addition of the native population of the conquered districts. Then, too, the frequent famines and the need of protection from enemies drove many to sell themselves to the more powerful, especially to churches and monasteries. While the institution of serfdom differed both in origin and in character in the different countries of Europe, it was generally true that the condition of the serf was far superior to that of the slave under Roman law.

It is probable that the mastership which the feudal and ecclesiastical lords exercised over their serfs was for centuries felt as a blessing rather than as a burden; for the feudal system was indeed, up to the tenth century, the main support of social order, the condition of life. In countries into which feudalism did not penetrate, such as Italy, no serfdom was developed; here the peasants, the population of the agricultural districts, entered the grades of the city republics in which they belonged, and their position as citizens was not very different from that of the burghers. In England before the Norman conquest a large part of the population were in a state of serfdom, the *thengs* being the lowest in the social scale and approaching the condition of a slave, while the *eorls* could not be bought or sold and enjoyed some personal rights. With the conquest the *thengs* disappeared and the *eorls* became the Norman *villens*, whose condition was an improvement on that of his Anglo-Saxon predecessor. If maltreated by his master he might have a hearing in the king's court, and he enjoyed the full protec-

tion of the law against strangers, but he could not own property, and could be sold with the land which he tilled. The terms *serf* and *villain* are used almost indiscriminately of the non-freemen, though originally the former term signified a lower order of bondman.

The abolition of serfdom in Europe was a gradual process. In England it gradually disappeared during the fifteenth and sixteenth centuries. It is mentioned for the last time in 1574 by a commission issued by Queen Elizabeth for its abrogation in the counties of Cornwall, Devon, Somerset, and Gloucester. In France, where both Louis IX. and Louis X. had sought support in the serfs against the feudal counts, serfdom was maintained, often in very harsh forms, up to the Revolution. In Denmark it was abolished in 1784 by Frederick VI., at that time heir-apparent only, but actually governing instead of his insane father; in Prussia in 1808 by von Stein; in Hungary in 1848 by the revolutionary anti-Austrian Diet; and in Russia in 1861 by Alexander II. See SLAVERY.

Revised by F. M. COLBY.

Serge [viâ O. Fr. : Ital. *sargia* < Lat. *se'rica*, silken garments, liter., neut. plur. of *se'ricus*, silken, deriv. of *se'res*. See SERES]: a name applied to various twilled fabrics. Silk serge is a coarse and strong material used for lining coats, making light shoes, etc. Woolen or worsted and woolen serges are made for ladies' cloaks and other uses. Some kinds of coarse serge are employed for making the garments of certain ecclesiastics. Other finer kinds are in some countries used exclusively for shrouds.

Sergeant [viâ O. Fr. *serjant* : Ital. *serviente* < Lat. *serviens*, *servien'tis*, servant, vassal, soldier, liter., pres. partic. of Lat. *servi're*, serve]: a non-commissioned officer (i.e. an enlisted soldier holding an appointment from the colonel authorizing him to exert a limited authority over his fellow soldiers) in the army and marines, of a rank higher than that of corporal. Each infantry company has a certain number of sergeants, one of which is of higher rank and pay than the rest, and is called first sergeant. Each battalion (or regiment, if, as in the U. S., it has but one battalion) has a sergeant-major, who is the highest non-commissioned officer of the battalion. He is the executive officer of the adjutant, and superintends the making out of details and the performance of other camp duties for the adjutant. There is also a quartermaster-sergeant to each battalion. In the U. S. service a number of quartermaster and commissary sergeants not attached to battalions, and the ordnance sergeants, whose duty relates to the care of ordnance, arms, ammunition, and military stores at the posts to which they are attached, are provided for by law to be selected from sergeants of the line who have served for a certain length of time as privates and non-commissioned officers.

Revised by JAMES MERCUR.

Sergeant, JOHN, LL. D.: lawyer; son of Jonathan D. Sergeant, lawyer; b. in Philadelphia, Pa., Dec. 5, 1779; graduated at Princeton 1795; was admitted to the Philadelphia bar 1799; was appointed a commissioner of bankruptcy 1801; was subsequently deputy attorney-general of Pennsylvania; sat several times in the Pennsylvania Legislature; was member of Congress 1815-23, 1827-29, and 1837-42; was the leading representative of the Northern States in advocating the passage of the Missouri Compromise Act 1820; was minister to the Panama congress 1826; Whig candidate for the vice-presidency on the ticket with Clay 1822, in which year his *Select Speeches* were published; president of the Pennsylvania constitutional convention 1830; declined the mission to England 1841; for half a century was regarded as one of the leaders of the Pennsylvania bar. D. in Philadelphia, Nov. 23, 1852.

Sergi, sār'jō, GIUSEPPE: psychologist and anthropologist; b. at Messina, Sicily, Mar. 22, 1841; educated at Messina; became Professor of Philosophy in lyceums at Messina and Milan; in 1880 Professor of Anthropology in the University of Bologna, and in 1884 professor in the University and director of the Institute for Anthropology at Rome. His principal works are *Elementi di Psicologia* (Messina, 1879); *Teoria fisiologica della Percezione* (Milan, 1881); *L'origine dei fenomeni psichici* (Milan, 1885); *Psychologie physiologique* (French trans., Paris, 1887); *Principi di psicologia*, vol. i., *Dolore e Piacere* (Milan, 1894); together with many anthropological memoirs. J. MARK BALDWIN.

Sergipe, originally **Sergipe del Rey**, sār-zheep'-ā-dāl-rā': an eastern maritime state of Brazil; between Bahia, Alagoas, and the Atlantic. Area, 15,090 sq. miles. The interior

is included in the Brazilian plateau, which is here low, much broken, and has little forest; a broad belt of lowland is separated from the ocean by extensive sand-dunes. The great São Francisco River (q. v.) forms the northern boundary; aside from it the state has only a few insignificant streams, and the mouth of the São Francisco forms the only harbor. The climate is dry and much of the land is unfit for agriculture; the best is in the coast belt and on the edge of the plateau, where sugar and cotton are cultivated. In the interior cattle-raising is the principal industry. Sergipe is the smallest and one of the least populous and progressive of the Brazilian states. The exports are hides, sugar, cotton, tobacco, and a little gold obtained from surface-washings. Pop. (1894) estimated, 261,991. Capital, Aracajú, a small town on the coast. H. H. SMITH.

Sericulture: See SILK.

Series [from Lat. *se'ries*, connection, row, succession, series, deriv. of *se'rere*, join, bind together]: in mathematics, a succession of terms whose values proceed according to some law. The most familiar examples are the progressions of elementary algebra, called respectively arithmetical and geometrical progression. A series may terminate at a certain term, but more commonly it may be continued without end. In the latter case it is called an *infinite series*. The above-mentioned progressions are examples of infinite series, because either of them, when once started, may be continued indefinitely.

An infinite series may be either *convergent* or *divergent*. A convergent series is one the sum of all of whose terms approaches a certain limit if the series is continued indefinitely. A familiar example of this is afforded by a decreasing geometrical progression. Students of algebra know that the progression

$$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \text{etc.}, \text{ ad infinitum,}$$

will approach 2 as a limit, always differing from that limit by a quantity equal to the last term included in the addition, which term may be made as small as we please by continuing the series.

A divergent series is one the sum of whose terms does not thus approach a limit. A series may be divergent in two ways; the sum of the terms may increase beyond all limit, when their number becomes infinite, and may therefore be called infinity. But the sum may also be continually larger and smaller, without increasing indefinitely. Such a series is

$$1 - 1 + 1 - 1 + \text{etc.}$$

The sum of this series will always be either 0 or 1, according as the number of terms added is even or odd. It is therefore called divergent.

Series are of very extensive use in advanced mathematics, especially in the applications of algebraic methods, because of the great number of quantities which can not be expressed in any other way. Quantities expressed by a series are said to be developed in a series, and if the series is convergent their true values can be found with any degree of accuracy by taking a sufficient number of terms. But if the series is divergent the development is made is divergent, it can not represent the quantity. S. NEWCOMB.

Serinagur: city of Kashmir. See SRINAGAR.

Seringapatam: city of Southern India and formerly capital of Mysor; on an island in the Cavery, in lat. 12° 25' N., lon. 76° 48' E. (see map of S. India, ref. 6-D). Under Hyder Ali and Tippoo Sahib its fortifications were strengthened, and although unhealthy it had 300,000 inhabitants. In 1799 it was conquered by the British, and now it has less than 12,000 inhabitants, and these mostly in the suburb of Ganjam. M. W. H.

Sermon: See HOMILETICS and HOMILY.

Serous Membrane [*serous* is deriv. of *se'rum*. See SERUM]: in the human body the membranous walls of the arachnoid, pleural, pericardial, and peritoneal cavities, and the investing membrane of the testis. Serous membranes in all instances, save the peritoneum in women, are closed sacs, with their opposed walls more or less in contact, but lubricated by secreted serous fluid, so as to permit of free motion. The serous membrane is therefore a contrivance of nature to insure the freedom of the large organs of the body in the limited movements incident to their functional activity. The movements of the heart, lungs, and intestines, the more limited increase and decrease of size of the brain, and the considerable friction of the joints are facilitated and made easy by the well-lubricated serous mem-

bones covering these structures. In certain parts the recesses of the ventral surfaces serve as ligaments to hold the organs in their proper places. (See *Herpetology*.) The tissues of serous membranes are chiefly inflammatory, and often involve the underlying internal organs. Hence they are usually very grave. Acute meningitis, acute pleuritis, acute involving the lung also, pleuro-pneumonia, pericarditis, and peritonitis, all are attended with danger, and often are fatal.

Revised by WILLIAM PIERCE.

Serra Pinto, ALEXANDRE ALBERTO DA ROCHA: explorer; b. in Portugal, Apr. 30, 1848; entered the army, and as major led a Portuguese scientific expedition (1877-79) from Angola to the Transvaal. His *How I Crossed Africa* (1881) appeared in several languages. In 1884-86, with Cardozo, he led another expedition, extending Portuguese influence to Moçambique to Lake Nyasa.

Serpent: a musical wind instrument of brass invented by Sébastien Trillardeau of Auxerre in 1599. It has a cylindrical bore, is composed of a mouth-piece, a neck, and a tail, and has six holes stopped with the fingers, with a compass from B flat below the bass staff to G, the treble-clef line.

Serpentine (named from its mottled yellow and green colors, thought to resemble those of the skin of certain serpents): a rock chiefly composed of hydrous magnesium silicate. Minerals associated with it may be calcite, dolomite, iron oxides, pyrite, amphiboles, pyroxenes, olivine, etc. The rock is usually green in various shades, often quite dark; sometimes broken or red. The mottling is due to the admixture of other minerals. White spots are usually due to calcite or dolomite, the rock being called ophiolite or ophite.

See *serpentine* in the name of any serpentine marble. Red, brown, and dusky shades are due to the presence of iron compounds.

Serpentine occurs in large bodies interbedded with limestone and various crystalline schists in veins, dikes, or irregularly shaped masses, traversing other rocks in the same manner as igneous rocks. In most cases it can be shown to have resulted from the decomposition of magnesium silicates, chiefly olivine and pyroxenes. Many occurrences are slightly altered igneous rocks rich in magnesia. The origin of those serpentines which are associated with the crystalline schists is not so evident. In some cases they are altered forms of magnesium silicate minerals, possibly from argillaceous rocks or volcanic tuffs associated with rocks subsequently metamorphosed. In others they may have resulted from the alteration of magnesium carbonate into a hydrous silicate.

Serpentine is widely distributed throughout the world. On account of its color and its susceptibility to high polish it is much employed for ornamental purposes, as well as for general building. Details of its occurrence and data of economic importance may be found in Merrill's work, *Stones for Building and Decoration* (New York, 1891). See *Brunner*, J. P. *Innomis*.

Serpent of Delphi: a column of Corinthian brass, fashioned by representing three intertwined serpents, and consecrated by the Greeks to the god Apollo after the battle of Plataea (479 B. C.). It was taken to Constantinople by Constantine, and has stood ever since in the Atmeban, the ancient Hippodrome. The heads and upper portion have been broken off, but the mutilated base still remaining is 164 feet high. The names of nineteen of the Greek cities which refused Xerxes may be distinctly discerned, cut deep in the metal not later than 478 B. C. The twelve other names have not been almost obliterated. No more precious monument of Greek antiquity exists. See *Grosvener*, *The Remains of Constantinople and its still existing Monuments* (London, 1899).

E. A. GROSVENER.

Serpents [Gr. *Ophi*, from Lat. *serpens*, liber, pres. partic. of *serpere*, creep; *Ophi*, from *Sin*, *serp*, *crep*, *crawl*, *glide*, *move* (see *deris*, *serp*, *serpent*); the *Ophi*, an order of snakes. They are recognized by the absence of true external scales, and their very elongated body, which regularly graduates into the tail, there being no abrupt distinction between the two; the back and sides have generally imbricated scales. These scales are rarely granular, while the lower surface is generally covered in front of the anus with a row of very broad plates, and behind the anus with usually two, sometimes one, row; sometimes, as in the sea-snakes of the genus *Platyrhina*, the scales extend upon the abdomen as well as on the sides and back; the head is covered with plates. The principal characteristics of the order, especially as given

by Prof. Huxley, are as follows: the premaxillaries are generally rudimentary, and represented by a single small bone, which is connected with the maxillaries only by fibrous tissue; the palatine bones never unite directly with the vomer or with the base of the skull, but are usually connected with the maxillaries by transverse bones, and by the pterygoids with the movable quadrate bones; thus the connection of the palatine-maxillary apparatus with the rest of the skull is more or less lax, and in the typical species exceedingly so; in certain worm-like forms, however, this is not the case; the lower jaw has its ramus connected at their symphysis, generally by ligamentous and extremely elastic fibers, the result of the mechanism exemplified in the typical serpents is that the mouth-piece are extremely distensible, and hence prey of much greater diameter than that of the serpent in its ordinary condition can be ingested. The teeth are acute, and directed more or less backward, and are generally developed simply upon the maxillary, palatine, and dentary bones; in one genus (*Rhachiodon*) the inferior spines of eight or nine of the anterior vertebrae are developed into tooth-like processes tipped with enamel. In the specialized poisonous species poison-fangs only are developed on the maxillaries, the roots on the palatines and dentaries existing as in the typical species; in an intermediate type, containing very poisonous species, there are also rows of teeth behind the poison-fangs. The vertebrae have ball-and-socket articulations and each of them bears ribs, with the exception of the first one or two, which may be considered as cervical. Anterior limbs are absent in all forms, but the posterior are in some types represented by rudiments which appear externally as hooks on either side, and a little in advance of the vent. The lungs are unequal in size, and in the typical forms the disparity is very great, the left one usually being the smaller of the two; sometimes (especially in the venomous species) only one of the lungs is developed: the form of the lungs is that of an elongated sac, in which the walls are produced into numerous septa "which render the cavity highly cellular near the bronchus, while at the opposite end they become smooth and but little vascular; in this latter region the lung may receive its blood from the systemic, and not from the pulmonary, circulation." The bronchus opens directly into the lung. The heart is divided into two auricles and a single very imperfectly separated ventricle.

The movements of serpents are often misconstrued. They progress by sinuous flexures from side to side, and are incapable of the vertical undulating movements which are sometimes ascribed to them in pictorial illustrations. Progression is greatly facilitated by the transverse plates with which the abdomen is covered. Many serpents are also capable of ascending trees, and vertical surfaces; but they are unable to progress on polished or glass-like surfaces. Some live in marshy regions, some in rocky, some on sandy desert plains, others among the trees, and still others burrow in the earth; again, some frequent fresh waters, while a few are even modified for swimming in the ocean. These sea-serpents, the *Hydrophidæ*, are not to be confounded with the mythical sea-serpents (see *Ska-sa-sa-sa*), for they are comparatively small species, with the tail strongly compressed and adapted for swimming, and with small poison-fangs. The *Solenophidæ*, in part at least, burrow in the earth, and thus by their habits, as well as form, justify the term of worm-like snakes.

Most serpents are oviparous, and lay eggs whose shell is generally more or less soft and yielding, but which have, at the same time, a greater or less amount of lime; and sometimes this is developed in sufficient quantity to give a considerable rigidity to the shell; other serpents are ovoviviparous. The innocuous species are generally oviparous, and the venomous ovoviviparous, but the exceptions are numerous. The eggs are generally extruded in a chain, being connected by a viscid substance. In most cases the mother, after laying her eggs, leaves them to be hatched by the sun or decaying vegetable matter, but some species—the pythons, for example—coil themselves around the eggs and thereby hatch them. Many species go with their young for some time after birth, and protect them from enemies. It has been well ascertained that with some species the parent opens its mouth at the approach of danger, and receives therein its young, which are afterward allowed to depart therefrom unharmful.

The venomous serpents belong to the *Proteroglyphæ* and *Solenoglyphæ*, the first including the *Elapidæ* (coral-snakes, etc.), *Najadæ* (cobras, etc.), and the second the *Viperidæ* (vipers) and *Crotalidæ* (rattlesnakes, etc.).

The order is represented by over 1,500 living species. The

representatives of the order as a whole live in hot regions, and are averse to cold. They are absent altogether in the extreme northern and southern countries, and sparingly developed and hibernating during cold weather in the temperate regions, but almost equally abundant in the tropical regions of the several quarters of the globe. In the northern part of the U. S. only three species of the poisonous snakes (the scale-headed and plate-headed rattlesnakes and the copperhead) occur, and the greatest number in any one region within the U. S. are found in Arizona and New Mexico. See POISON OF SERPENTS and the names of different genera and species.

Revised by F. A. LUCAS.

Serpent-stars: See OPHIUROIDEA.

Serpent-worshippers: See OPHITES.

Serpukhof: town; in the government of Moscow, Russia; on the Nara; 57 miles by rail S. of Moscow (see map of Russia, ref. 7-E). It has a fine cathedral of the fourteenth century, and manufactures of linen fabrics of different descriptions, mostly coarse; also leather, paper, earthenware, and furniture. Pop. (1888) 22,718.

Serpula [Mod. Lat., from Lat. *serpula*, little snake, deriv. of *serpere*, creep]: a genus of annelids which build calcareous tubes in which they live. The head is surrounded with feathery tentacles, one of which is modified into a stopper to close the aperture of the tube when the animal is retracted.

Serra, JUNIPERO: missionary; b. in the island of Majorca, Nov. 24, 1713. He entered the Franciscan order, was sent to Mexico in 1749, and labored for years among the Indians of the northwestern districts. When the Jesuits were expelled, in 1767, their missions were placed in charge of the Franciscans. Father Junipero was made president of those of California, then confined to the peninsula of Lower California. One of his first measures was to extend his field to Upper California (now California). The San Diego mission was founded July 16, 1769, Monterey soon after, and others later. These were the first civilized communities within the bounds of the present State. Many of the buildings remain. D. at the San Carlos mission, Aug. 28, 1784. See Bancroft, *History of the Pacific States: California, and The Century Magazine* (May, 1883).

H. H. S.

Serra do Mar: a division of the Brazilian Coast Range bordering the coast or running near it from Southern Paraná to Espírito Santo. The Parahyba valley separates it from the Serra da Mantiqueira. The bizarre forms of many of its peaks make this region extremely picturesque. It culminates in the ORGAN MOUNTAINS (q. v.).

H. H. S.

Serran'idæ [Mod. Lat., named from *Serranus*, the typical genus, from Lat. *serra*, saw]: a family of fishes of the sub-order *Acanthopteri*, including the sea-bass, groupers, jewfish, etc. The body is oblong and compressed; the scales ctenoid and generally moderate; the head compressed, and more or less pointed; the supranaxillary bones not retractile behind under the supraorbital bones; the spinous portion of the dorsal fin about as long as the soft or longer; anal like the soft portion of the dorsal, and with three spines. The variation in size among the species of the family is great, some being only a few inches long, while others exceed 7 or 8 feet. Among the gigantic forms are the jewfish (*Promicrops guasa*) of the Southern States and Cuba, which attains a weight of 500 or 600 lb., and the *Stereolepis gigas* of California, which appears to attain an equally large size. Almost all the species are esteemed as food.

Serrano y Dominguez, sār-raa'nō-ee-dō-meen'gāth, FRANCISCO, Duke de la Torre: soldier and statesman; b. at San Fernando, near Cadiz, Spain, Sept. 18, 1810; entered the army and rose rapidly in rank; joined Narvaez in effecting the overthrow of the regent Espartero in 1843; became lieutenant-general and senator in 1845, and obtained such influence over the young queen after her marriage (1846) as to give rise to much scandal. After taking part in several political intrigues and holding some important offices, he became captain-general of Cuba 1860-62, and won a dukedom as a reward for his successful efforts to reannex San Domingo to Spain. In 1866 he became president of the senate in Spain and suffered a short imprisonment in the same year. His continued opposition to the Government caused his exile to the Canary Islands July, 1868, when he took part with Prim and Topete in effecting the revolution which drove Isabella from the throne. He then became the ostensible head of the Government as president of the council of ministers and commander-in-chief of the army; was elected regent June 16, 1869; negotiated the acceptance of the Spanish

crown by Prince Amadeus of Italy, by whom he was made premier Jan., 1871; resigned that post in July of the same year; took the field as commander-in-chief against the Carlists Apr., 1872; concluded with them the convention of Amorevieta in May; returned to office as premier for a few months; fled to France soon after the proclamation of the republic (Apr., 1873), but shortly returned; was made chief of the executive after the *coup d'état* of Gen. Pavia Jan., 1874, and remained at the head of the Government till the end of the year, when he resigned his authority into the hands of Alfonso XII. D. in Madrid, Nov. 26, 1885.

F. M. COLBY.

Sertorius, QUINTUS: Roman general. He was a native of Nursia in the country of the Sabines; distinguished himself in the battle of Aquæ Sextiæ (102 B. C.) under Marius. He fought with Cinna at the Colline gate in 87 B. C. against Pompeius Strabo, but he did not participate in the bloody massacre which Marius instituted at the capture of Rome. On the contrary, he put to death a gang of about 4,000 slaves whom Marius had let loose on the city, and who had perpetrated the most horrible cruelties. In 82 B. C. he was sent to Spain as proprator, but in the same year Sulla returned to Rome from Asia, and the power of the democratic party came to a sudden end. Although he had in the beginning only a small army, Sertorius maintained his position in Spain against the leading generals of Rome. He gained the favor of the natives, especially the Lusitanians, who became his faithful allies, and gradually drew about him the remnant of the Marian party. In 74 B. C. he formed an alliance with Mithridates. Metellus Pius, whom Sulla first sent against him, was repeatedly defeated, and even Pompey, who came to Spain in 76 B. C., achieved nothing, and was driven back across the Ebro. But intrigues and jealousies arose in Sertorius's camp, and in 72 B. C. he was invited to a banquet by Perpenna and treacherously assassinated at the festival. His biography by Plutarch is very interesting, though more full in its description of his personal character than in its narrative of his exploits.

Revised by G. L. HENDRICKSON.

Sertulariæ: a group of HYDROIDA (q. v.) of uncertain position. They form colonies sometimes 10 inches in height. The individual polyps are situated in horny cases (thecae). No medusa (jellyfish) stage occurs in the life-history.

Serum [from Lat. *serum*, whey; cf. Gr. *ops*, whey, and Sanskr. *sāra*, curds]: the watery portion of certain animal fluids. Serum of milk is whey containing no albuminous matter, whereas serum of blood, the fluid part left after the separation of the coagulum from blood, is a strong solution of albumen in a liquid containing certain salts, neutral and alkaline. The total amount of saline matter in the serum of a healthy man is somewhat over 10 per cent., and there are present carbonates and phosphates of sodium, potassium, calcium, and magnesium, with considerable chloride of sodium, some chloride of potassium, a sulphate of sodium and potassium. The amount of albumen is in the neighborhood of 7 per cent. Both the salts and the albuminous matter prevent the solution of the blood globules, which are very soluble in water itself, and are attacked at once on addition even of a very little water to blood. The physiological and pathological properties of blood serum have recently occupied much attention, and there bids fair to be great advancement in the treatment of disease, based upon these studies. The serum of an animal is known to possess properties which render it more or less destructive to invading micro-organisms. According as this is ill or well developed will be the likelihood or unlikelihood of a severe attack.

Revised by W. PEPPER.

Serum Therapeutics: that department of medical practice which secures IMMUNITY (q. v.) by the introduction of certain substances in the blood which act in an antagonistic manner to the bacteria of the disease in question, or to the toxic substances developed from these or by them. According as the protective substances are present in large or small quantity, permanently or temporarily, so will be the permanence and completeness of the immunity. The same sort of immunity may be developed by artificial inoculation with the specific micro-organisms themselves. The latter may be made less powerful by certain methods of cultivation, as was done by Pasteur in the case of the anthrax bacillus, or they may be injected in small amounts, and thus immunity developed without risk of a serious attack. Immunity may, however, be obtained by injection of the products of the bacteria, obtained either from cultures of

the microorganisms or from the blood of a person or animal previously rendered immune by a natural or experimental attack of the disease. The same substances in larger doses are also in a curative way.

Recently this treatment has been particularly lauded in France. The exact method by which the antitoxic substances in this disease are prepared is as follows: Horses or some preferably the former, are inoculated with cultures of the specific micro-organisms, rendered less virulent by addition of kochin or of sodium or other substances, or with small doses of the toxins of these organisms. There is thus established a specific intoxication of slight intensity, with development of antitoxic substances and leaving a certain degree of immunity, so that the animal may be injected with greater quantities the second time, etc. After repeated injections of this kind the animal becomes practically immune from any dose of the poison. The blood-serum obtained from such an animal will be active for the production of artificial immunity in another animal, or in larger dose it will prove curative of the developed disease. Whatever the outcome of this method of treatment may prove to be in man, it is admirably established that immunity may be conferred upon animals in this way for infection with the organisms of anthrax, malignant edema, anthrax, cholera, typhoid fever, pneumonia, and other diseases. WILLIAM PERREN.

Serval—the *Felis serval*, an animal of the *Felidae* or cat family, having a slender body, small head, long legs, long and shaggy hair, body spotted with dark brown, the general color being yellow, and the lower parts white. It is about 1.5 m. long, exclusive of the tail, which is tipped and ringed with black. It is found in the southern part of Africa.

Servant: See **MAJORS AND SERVANTS**.

Servetus Lupus: polemical writer; b. about 805; was educated in the monastery of Perrières, in the diocese of Evreux, and studied afterward in Fulda under Rabanus Maurus. For some time he lived at the court of Louis the Pious, and in 842 he was made abbot of Perrières by Charles the Bald. D. after 863. He played quite a prominent part in the ecclesiastical history of his time. In the controversy between Gottschalk and Hincmar he sided with the former, but defended him both by his words in the synods and by his pen: *De tribus questionibus* and *Collectaneum*. His works, which also comprise a number of very interesting letters (last, ed. by G. Desclaux du Desert, Paris, 1889), are found in Migne, *Patrol. Lat.*, xix. See Nicolas, *Études sur la littérature Servet-Lup* (Paris, 1881); F. Spratte, *Servetus Lupus* (Halsbam, 1886). Revised by S. M. JACQUES.

Servetus, Michael [the popular Latinized name of Miquel SERRA]; theologian; b. at Villanueva, near Saragossa, Spain, in 1511, or more probably at Tudela, in Navarre, 1511, his own testimony, though contradictory, inclining to the latter place and date; son of a notary, who sent him at the age of thirteen or seventeen to study law at the University of Toulouse, France; gave his attention principally to theology, in which he became proficient; visited Italy, and was present at the coronation of Charles V. at Bologna (1530); traveled in Germany and Switzerland; became acquainted with many of the Reformers, and partially adopted their doctrines; resided some months at Basel, where he discussed theology with the celebrated Hans Haagen (Gangreponius), and launched for the first time his criticism of the current doctrine of the Trinity; proceeded to Strasbourg, acquainted himself with the teachings of the Protestant divines Bucer and Capito; went thence to Lugdun, Alsace, where he published his *De Trinitate liber unus* (1531) and *Dialogorum de Trinitate Liber unus*; in *Notitia Regni Christi Capitulo quatuor* (1532), works which excited him both with Roman Catholics and Protestants; took up his residence at Lyons under the name of Michel de Villanueva about 1533; studied medicine, and supported himself by working as an editor of scientific works; settled at Paris (1536); studied medicine under another, Dintius, and Forest; took the degree of M. D. with his honors (1536), in which year he first met with Calvin; became an eloquent and popular lecturer at the university in medical science and mathematics; published a treatise, *Compendium Universæ Ratiō* (1537), attacking opinions of some of the Paris faculty of medicine; had about this time several conferences on theology with Calvin, who proposed, as he himself says, to set him right on theological matters; proceeded to Châlon, near Lyons, 1538; lived some time at Arignon; published at Lyons editions of *Salmeron's Cosmographia* (1541) and of the Bible (1542) with

Latin notes, which were condemned as heretical by the Roman Catholic Church; took up his residence in 1542 at Vienna, Dauphiné, living as confidential physician in the palace of the archbishop, Pierre Paulmier, a former pupil; carried on with Calvin, then at Geneva, an active theological correspondence, which resulted (1546) in a bitter quarrel; published anonymously his chief work, *Christianorum Reformationis* (Vienna, 1550), the authorship of which was recognized by Calvin, to whom he had sent much of it in MS., and made known by him to the Roman Catholic Archbishop of Lyons, Cardinal Tournon. Arrested and imprisoned by the Inquisition at Vienna, at the instance of that prelate Servetus would probably have been acquitted for lack of evidence had not Calvin supplied portions of his correspondence as proofs against him. Servetus escaped from prison, crossed the frontier into Piedmont, and remained in concealment several months. Meanwhile his trial went on; he was condemned for heresy, and burned to effigy at Vienna June 17, 1553. He then resolved to go to Naples, but by a strange fatality went first in disguise to Geneva, where, his presence having become known to Calvin, he was arrested, brought to trial (Aug. 14) before the municipal court on charges of heresy, sedition, insult to the Fathers of the Church, and calumny against Calvin and other Protestant divines; was forced to discuss doctrinal points with Calvin, who appeared as prosecutor and drew up the final articles of accusation, thirty-eight in number; was condemned to the stake, and, notwithstanding the desire of Calvin for his decapitation as a milder form of death, was burned alive on a hill near Geneva Oct. 27, 1553. The Roman Catholic Inquisition had previously (June 17) sentenced him to the same punishment. The Reformers generally, including Melancthon, approved his execution. Calvin might easily have been antithetical of his accidental presence in Geneva, but he had threatened him with death if he came within his reach and he kept the promise he had made. *Lives of Servetus* have been published by Modestus (1750), Trechsel (1836), W. H. Drummond (London, 1845), and Brunnemann (1865). Cf. Schaff's *Church History*, vol. vii. The most careful study of his career and the best authority on his life is H. Tollin's *Chemisch-historische Michael Servetus*, and many articles that Tollin published in various journals. The theological position of Servetus was extremely individual. He was no Arian, and while denying the tri-personality of the Godhead and the eternity of the Son, he was passionately devoted to the person of Christ and equally to the Bible as the sole standard of authority. His was a boundless intellectual curiosity, a wide and various culture, an absolute sincerity, but withal a love of controversy, not peculiar to him in his generation, which brought him into frequent danger and finally to a cruel death.

Revised by J. W. CHADWICK.

Ser'via [from Russ. *Serbiya*, deriv. of *Serbi*, a Servian, from *Serr*, *Serb*, a Servian (Turk. *Syryl*): a kingdom of Southern Europe in the Balkan peninsula; between 42° 20' and 45° N. lat., and 19° 10' and 22° 45' E. lon. It is bounded N. by the Austro-Hungarian empire, from which it is separated by the Save and Danube rivers, E. by Roumania, from which it is separated by the Danube, and Bulgaria, S. by Bulgaria and Albania, W. by Albania and Bosnia. Area, 10,050 sq. miles.

Topography, Products, Commerce, etc.—Servia is divided by the river Morava into two unequal sections. The western section is broken by the Dinaric Alps, the eastern by the Balkans. At Orsova, on the Danube, the Balkans are separated from the Carpathians by a narrow cleft, called the Iron Gates, through which the Danube rushes. From its southern frontier, dominated by the Kopaonik Mountains nearly 7,000 feet high, Servia slopes to the north in a roughly inclined plane, and on the northwest spreads out in level tracts. The soil in the valleys and lower regions is fertile, producing rice, maize, wheat, flax, hemp, and tobacco. Along the Danube are numerous vineyards and orchards, especially of plum-trees, whence the *slivovitz*, a popular sort of brandy, is obtained. More than half the territory is covered with forests, wherein oaks and walnuts abound. Iron, copper, lead, and coal are found in certain localities, but absence of roads and lack of enterprise prevent their being worked. From the same cause the forests are untouched, except that they are given over to raising immense herds of swine. These hogs are exported, and constitute the chief industry and the principal source of revenue. There are practically no manufactures except in a primitive way, as each household supplies its own necessi-

ties. Commerce is confined to the exportation of raw materials and the importation of the most essential manufactured goods. The system of agriculture is simple and rude; little attention is paid to education, and the condition of the country and people presents a striking contrast to the progress made by Roumania and Bulgaria since 1870.

The unit of value is the dinar or franc. During the fiscal year 1894 the state receipts were 63,755,600 dinars; expenditures, 63,736,300. The public debt is 359,144,500 dinars. In 1893 the imports amounted to 40,922,525 dinars, seventieths of which were from Austria-Hungary; exports, 48,910,400, about five-sixths of which were to Austria-Hungary. There are 388 miles of railway. Length of telegraph lines, 1,946 miles; offices, 143.

Servia is an hereditary monarchy. The national assembly or Skupstchina consists of 134 members and meets annually. Pop. (1894) 2,256,084. Except 143,684 Roumanians and 37,581 gypsies (1891), there are few not of the Servian race. With rare exceptions the inhabitants belong to the national Church, the Eastern Orthodox or Greek. Pop. of chief towns (1890): Belgrade, the capital, 54,249; Nisch, 19,877; Kragujevatch, 12,669; Lescovatch, 12,132; Pojarevatch, 11,134. In 1892 there were 20,934 marriages, 93,833 births, and 74,128 deaths. By statute of 1889 military service is obligatory on every able-bodied male Servian from the age of twenty-one to fifty-one; 1 year in active service, 9 in the reserve, 10 in the first division, and 10 in the second division of the national militia. Servia claims ability to put into the field 5,700 officers, 239,950 men, with 45,100 horses and 402 cannon.

History.—The Servians are a branch of the Slavic family. During the seventh century they were induced by the Byzantine emperor Heraclius I. to abandon their homes in the Carpathians and colonize the then depopulated territory between the Danube and Adriatic. Bound to the Byzantine empire by friendship and allegiance, they formed an efficient defense against the barbarians of the north. Christianized in the ninth century, Servia became independent in the eleventh, and its sovereign, the Grand Shupane, was recognized as a king by Pope Gregory VII. Stephen Dushan, the tenth sovereign, conquered nearly all the Balkan peninsula, threatened Constantinople, and in 1346 took the title of czar. In 1389, at the terrible battle of Kossova where the Servian king Lazarus and Sultan Murad I. were slain, Servia lost its independence, and disappears from history till the early part of the nineteenth century. Then the peasant Kara George, aided by Russia, expelled the Ottomans, and ruled from 1804 to 1813. Again the Ottomans overran the country when the swineherd Milosch Obrenovitch, who had assassinated Kara George, headed a desperate resistance during fifteen years. Supported by Russian diplomacy he forced the Porte in 1830 to recognize him as hereditary prince of Servia. In 1869 a constitution was framed, according to which the Government appointed one-third of the Skupstchina, while the electorate of the other two-thirds was greatly restricted. In 1876 Servia declared war against the Ottomans, and was saved from destruction only by the interference of Russia. The Congress of Berlin (1878) recognized the independence of the principality, and increased its territory on the south at the expense of the Ottoman empire. Servia declared itself a kingdom Mar. 6, 1882. In Nov., 1885, King Milan made an unjustifiable attack on Bulgaria, but was ignominiously defeated and his kingdom maintained intact only through the intervention of Austria-Hungary. In 1889 a more liberal constitution was granted, all taxpaying citizens becoming electors, by whose votes the entire Skupstchina was elected. The Servians are a brave and generous people, and the unfortunate history of Servia since 1868 is largely due to the influence of their incapable and pusillanimous ruler, MILAN I. (q. v.), who on Mar. 6, 1889, abdicated in favor of his son, Alexander I. The latter in May, 1894, by a *coup d'état*, abolished the new constitution and restored that of 1869.

WORKS OF REFERENCE.—Chopin, *Provinces Danubiennes*; Courrière, *Histoire de la littérature contemporaine chez les Slaves*; E. de Laveleye, *The Balkan Peninsula*; Minchin, *Servia and Montenegro*; Saint-René Taillandier, *La Serbie au XIX^e Siècle*, Karah George et Milosch; von Ranke, *History of Servia*. E. A. GROSVENOR.

Servian Language: See SLAVIC LANGUAGES.

Servian Literature: in its broadest sense, the literary monuments of the Servian or Servian-Croat language, spoken by most of the inhabitants of Servia, Bosnia, Herzegovina,

Montenegro, Dalmatia, and Croatia (including Slavonia), about 6,000,000 in all. This belongs to the southern division of the Slav languages, and, though somewhat influenced by Turkish, is most closely related to Bulgarian, Slovenian, and Russian. In a narrower sense the term Servian is restricted to Servia alone. The Servian and Croat languages and literatures, although essentially of the same origin, and differing in little except that the former employs the Cyrillic (Russian) alphabet and the latter the Latin, had for centuries an independent development, owing to political, religious, and territorial influences. While Croat literature developed under the Roman Catholic Church and Western European influences, Servian literature, as the intellectual medium of a people belonging to the Greek-Oriental Church, grew under the influence of that Church and the Byzantine empire. Consequently the Servians received with the Old Slovenian liturgy also the Old Slovenian or Old Bulgarian language. This, by an admixture of dialectic peculiarities, was gradually moulded into the so-called Servian Church Slavonic, in which, until the destruction of the Old Servian realm (battle at Kossova in 1389), a rather extensive Church literature was produced.

Early Servian Literature.—Among the first writers was Stephen, first King of Servia (crowned in 1217), who wrote a biography of his father, Stephen Nemanjas (ed. by Šafarik, *Život sv. Simeuna*, Prague, 1868 and 1870). His brother Sava, who founded the Servian monastery Chilandar on Mt. Athos, and was in fact the apostle of the Servian people, wrote a legend, a ritual, and a liturgy from Old Bulgarian sources. Domentian wrote lives of St. Sava and St. Simeon (ed. by Daničić, Belgrade, 1865). The *Radostor*, by Archbishop Danilo (1291–1338), is a genealogical account of Servian kings and archbishops (ed. by Daničić, Agram, 1866). These works were of a panegyric ecclesiastical nature, hardly popular enough to encourage secular literature.

The most important productions for the study of the old language and history of Servia are the documents and records of the old kings, and especially the *Zakonik* (a collection of laws), by King Stephen Dushan (d. in 1356). The Turkish yoke after Kossova almost completely checked literary life in Servia for nearly 400 years; but the Gospels were printed in Belgrade in 1552, and Georg Branković, during his captivity in Eger, wrote a chronicle of Servia from the origin of the Servian people to about 1700.

Literary Activity during the Turkish Supremacy.—While Servian literature was thus suppressed by the Turkish conquest, a similar and cognate literature sprang up and attained full development in the Illyrian towns or the Dalmatian cities and islands from the end of the fifteenth to that of the seventeenth century, gradually declining thereafter. Its language was Croat (West Servian-Croat) in the old historic sense, although in the south (at Ragusa) the South Servian or Herzegovinian dialect predominates. This literature frequently loses the national Slavic color owing to the imitation of the various Italian literary movements. A considerable portion of it is actual translation from the Italian, but most of it is lyric poetry, love songs in the style of the Italian sonnet poetry, idyllic tales, and epics; even the drama is represented in both tragedy and comedy. The oldest writer of this literature is Marko Marulić, at Spalato (1450–1524); his poetry is biblical, its form yet rather imperfect. The island of Lesina produced two masterly poets—Hannibal Lučić (1480–1525), author of lyric songs and the drama *Robinja*, and Peter Hektorović (1486–1572), who wrote the descriptive poem *Ribanja* (a fisherman's tale). Then Ragusa took the leadership, owing to such lyric poets as Menčeta (1457–1501) and Držić (d. about 1510), both masters of love poetry. Greatest of all was Ivan Gundulić (d. 1638), the author of the epic *Osman*, celebrating the Polish victory over the Turks at Chocim. In 1667 Ragusa was destroyed by an earthquake, which ended its material and intellectual development. Jacob Palmotić (d. 1680) portrays its destruction and rebuilding in his epic *Dubrovniki ponovljen* (Ragusa Renewed). The works of Dalmatian poets have been edited by the South Slavonic Academy at Agram (1869, seq.).

The revival of Servian literature was due to the political struggles carried on by Austria against the Turks for the liberation of the Servian people, at the end of the seventeenth and the beginning of the eighteenth centuries. A considerable part of Servia was thus restored to Western European life and civilization, but at the same time a reaction against the latter took place; Russian teachers were called to the schools, and the Church-Slavonic language in its Russian form introduced into the service of the Church.

The Archbishop Ivan Račić's *History of the Slavonic people especially the Bulgarians, Croats, and Serbians* (1905; n. s. 4 vols., Budapest, 1923), was an important country. Đorđević Obradović and Vuk Karadžić, an able and energetic, reorganized and reformed the popular Serbo-Croat language proper, and with the liberation of the Serbian nation from the Turkish yoke its literature took a high stand among those of Europe. The monk Đorđević (1738-1811), who was the teacher of the children of Kara George and died a senator, exerted a permanent influence on the revival of national life and literature in Serbia. Vuk Karadžić (1797-1864) collected the Serbian songs which attracted much attention in Germany and England as pearls of popular poetry. The first modern poet was Ljudevit Mulić (1777-1847), but his pseudo-classicism did not exercise a beneficial influence upon the developing taste of his people. More popular and natural in the poetry of Sima Milutinović, who wrote poems on the heroic war of independence (Leipzig, 1826) and the history of Serbia in 1812-14 (Leipzig, 1857). The greatest poetical treasure of the nation, however, is their ballads. (See *Serbs*, *Serbia*, by Child, vol. 1, p. 409.) With the increasing enlightenment of the nation many prose works also were written and journals sprang up over the country, the most important among them being the *Novi Listopis* (Serbian News Journal), published since 1822. During the second half of the nineteenth century Serbian poetry became more and more original, national, and independent, reflecting the inner life of the aspiring state.

Josif Petrović Njegoš (Vladika of Montenegro) wrote the celebrated epic *Džeko vojvoda* (Vienna, 1847), describing the mass liberation of Montenegro from the Turkish yoke at the end of the eighteenth century. The other nation's best poets are those of the lyric poets Branko Radičević, Ivan Mašević, and Djura Jakšić, and the novelist Milicaević who, in the *Zemlja* series, tales of Serbian life. The *Illustri*, edited by the Society of Scientists since 1847, contains valuable statistical history, geography, literature, and philology.

The *new Croat literature*, permeated by the Pan-Slavic desire to become intellectually united with the Serbian sister nation, has been so modified that the only difference between them is one of external form. The publicist Ljudevit (1829-72), an Agrian, the center of the South Slavic movement, was especially active in this respect since 1834. The *new Serbian dialect* and the Latin characters were to be employed by the authors of this school, but in actual fact, and for ethnological and political reasons, this literature was to be called *Illyrian*. Since 1848, however, the *new Croat and Serbian-Croat* have prevailed. The most important parts of this literature are Peter Preradović (1818-76), known also for birth a Slovene (1819-51), excellent lyric poetry; Matković, the author of the famous patriotic song, the epic of hero, *Novi Smol-naga Čovjek* (Death of Lord Agia), and Bogović, author of dramas, songs, and political novels. The epic popular songs of the Croats have been collected and edited by Bogović (*Narodna pjesma*, Belgrade, 1876), and partly by Mikesich (*Die Volkslieder der Kroatens der slow. Volksweisen*, J. Die Volkslieder der Croaten, Vienna, 1870).

Illyrianism.—*Narodna škola pjesma*, a work on Serbo-Croat popular poetry, by Karadžić (Germ. trans. by Talvj, Leipzig, 1864); *Kapitel, Geschichte der Serben* (Leipzig, 1852); *Illyrianism, History of Serbo-Croat Literature* (1867); *A. N. Pypin, I. Pypin, Serbo-Croat* (Paris, 1888); *A. N. Pypin and V. D. Pypin, Illyrian, slavisch-lit. Literatur* (Germ. trans. by T. Pypin, vol. 1, Leipzig, 1889). HERMANN SCHÖNKNECHT.

Service-berry (See **DICTIONARY**).

Service-tree: a roseaceous tree, *Pyrus domestica*, of Europe, Asia, and Africa, much resembling the Medlar and *Malus* (q. v.). Its fruit, when overripened and blotted, is soft and pleasant to eat. It is considerably cultivated. The wood is very hard and valuable, and is used as a substitute for oak. In parts of North America the name *service* is applied to the chest-tree, and in others to the mountain-ash.

Revised by L. H. BAILEY.

Servites: a community of Augustinian friars, called Servants of the Virgin Mary; founded at Florence in 1239. Giulio Strozzi was their first general and one of their founders. They were confirmed in 1255 by the pope, and in 1263 a part received a reformed rule. There is also a community of Servite Terziars, and there are a few houses of Servite nuns. The Servites are mostly found in Europe, and have a monastery at Chicago, Ill.

J. J. K.

Servitudes (from Lat. *servitudo*, deriv. of *servus*, slave): The term *servitudes*, as employed in the Roman law, covers not only the Easement (q. v.) of the English law, but also life-estates in land and life-interests in personal property. It is a right to use the property of another, whether real or personal. The term does not include purely contractual rights of use, such as are established by *lease* or *loan*, but is restricted to such property rights as are enforceable against all the world by actions in rem.

Servitudes on land, if established in favor of an adjacent and "dominant" estate, are termed *real* or *predial servitudes*. These are again divided into *ruralis* and *urbana* servitudes. The former include rights of way, rights of drawing water from or conveying water across neighboring land, etc. Examples of the latter class are rights of light and prospect, right of discharging rain-water on neighboring land, right to have a wall or beams supported by the neighbor's wall. The modern European law of real servitudes is substantially Roman.

Servitudes upon land, if created in favor of a particular person without regard to his ownership of adjacent land, and property rights less than ownership in movables, are *personal servitudes*. They are always limited to a single life, while the real servitudes are in principle perpetual. The most important of the personal servitudes is *usufruct*. This may be established not only in land (life-estate of the English law), but in any property which is capable of being used without material impairment of its substance (so-called "non-consumptibles," e. g., a collection of books or jewels, a service of pasture). The right may be exercised directly, or it may be sold or leased. The usufructuary is bound not to deteriorate the property, and he must give security for its restoration. In the case of consumptibles (including money) a so-called *quasi-usufruct* is recognized. Here the usufructuary is really owner, and gives security for the restoration, not of the things or money which he has received, but of their equivalent or value.

Limited rights of using land may be conferred by law upon a neighbor or upon the public generally. In such cases continental jurists speak of *legal servitudes*.

Agroperitina.—Hilvers (Marburg, 1856); Gavini de Campile (Paris, 1870); special works upon usufruct: *Usus* (Paris, 1859); *Hausrecht* (Erlangen, 1879). MANNUS SMITH.

Servius: a Roman grammarian of the latter half of the fourth century A. D. He is frequently mentioned in the *Saturnalia* of Macrobius, but is chiefly noted for his complete commentary upon Vergil, which is based upon the labors of many earlier scholars, and embodies much useful information on the text and in general on Roman religion, history, and antiquities. This commentary exists in a longer and shorter form, and the relation between the two has caused much discussion. The last edition is by Thilo (and Hagen) (Leipzig, 1821-27). See also E. Thomas's *Commentarii Servii* (Paris, 1880), and Nettleship's *Lectures* (Oxford, 1885; p. 322 f.). M. WARDEN.

Servius Tullius: the sixth King of Rome (legendary dates 578-534 B. C.). The account of his life is full of fables and wonderful traditions—his being the son of a female slave by the god Vulcan; his education in the royal household under the special care of Queen Tanaquil; his marriage with the king's daughter, and his accession to the throne by the stratagem of his mother-in-law; his death in Vico Secleratus, by being thrown down by the younger Tarquin from the stone steps of the senate-house, then overtaken and stabbed by Tarquin's servants on his way home, and finally driven over by the chariot of his unnatural daughter, Tullia, the wife of Tarquin. But amid the many mythical elements which cling to his name there appear to be some remnants of tradition that have a genuine historical value. To him is attributed a constitution which made landed property the basis of the military system, and thus admitted the plebeians to a place in the army and a share in the government. He formed an alliance with the Latins, and completed the city by incorporating with it the Quirinal, Viminal, and Esquiline hills, and surrounding the whole with a wall 5 miles in circumference, which was the legal boundary of the city up to the time of Sulla. Revised by G. L. HERRINGTON.

Sesame, or **Benne-plant**, as it is called in the southern parts of the U. S. (*sesamum* = Gr. *sesadon*, *akrasos* (whence Lat. *sesame*, *sesamum*); cf. Arab. *simsim* and Hind. *simsem*, *sesame*); an herbaceous plant, *Sesamum indicum*, belonging to the small family *Pedaliaceae*, sometimes annexed to *Rhamnaceae*, valued for the oil expressed from its seeds.

There are several varieties, which have been regarded as species. They are annual Oriental plants, naturalized in most warm climates. Sesame was probably introduced into the U. S. by slaves from Africa. Its rich oily seeds are prized by the Negroes, who also make a thick gelatinous drink of the leaves, which is very bland and useful in diarrhoeas. The seeds can be made to yield half their weight in oil, which is in some respects better than olive-oil. The oil is called oil of benne and gingelly-oil.

Revised by CHARLES E. BESSEY.

Sesame-grass: a large grass, *Tripsacum dactyloides*, of the U. S. growing in moist soil near the Atlantic coast from Connecticut southward, with broad leaves and a solid stem, like that of Indian corn or sugar-cane, which it somewhat resembles. It is very coarse, and in the North is not valued, but in parts of the South and in the West Indies and Mexico is used as fodder.

Ses'amoid Bones [*sesamoid* is Gr. *σάμων*, sesame + suffix *-oid*, like; so called from their supposed resemblance to a sesame-seed]: bones developed in the tendons of muscles. The most familiar example is the patella or knee-pan. They do not belong to the vertebral appendages proper, but to the sclero-skeleton.

Sesot'stris [Gr. *Σεσωτρίσις*, or *Σεσωτρίς*; cf. Egypt. *Sesetsu* = Ramses II.]: the name applied by Greek writers to Ramses II. of the nineteenth Egyptian dynasty, about whom they grouped the record of the deeds of other famous Pharaohs as well as those which belonged to himself, thus forming a single exaggerated personality. Views have differed as to the persons thus combined, Bunsen holding to a commingling of two kings of the ancient empire, while Lepsius held that Ramses II. formed the central figure. Manetho applies the name Sesotris to Usertasen II. of the twelfth dynasty, while Herodotus and Diodorus evidently have Ramses in mind. According to the Greek story, Sesotris was reared with children born on the same day, apparently 1,700 in number, and in his youth led victorious expeditions into Ethiopia and Libya. After his father's death he equipped an army of 600,000 infantry, 24,000 cavalry, and 27,000 chariots, giving the command to his fellow students, marched against Ethiopia and took heavy tribute. He then fitted out a navy of 400 vessels and sailed to the end of the Arabian peninsula. Thence he proceeded through Arabia and along the coast, crossing the Indus and conquering India. Returning by land he subdued the Scythians. According to one account he left a portion of his army in this region, and they became the ancestors of the Colchi. Then, after conquering Thrace, he returned to Egypt with great spoil and many captives, having been absent exactly nine years. The remainder of his reign occupied fifty-nine years. He divided Egypt into thirty-six nomes or districts; built roads, canals, cities, and temples, using his captives as laborers; by grace of Thoth was learned in the law, and was reckoned among the great Egyptian lawgivers; introduced the worship of Serapis; and divided the Egyptians by a system of caste, forbidding also that a son abandon the calling of his father. In his old age he became blind and took his own life. The Greek story is in accordance with the actual facts only in a few particulars. For the Egyptian account, see RAMSES. See Herodotus (ii., §§ 102-110) and Diodorus (i., §§ 53-58), and the authorities quoted by Wiedemann, *Aegyptische Geschichte*, p. 429. CHARLES R. GILLET.

Sessa Aurun'ca (anc. *Suessa*): town: in the province of Caserta, Southern Italy; on the crater of an extinct volcano about 6 miles from the Tyrrhene Sea (see map of Italy, ref. 6-F). Suessa was a conspicuous city of the Auronians or Auruncians as early as 418 B. C., and, judging from the position of important architectural remains, antiquarians and geologists are of opinion that the town was, in part at least, buried by a volcanic eruption. The present town is poorly built, but it has a cathedral, a theological seminary, and a technical college. Pop. 6,000.

Sester'tius [Lat., liter., two and a half; *se'mis*, half + *ter'tius*, third, i. e. the third (*as*) being only a half]: in ancient Rome, a silver or bronze coin worth one-fourth part of a denarius. Originally, it was worth two and a half asses, but in later times four asses made one sestertius, and the coin, originally of silver, was struck in fine bronze. The sestertium was a money of account equal to 1,000 sestertii, but it was never coined. The value of the sestertius, roughly stated, was from one and a half to five cents of U. S. money, for the value declined greatly after the fall of the republic.

Sesto, CESARE, da; painter; b. at Sesto, Milan, in the sixteenth century. He was a pupil or imitator of Leonardo da Vinci. He afterward went to Rome and became acquainted with Raphael, whose style he adopted. Baldassare Peruzzi engaged him to assist in executing the frescoes in the citadel at Ostia. His masterpiece is the picture in the Church of San Rocco of Milan, in several compartments. At Saronno he painted four narrow pilasters with figures of St. Martin, St. George, St. Sebastian, and St. Roch (San Rocco), which he inscribed *Cesar Magnus fecit*; this has led some critics to believe that he belonged to the de Magni family, or that these frescoes were by another painter, but the similarity of workmanship does not allow of the latter hypothesis. The date of his death is supposed to be 1524.—His brother STEFANO was a sculptor whose bas-reliefs in the Certosa of Pavia are remarkable. W. J. STILLMAN.

Sestri Ponente: town: in the province of Genoa, Italy; beautifully situated on the seashore about 5 miles W. of Genoa (see map of Italy, ref. 4-B). It has a delightful climate, and is a favorite summer resort. The inhabitants of Sestri Ponente are extensively engaged in ship-building, and are otherwise very industrious. Pop. of commune, 10,656.

Sestus, or Sestos: See ABYDUS.

Sete Quedas: See PARANÁ (river).

Seth, ANDREW, M. A., LL. D.: educator and philosopher; b. in Edinburgh, Scotland, Dec. 20, 1856; educated in Edinburgh, Berlin, and other universities; became assistant in logic in Edinburgh in 1880; professor in University College, Cardiff, 1883; lecturer in the University of Edinburgh 1883; professor at St. Andrews 1887; and Professor of Logic and Metaphysics in Edinburgh University 1891. His principal works are: *The Development from Kant to Hegel, with Chapters on the Philosophy of Religion* (1882); *Essays in Philosophical Criticism* (1883; edited in conjunction with W. R. B. Haldane); *Scottish Philosophy: a Comparison of the Scottish and German Answers to Hume* (first series of Balfour Lectures, 1885; 2d ed. 1890); *Hegelianism and Personality* (second series of Balfour Lectures, 1887; 2d ed. 1893). J. MARK BALDWIN.

Seti [*Seti meri-n-Ptah*, belonging to Set, beloved of Ptah; Gr. *Σετις*]: name of two Egyptian kings, the first and fourth rulers of the nineteenth dynasty.

SETI I., son of Ramses I. and father of Ramses II. (see RAMSES), ruled for about twenty-seven years. The period just preceding had been one of weakness, in which the limits of the kingdom were narrowed from those established by Thothmes III. (See THOTHMES.) This resulted from the internal dissensions caused by the effort of KHUNATEN to establish the solar monotheism of Aten and to abolish the worship of Amon. Monumental proof of the return of the nation to the old religion under Seti is seen in the inscriptions and representations on the walls of the hypostyle hall at Karnak, which Seti founded. Besides this great building, he was architecturally active elsewhere in Thebes and also in many parts of Egypt. He was a patron of art and left many monuments bearing his name, some of them undoubtedly usurped. From some of his monuments even his own name has been erased, indicating the later revulsion of the Egyptians against the cult of the foreign deity Set, in whose honor Seti was named.

Manetho marked a dynastic division between Ramses I. and Seti I., and, for reasons unknown, began a new dynasty with the reign of the latter. On obvious grounds, however, the dynasty is reckoned by some from the ascent of Ramses I. to the throne. In his first year Seti I. was compelled to proceed to Asia against the beduin (*Shasu*) and the peoples of Palestine and Syria. Among the conquered peoples the Hittites (*Kheta*) are enumerated, but the strength which they exhibited under Ramses II., the succeeding king, renders this record somewhat doubtful. Later Seti I. engaged in war with the Libyans and overcame them. Gradually they enlisted as mercenaries under Seti and his successors, till some 400 years later they had grown to such power that the Libyan Shishak usurped the throne and founded a new dynasty. Seti's inscriptions claim for him a dominion extending from Mesopotamia to Punt, Nubia, and Libya, and they show that under him the mines of Sinai and Nubia were worked. The record of his exploits is sculptured on the north wall of the hypostyle hall at Karnak. (Lepsius, *Denkmäler*, iii., 126a-130b; Brugsch, *Geschichte Aegyptens*, pp. 457 ff.; Broderick's English edition, pp. 242 ff.; Wiedemann, *Aegyptische Geschichte*, pp. 416 ff.; Lushington,

Transactions of the Society of Biblical Archaeology, vi, pp. 388-394. Set's tomb at Bilis el-Muluk contains a copy of the myth of the destruction of mankind by Ra. See Brugsch, *Die ägypt. Weltordnung* (1889), and Naville, *Records of the Past* (1891), vol. vi, pp. 103 ff.

Set II, was the fourth king of the same dynasty. Little is known concerning him except that he was the grandson of Nubkheperre Intef. His name is found on various small objects and upon monuments of his predecessors, which he usurped. His tomb at Bilis el-Muluk is ornamented with well executed inscriptions and reliefs. The famous Tale of the Two Brothers (in the d'Arnyer papyrus in the British Museum), recording a woman's tale of Joseph and Potiphar's wife was prepared for his collection. CHARLES R. OLLIVER.

Set-off, in law, a counter-claim existing in favor of a defendant which in certain actions and under certain conditions may be introduced as a defense, either partly or wholly satisfying the claim by the plaintiff or even resulting in a recovery against him. A set-off is distinguished from a defense by the moment when the latter must be filed, the fact that it is an ordinary defense, as of payment, former judgment, non-occurrence, etc. It is not pleaded upon the trial of the action against which it is a defense, the right to set it up is lost, whereas in a set-off, except as otherwise provided by statute in a few States of the U. S., if not pleaded as a defense, may be used upon a separate action. Set-off should be distinguished from *Recoupment* (q. v.), although it is often difficult to say in which form the opposing demand should be set up as a defense. The word *recoupment* has a broader meaning, ordinarily including both set-off and *recoupment*.

This species of defense (analogous in the composition of the verb) and *Set-off* and the *recoupment* of the law of the State of Louisiana) was unknown to the common law, and was first authorized by the English statutes 2 Geo. II, c. 28, § 10, and 2 Geo. II, c. 24, § 4, which have been substantially re-enacted in the several States of the U. S. The original statute only permitted a set-off in the case of mutual "debts" of a definite character. The use of the compound word "debts" restricted the set-off to actions brought for the recovery of a fixed certain sum of money due upon a contract, and the demand in favor of the defendant had to be of the same nature. There could be no set-off of unliquidated damages resulting from the breach of a contract, but only of those claims the amount of which had been ascertained and settled by the promise itself, whether that promise was express or implied. The debts had to be also mutual and due to the parties in the same right.

The provisions of the original statute, however, have now been generally more or less modified by later statutes enlarging the scope of the defense. In Great Britain a defendant in an action may now set off or set up by way of counter-claim against the claims of the plaintiff any right claims, whether such set-off or counter-claim is based in damages or not. The provisions of the statutes in the different States of the U. S. vary, but in the majority of them the restriction of the defense to liquidated claims is removed and also the restriction as to mutuality. Where the counter-claim is asserted in favor of the actual parties, the plaintiff and the defendant, if the defendant's claim is the counter-claim of the two he may not only defeat the plaintiff's recovery, but reserve a judgment for the excess. Where the counter-claim is originally asserted in favor of persons who are not both the parties to the action (as, for example, where the plaintiff is an assignee of the demand in suit and the defendant's claim is against the assignor) and set-off is allowed, it can only avail as a partial or total defense. No judgment for any excess can be recovered by the defendant, since the plaintiff is not his debtor. Courts of equity, setting upon the analogies of the statute, have created an equitable set-off broader and more comprehensive than that authorized by the courts of law. See *Parsons on Contracts*; *Greenough's Law of Set-off, Recoupment, and Counterclaim*; and *Baylis's Law of Set-off*. F. STREUMER ALLEN.

Seton [= *Fe*, *Rice*, augmentative of Lat. *seta*, bristle, comb. *lance* (in Latin *Seta*) silk] in surgery, a twist of silk or wire of leather, India-rubber, or other material passed through a fold of skin and beneath the subcutaneous tissue for the purpose of exciting suppuration. Its action may be *decompressive*, or it may tend to promote a solitary abscess or *inflammation*. The use of setons is less common than formerly, but they nevertheless often serve a very useful purpose.

Seton, ELIZABETH ANN (*Bayly*): philanthropist; b. in New York, Aug. 28, 1774; married William Seton about 1798, and on his death at Pisa, 1804, returned to New York; joined the Roman Catholic Church Mar. 14, 1805; established a school at Baltimore 1805-08. She and her sisters-in-law, Harriet and Cecelia Seton, took the veil as Sisters of Charity Jan. 1, 1809, at Emmitsburg, Md., being the first members of that order in the U. S. A conventual establishment was opened at Emmitsburg July 30, 1812, with Mother Seton as superior-general. The new order took charge of orphan asylums in Philadelphia 1814, and in New York 1817, in which year it was incorporated by the Legislature of Maryland. At the death of the founder, at Emmitsburg Jan. 4, 1821, there were fifty members. There are in the U. S. about 110 houses and 1,450 Sisters of Charity.

Revised by J. J. KRASE.

Settembrini, LEONARDO; author; b. in Naples in 1812; was appointed professor in the Lyceum of Cumana in 1835, but, becoming compromised in political affairs, was arrested in 1839 and imprisoned at Naples. Being set at liberty in 1843, he gave private lessons in literature until 1848, publishing in the meantime his bold *Protesta del Popolo delle Due Sicilie*. In 1848 he held an important post in the ministry of public instruction; on May 16, 1849, the reaction having triumphed, he was arrested and thrown into the prison of San Stefano, where he occupied himself in translating the works of Lucian into Italian. On his release he devoted himself wholly to literature, and published *Lettere di Letteratura Italiana* (3 vols., Naples, 1867-73). In 1871 he was appointed senator of the Kingdom of Italy. D. in Naples, Nov. 4, 1876. See his *Ricordanze della mia vita* (2 vols., Naples, 1876-80).

Setter: a hunting dog of a breed apparently intermediate between the pointer and the spaniel. This dog was formerly trained to sit or drop when marking down game, but at present it stands at its work like a pointer. There are several distinct strains, as the Irish and the English setters, and of late there are several new stocks which are highly prized. Notable among these are the Gordon, the Maslin, and the Laverack setters. The colors vary, but a liver color is a favorite one. See *Dogs*.

Setignano, set-tén-ran'ñ, Designano, dai' seniphar; b. at Settignano, a suburb of Florence, in 1434. He is reported to have studied with Donatello. Very little is known of his life, which was probably spent in and near Florence. According to Vasari, he died very young, but recent writers have disputed this. His most important work, which, moreover, is not disputed, is the wall-tomb of Santa Croce in Florence, erected in memory of the scholar Niccolò Nicomachi of Arezzo, one of the finest of the many splendid monuments of the Renaissance. The portrait-bust of Marietta degli Strozzi, placed in the Berlin Museum about 1890, the bust of Beatrice d'Este, in the Louvre; an exquisite bas-relief in the Via Carnar in Florence; a large marble, or rather anlely (Italian, *sterni*) in the Church of San Lorenzo, are generally recognized as his work. Probably he was one of the most busily employed of these able designers in mingled architecture and sculpture in which the Florentine Renaissance was so rich. D. Jan. 16, 1464. HERBERT STROUD.

Settlement, Act of: See *Act*.

Set-Ty'phon: an Egyptian deity. Set (Gk. *Σετ*) was classed as parallel with the monster Typhon (Gk. *Τυφών*, or *Τυφών*), son of Tartarus and Gaia or of Hera, who desired to gain mastery over the gods, but was slain by Zeus and hurled in Tartarus. Set was believed to be the son of Seb and Nut, brother of Osiris, Isis, and Nephthys, the last being also his wife. As a solar deity he stood for the evil power of the sun's heat, and in general represented the principle of evil and harm, just as Osiris was the type of all that was good and beneficent. The worship of Set was very ancient, dating from the fifth dynasty at least, and his principal sanctuary was at Ombos in Upper Egypt, where he was regarded as the lord of the South. There he was sometimes confounded with the crocodile-headed god Sobek. It is probable that at the time of the eighteenth to the nineteenth dynasties Set was still worshipped, since several kings and other persons bore names compounded with his, such as *Seti*, "belonging to Set." As Osiris, the god of the dead, was revered out of hope, Set held his worshippers through fear of the evil which he had power to inflict on gods and men. For his connection with the Osiris myth, see *Osiris*.

In general Set was regarded as a foreign deity like Baal, and was in fact the principal god of the Hyksos, under the name

of Sutech. It was the demand of the Hyksos king Apepi addressed to the Egyptians, that they should adopt Set as their chief god, which led to the religious war that ended in the expulsion of the Hyksos by Aahmes, the first king of the eighteenth dynasty. In the Hyksos city Tanis Set was regarded as a solar deity, the enemy of the serpent Apepi, whereas the general Egyptian view identified the two. Set was not only a foreign god, but came to be regarded as the god of the foreigners, and after the evils of foreign oppression had been experienced, the honor paid to him gradually ceased, till during the twenty-second and following dynasties the general detestation in which he was held is evidenced by the fact that his name was erased from the monuments and his images destroyed. He is also found as the god of the Hittites, and consequently he was regarded as the enemy of Rā, the sun-god. Set was represented in the hieroglyphics as an ass-headed figure, or as an ass seated on his haunches with a forked tail in a vertical position. The ass, crocodile, and hippopotamus were sacred to Set, and red-haired men were under his special protection. See Meyer, *Set-Typhon* (Leipzig, 1875). CHARLES R. GILLET.

Setu'bal (sometimes called **St. UBES**): town; in the province of Estremadura, Portugal; on the Bay of Setubal; 20 miles S. of Lisbon (see map of Spain, ref. 17-A). It has an excellent harbor, lined with broad quays and defended by five forts. It is an old town, the *Cetobriga* of the Romans, and is surrounded by walls, but it is well built and clean. It is the chief seat of the Portuguese salt-trade, and has also an extensive trade in wine and oranges. Considerable pilchard-fisheries are carried on. Pop. 15,600.

Revised by M. W. HARRINGTON.

Seoul: same as **SEOUL** (q. v.).

Seurt, or **Saird**: town; on the upper Tigris; in the vilayet of Bitlis, Kurdistan (see map of Turkey, ref. 5-1). It is probably the ancient *Tigranocerta*, built by Tigranes the Great (80 B. C.). It carries on trade in wheat, barley, mohair, and gallnuts. Pop. 12,000, Kurds, Armenians, Syrians, and Chaldeans. E. A. G.

Seusse: See **SUSO**.

Sevasto'pol, or **Sebas'topol**: seaport and fortress; near the southwest extremity of the Crimean peninsula in the Black Sea (see map of Russia, ref. 11-C). The roadstead and the harbor, and the extensive establishments connected with them, form the most important features of the place. It was a Tartar village (*Akh-tiar*) until 1780, when the Russian Government commenced the work of establishing here its naval arsenal. The great harbor fortifications which existed at the period of the siege were planned in 1834, and also at the same time land-defenses. The latter had not been constructed when (Sept., 1854) the allied armies of Great Britain and France established themselves before the place and the memorable siege commenced. Every effort was then made to increase the strength of existing intrenchments, and the process continued *pari passu* with the siege. The bastions (of earth) mentioned in accounts of the siege had been previously thrown up. The connecting lines had not the strength of ordinary field-fortifications, the scarcity of earth preventing the excavation of ditches, except about the bastions and other points of support (e. g. the Malakoff, originally a stone tower; the Redan, an earthwork, etc.). To compensate for want of ditches, every practicable expedient was adopted to render access difficult.

Though compressed into comparatively small linear space, the real magnitude of these defenses was enormous, 5,000 or 6,000 men being at some periods daily engaged on them, and the labor being unintermitted during the eleven months of the siege. The garrison during this period (always in free communication with the external forces by which it was replenished) was usually about 30,000 men; the number of guns mounted at the final assault is said to have been 800, several times that number having been rendered unserviceable in the course of the siege (Oct., 1854-Sept., 1855). The Russian loss in the defense was 84,000 men. (*Todleben*.) The forces actually engaged were, during the latter months, about as follows: French, 120,000; British, 27,000; say, 147,000 men. The Sardinians (5,000) and Turks are not included, as they were not directly engaged. The former and a portion of the Turkish force helped to hold the base (Balaklava) and communications of the besiegers. The French loss was 44,500 (*Niel*); hence the total loss of allies must have been about 60,000. The total loss of besieged and besiegers must have been nearly 150,000.

The fortifications and naval establishments were, after the capture, destroyed by the allies, and by the Treaty of Paris, which terminated the war, Russia was debarred from building arsenals and maintaining a naval force in the Black Sea beyond a very limited magnitude; but this restriction was removed by the abrogation of the neutrality of the Black Sea by the Conference of London (1871). The town has been rebuilt, and since 1885 the fortifications have been actively replaced and the docks reconstructed. Sevastopol has become a pleasant watering-place, and is Russia's greatest southern naval headquarters. It has ceased to be a commercial port since the opening of the new harbor at Kaffa (1895). Pop. (1890), inclusive of the garrison of 12,000, 41,000. See **CRIMEAN WAR**. Revised by M. W. HARRINGTON.

Seven Pines, Battle of: See **FAIR OAKS**.

Seven Sages (or **Wise Men**) of **Greece**: according to most authorities, Bias, Chilon, Cleobulus, Periander, Pittacus, Solon, and Thales, but the names are variously given. Many aphorisms in prose and verse, chiefly practical observations for the regulation of life, the work of these and other wise men of the antephilosophic period of Greece, have been collected in Orelli's *Opuscula Græcorum Veterum Sententiosa et Moralia* (vol. i., p. 188, seq.). J. R. S. S.

Seven Sleepers: according to an early tradition, seven Christian brothers of Ephesus who, during the persecution of Decius (251), took refuge in a cave, the entrance of which was walled up immediately after by the heathen. There they slept miraculously until 447. Then they awoke, told their story to many persons—among others to the Emperor Theodosius II.—and died after having thus confirmed the faith of the Christians. The Roman Catholic Church commemorates them on July 10. This legend can be traced at least as far back as the beginning of the sixth century. It is also told by Mohammed in the Koran. Kindred tales are found in various forms in the folk-lore of the East. E. A. G.

Seventeen-year Locust: See **CICADA**.

Seventh-day Adventists: See **ADVENTISTS**.

Seventh-day Baptists: a denomination of Christians formerly called *Sabbatarians*. They hold to the immersion of adult believers, and also to the observance of the seventh day of the week as the Sabbath, arguing that since the institution of the Sabbath at the close of creation and its formal annunciation as a part of the Sinaitic code there has always been an unbroken chain of men who have kept the seventh day of the week as a Sabbath, according to its original institution and enjoyment, and considering the introduction of the observance of Sunday, in the middle of the second century, as the first step to apostasy. Traces of the peculiar practice of observing the seventh day of the week as the Sabbath among some of the early Reformers are not few. The Sabbatarians began to attract attention in England about the time of the Commonwealth. In 1650 they assumed a denominational form in that country. The first Sabbatarian church in America was organized at Newport, R. I., in 1665, under the care of Stephen Mumford. In 1671 they left the Baptist denomination. In 1818 they assumed their present name. In the U. S. they have three colleges, one at Alfred Centre, N. Y., one at Milton, Wis., and one at Salem, W. Va., a number of academies and periodicals, a tract and publication society, and a missionary organization. The number of organizations in 1892 was 112, the number of members 9,317. In England they are at present few in number.—**SEVENTH-DAY BAPTISTS** (GERMAN), a small sect which in 1728 seceded from the Dunkers of Pennsylvania, and established at first a solitary, and then a conventual, life at Ephrata, Lancaster co., Pa. They hold a part of their property in common, adopt the Capuchin habit and a system of monastic names, and recommend, but do not absolutely require, celibacy. At present their leading establishment is at Snowhill, Franklin co., Pa. In 1890 there were six organizations and 194 members. Their founder was Conrad Beissel. See *A General History of the Sabbatarian Churches*, by Mrs. Tamar Davis (1851). See **BAPTISTS**. Revised by W. H. WHITSITT.

Seven Up: a game at cards known also as *all-fours* and *old sledge*. It is designed for two players and is played with a full pack, the cards ranking as in whist. Six cards are dealt each player, three at a time, and the next is turned face up. If the non-dealer is dissatisfied with this for trump he "begs," and the dealer must either immediately add one point to his opponent's score or lay the turned card aside and deal three more to each player, turning the next card for trump; but if this be of the same suit as before he must

as it wins and deal three more to each, and so on until a new trump is turned. The oldest hand leads first, and thereafter the winner of the trick. A player must follow suit if he can, except that he may play a trump instead. One point is scored for (1) playing the highest trump (high), (2) playing the lowest trump (low), (3) turning up a knave or taking the knave of trumps (jack), and (4) taking the most valuable cards (trumps), counting here each ten as 10, ace 4, king 3, queen 2, and knave 1. The first to score seven points wins; in the last hand the points are scored in the order given above not in the order in which they are made, except that the point for turning a knave is scored when it is turned. This game is much played, and is of especial interest as being a game from which many others have been derived by greater or less modifications and additions; examples are California jack, Pedro, vint, or double Pedro, draw Pedro, and pitch.

S. A. TORRANCE.

Seven Wonders of the World: variously given, but generally as follows: The Colossus of Rhodes (see CHARLES), Diana's temple at Ephesus (see DIANA, TEMPLE OF), the Mausoleum at Halicarnassus (see MARCULLUM), the Pyramids (see), the Pharos at Alexandria (see LACRIMOSUS), the Hanging Gardens of Babylon (see LACRIMOSUS), and the colossal gold and ivory statue of Zeus, by Phidias, at Olympia.

Seven Years' War: the contest between Prussia and several of the other powers of Europe extending from 1756 to 1763. Prussia, which had previously seized the Austrian province of Silesia, held it despite the efforts of Maria Theresa to regain it. The latter was determined to crush, or at least humiliate, the house of Brandenburg, and since the Peace of Aix-la-Chapelle (1748) the Austrian generals had been busy in reorganizing and increasing their armies, while the emperor and his agents had been forming alliances against Prussia. The Czarina of Russia, Elizabeth, was a willing ally; she knew that Frederick II. need to make her humiliations the favorite subject of his sarcasms. But with respect to France, the hereditary enemy of Austria and just then at war with England, the former ally of Maria Theresa, the difficulties seemed almost insurmountable. Nevertheless when George II. concluded an alliance with Prussia Jan. 16, 1756, in order to secure his Hanoverian possessions against a French invasion, and when Maria Theresa stooped to write a letter to Madame de Pompadour, Prince Kaunitz lost in forcing an alliance between France and Austria (May 1, 1756). London, whose possessions in Northern Germany were confined to Stralsund and the island of Rügen, was easily persuaded by France to make a descent on Pomerania. In Saxony the elector was so exasperated at Prussia that he even came forward with a proposal of alluring the Prussian king into Bohemia by a feigned neutrality, and then throwing an army into his rear to cut off his lines of retreat and communication. Frederick II. knew of all these plans, and when he saw that war was unavoidable he set at once, without any declaration of war, upon Saxony with 60,000 men (Aug., 1756), took Dresden Sept. 9, shut up the Saxon army of 15,000 men in its camp between Pommersfelden and Kottbus, defeated the Austrian army under Daun, who from Bohemia hastened to the support of Saxony, compelled the Saxon army to surrender Oct. 15, and placed the whole country under Prussian control. But notwithstanding this brilliant beginning the situation in the spring of 1757 was almost overwhelming. At the north 22,000 Swedes gathered in Stralsund ready to cross the Pomeranian coast; 100,000 Russians under Apraxin pushed onward to Moscow; in the southwest two Austrian armies approached through Bohemia—the one, of 76,000 men, under Charles of Lorraine, destined for Silesia, the other, of 46,000 men, under Daun, destined for Saxony; in the southwest two French armies marched toward Prussia—the one, of 100,000 men, under d'Estrées, through Hanover; the other, of 36,000 men, under Montmory, through Hesse-Cassel; in the south an army from the neighboring of the South German states was destined to maneuver in connection with the Western Austrian and Eastern French armies. In the center of this circled Frederick II. with an army of about 200,000 men, first Britain, his only ally, promised and paid him for several years a handsome subsidy, but her representative, the Duke of Cumberland, commanded an army of only 40,000 British-Hanoverian troops in Hanover. In Apr., 1757, Frederick broke into Bohemia; attacked the Austrian army under Charles of Lorraine before Prague May 6; split it in two, of which the rear part retired into Prague, and the other retreated to the southwest to join Daun; invested and be-

sieged Prague; marched with one division of his army against Daun, who came to re-enforce the city; met him at Kolin June 18; was completely defeated, and retreated with his whole force into Saxony, closely followed by Daun, while Charles of Lorraine marched onward to Silesia. In Hanover the Duke of Cumberland was totally defeated by d'Estrées at Hastenbeck July 26, and compelled to conclude the capitulation of Kloster-Zeven Sept. 8, by which his army was dissolved. D'Estrées's successor, the Duke of Richelieu, was too much occupied with plundering Hanover to do anything serious, but in the meantime Montmory, with the second French army, had conquered Hesse and penetrated into Saxony. Frederick II. met him at Rossbach Nov. 5, and literally scattered his army to the winds. With incredible rapidity he then turned to Silesia, which had fallen into the hands of the Austrians; routed Charles of Lorraine at Leuthen Dec. 5, and reconquered the whole province with the exception of Schweidnitz. In the north the Swedes were driven back into Stralsund, and the Russians, although victorious at Grossjägerdorf Aug. 30, and still occupying Memel, suspended all hostilities on account of the illness of the czarina, which changed the whole policy of the country. Thus, when winter set in and stopped all military operations, the actual loss which Frederick II. had sustained was not great, and the prestige he had gained was enormous. The capitulation of Kloster-Zeven was not ratified by the British Parliament. On the contrary, a new British-Hanoverian army was organized and placed under the command of Duke Ferdinand of Brunswick, and during the subsequent campaigns he succeeded by his vigilance, energy, and shrewd tactics, and by several brilliant victories—at Crefeld June 23, 1758, over Clermont, and at Münden Aug. 1, 1759—in keeping the French on the other side of the Rhine. In the sea-war between Great Britain and France, Spain joined the latter in 1761, but Great Britain was so successful in North America, the West Indies, the African coast, and India, and showed herself so superior to France in all their great naval encounters—at Quiberon, 1759, and Belleisle, 1761—that she then laid the foundation of her great maritime empire. In 1758 Frederick II. defeated the Russians at Zorndorf Aug. 25, but he was himself defeated at Hohenkirchen Oct. 14, by the Austrians under Daun. He nevertheless kept both Silesia and Saxony, but in 1759 was so completely routed at Kunersdorf, Aug. 12, by the Russians and Austrians, that the morning after the battle he could hardly gather 5,000 men. Dresden and a large part of Saxony fell into the hands of the allies, and although he reconquered it in 1760 by the brilliant victories at Liegnitz Aug. 15, and at Torgau Nov. 2, his ruin seemed, nevertheless, unavoidable. On Oct. 25, 1760, George II. died, and the British subsidies stopped. The Russians under Tottleben took Berlin and plundered it for three days. In large districts, especially of the eastern part of his kingdom, the houses were burned, the animals driven away, the men killed, and the women and children left to starve. Frederick's army, mostly foreigners and young recruits, numbered only 50,000, and with this force he had to face three hostile armies at once, each superior in numbers to his own. But the czarina died Jan. 5, 1762, and her successor, Peter III., was an enthusiastic admirer of Frederick II. Peace was concluded with Russia May 3, and with Sweden May 22, and although the projected Russo-Prussian alliance was frustrated by the assassination of Peter III., Catherine II., his successor, declared herself neutral; Austria felt too weak to carry on the war alone. Almost without any preliminary negotiations peace was concluded between Prussia and Austria at Hubertsburg Feb. 15, 1763, by which "all should remain as it had been before the war." The effort to wrench Silesia from Prussia had failed, and the heroic and triumphant resistance of the king gave him the permanent appellation of Frederick the Great. See Frederick II., *Histoire de la Guerre de Sept Ans* (6 vols., 1794-1801); Carlyle, *Frederick the Great*; Ranke, *Ergebnisse der siebenjährigen Kriege* (1871). Revised by C. K. ADAMS.

Severinus, SAINT: the apostle of Noricum; b. in Italy in the beginning of the fifth century; made a journey to the East, where he adopted a life of the severest asceticism, and devoted himself, after his return to the West, to missionary work. He first visited Pannonia, but afterward settled in Noricum, a Roman province comprising the present Austria, Styria, Carinthia, Cariola, and Tyrol. He died, after an eventful life, at Favianis, a city situated on the Danube, near the present Vienna, Jan. 8, 482. His *Life*, by his pupil Eugippius, is in Migne, *Pat. Lat.*, 1st, 530, seq.

Severn: a river of England which rises in Montgomeryshire at an elevation of 1,500 feet above the level of the sea, flows east, south, and then southwest, and falls into the Bristol Channel after a course of about 210 miles, though the distance from source to mouth is only 80 miles in a straight line. It is navigable for 150 miles, and the tide, which in its estuary assumes the character of the bore, locally called *hygre*, is perceptible 120 miles from its mouth. Its chief affluents are the Terne and the upper and lower Avon on the E. and the Teme and the Wye on the W. A canal 18½ miles long, and navigable for vessels of 400 tons, extends from Gloucester to the upper portion of the estuary. Other canals establish communication between the Severn and the Thames, Trent, and Mersey.

Severus, ALEXANDER: See ALEXANDER SEVERUS.

Severus, SEPTIMIUS: Roman emperor (193-211 A. D.); b. near Leptis in Africa in 146; married the famous Julia Domna, daughter of Bassianus, priest of the Sun at Emesa. While commander-in-chief of the Roman armies in Illyria and Pannonia he was proclaimed emperor by his troops. He deposed the Emperor Julianus and crushed the rival claimants Pescennius Niger and Clodius Albinus; captured Byzantium (197) after a memorable siege which lasted three years; invaded Parthia and captured Ctesiphon; from 203 to 207 remained peacefully at Rome, where he remodeled the constitution of the Pretorian Guards; was then called to Britain to repress rebellion and marched the entire length of the island, subduing the Caledonians; died at Eboracum (York) in 211, his death being hastened by the unnatural conduct of his son Caracalla. E. A. GROSVENOR.

Severus, SULPICIUS: See SULPICIUS SEVERUS.

Severus, Wall of: a wall of stone partly built or repaired by the Emperor Severus in 208 A. D. to protect Roman Britain from the Caledonians. It was originally erected by Hadrian. It extended from the Solway to the Tyne, immediately N. of the wall of Hadrian, and consequently far S. of that of Antoninus. Considerable portions of the wall still remain. See HADRIAN'S WALL.

Sevier, sev-er', JOHN: pioneer and soldier; b. on Shenandoah river, Virginia, in 1745, of French parents; originally named XAVIER; explored the Holston river in East Tennessee (then North Carolina), built Fort Watauga, and fought successfully against the Indians. During the Revolutionary war he distinguished himself by his bravery. He was foremost in almost all the battles and skirmishes, as well as treaties and negotiations, with the Indians during many years, and was regarded by the settlers as their friend and protector; was chosen in 1785, without opposition, Governor of the anomalous State of Franklin, comprising Western North Carolina and Eastern Tennessee. He received from President Washington the commission of brigadier-general of the territory S. of Ohio river. In 1796 the State of Tennessee was erected and admitted into the Union, and Sevier was chosen Governor, served for two consecutive terms, and was re-elected in 1803; was elected a Representative in the U. S. Congress in 1811, and re-elected in 1813. D. near Fort Decatur, Ga., Sept. 24, 1815, while on a mission to the Creek Indians. F. M. COLBY.

Sevier Lake: a body of salt water in Western Utah; in lat. 39° N., lon. 130° 10' W.; altitude, 4,000 feet. Its sole tributary is the Sevier river, which enters at the north end. Its valley is a southward arm of the Sevier desert, limited at the W. by the House Range of mountains and at the E. by the Beaver Creek Range. The lake, having no outlet, is of variable size, its extent depending on the relation between inflow and evaporation. In 1872 its length was 28 miles, its width 10 miles, its area 188 sq. miles, and its depth 15 feet; but its natural size was somewhat greater, for at that time a portion of the water of the Sevier river was used for purposes of irrigation. The whole of the river is now utilized in that way through the entire spring and summer, so that little water reaches the lake except in winter. As a result its bottom generally becomes dry each year, and the water acquires in winter a depth of but a few inches. The salts which made the natural water a strong brine have been precipitated and form a crust over the lake-bottom. This crust is estimated to contain 1,500,000,000 tons, of which about three-fourths is sodium chloride and the remainder sodium sulphate and magnesium sulphate. The only inhabitants of the lake are a species of brine-shrimp (*Artemia*) and the larvæ of certain insects. Such fishes as reach it from the river are poisoned by the brine. Old water-lines

about the margin of the valley show that the lake was once of greater extent. At the time of its extreme depth, 590 feet, it coalesced with Great Salt and other lakes, the whole forming a vast inland sea. See BONNEVILLE LAKE.

G. K. GILBERT.

Séguigné, sã'veẽn'yã', MARIE DE RABUTIN CHANTAL, Marquise de: writer; b. in Paris, France, Feb. 6, 1626; was left an orphan very early, but received an excellent education from her uncle, Abbé de Coulanges, and married in 1644 the Marquis Henri de Séguigné (d. 1651), to whom she bore a son and a daughter. She was rich, spirited, beautiful, one of the most prominent members of the literary circle of the Hôtel Rambouillet, and on intimate terms with all the principal actors in the civil war of the Fronde. In 1669 her daughter, to whom she was passionately attached, was married to the Marquis de Grignan, governor of Provence; the consequent separation occasioned a correspondence which, although not intended for publication, appeared after the death of the authoress, and has made her name celebrated, the letters being at once of great historical interest and of the highest literary merit. D. at Grignan, Apr. 18, 1696. The chief edition of her *Letters* is that of Regnier (14 vols., 1862-67; new ed. begun 1887). See also Walckenaer, *Mémoires touchant la Vie et les Écrits de Madame de Séguigné* (1842); Capmas, *Lettres inédites de Madame de Séguigné* (1876); Combes, *Madame de Séguigné historienne* (1885); the biographies by Bossier (1887) and Valléry-Radot (1888); and Saporta, *La famille de Madame de Séguigné en province* (1889). F. M. COLBY.

Seville, sev'il (Span. *Sevilla*, anc. *Hispalis*): capital of the province of Seville, Spain; on the left bank of the Guadalquivir, 70 miles from its mouth (see map of Spain, ref. 19-C). Under the Romans, Goths, and Moors it was the capital of wealthy and powerful empires. The earlier kings of modern Spain also resided here; and though Charles V. removed the royal residence to Valladolid, Seville rose to a still higher degree of splendor and prosperity when America was discovered, as it became the mart of the new colonies. During the French invasion (1810-13), and by the subsequent loss of the Spanish colonies, it suffered very much, but it recovered rapidly, and is an enterprising modern town. Its old Moorish walls, 5 miles in circuit, pierced by fifteen gates, and surmounted by sixty-six towers, have disappeared, except the single gate called Triana. Across the city runs the Alameda, a broad, open street lined with palaces, planted with magnificent elms, and adorned with numerous fountains, which, like the city in general, are provided with water by several great aqueducts, of which that built by Julius Caesar and rebuilt by the Moors in 1172 is a magnificent structure resting on 410 high arches. The rest of the city, with the exception of the numerous public squares and promenades, consists mostly of narrow streets lined with high, somber-looking, but substantial houses of Moorish construction. Among its edifices the cathedral is the most remarkable. It is one of the greatest Gothic structures in the world, 481 feet long, 315 feet wide, and 145 feet high under the transept dome, and it is most magnificently adorned with paintings by Murillo, the Herreras, and other masters of the school of Seville, besides being almost overloaded with sculptures. Unique of its kind is the Giralda, a belfry 350 feet high; and most interesting on account both of their architecture and ornamentation are the Alcázar, the royal palace and the university, founded in 1579. Besides the university, to which several scientific establishments are attached, Seville has many good educational institutions, and several valuable libraries and art collections. Among its manufactures are an immense cigar-factory, a cannon-foundry, several manufactories of muskets and other firearms, powder, saltpeter, soap, leather, cotton thread, etc. Its chief exports are oranges, olive-oil, wine, wool, cork, copper, lead, and quicksilver. As Seville was held by the Moors for five centuries and entirely rebuilt by them from the materials of former Roman edifices, it became a purely Moorish city, and to a certain extent it still preserves that character, though the narrow, tortuous streets are gradually giving way to broad and straight boulevards. Pop. (1887) 143,182. The province of Seville occupies the lower valley of the Guadalquivir, bounded W. by Huelva and S. by Cadiz; area, 5,235 sq. miles; pop. (1887) 544,815.

Revised by M. W. HARRINGTON.

Sèvres, sev'r: town; in the department of Seine-et-Oise, France; on the Seine; 10½ miles S. W. of Paris by rail (see map of France, ref. 3-F). It is celebrated for its manufactures of

presiding, which are generally acknowledged to be the most elegant ever produced in bold design and painting. The porcelain museum contains a large collection of china and services from all parts of the globe. Pop. (1891) 6,904.

Sèvre-Bony, *département* of Western France, deriving its name from two rivers—the Sèvre-Nantaise, which flows into the Bay of Biscay, and the Sèvre-Nantaise, which joins the Loire. Area, 2,167 sq. miles. The northern part is hilly, with mountains; the southern level. The soil is everywhere fertile; it produces more wheat than is necessary for home consumption, and affords excellent pastures. Cattle, horses, mules, and asses are extensively reared. Iron, marble, and granite are found, and considerable manufactures are carried on. Pop. (1891) 334,285. Capital, Niort.

Sewall, JONATHAN, LL.D.; b. in Boston, Mass., Aug. 28, 1753; graduated at Harvard 1778; taught school at Salem 1776; began the practice of law at Ellington in 1779; became attorney-general of Massachusetts 1787; secured a writ by which slavery recovered his freedom at common law 1793, resided at Cambridge until 1774, when the three settlements owned his house to be wrecked by a mob; went to England in 1775; was included among the sufferers by the penal act of Apr. 30, 1775, against the loyalists; settled at St. John, New Brunswick, 1788, and was judge of the court of vice-admiralty until his death Sept. 26, 1796. He was long reputed the author of the letters signed Massachusetts published in defense of British policy, and refused to let John Adams over the signature of Novanglus, but it is now known that they were written by Daniel Leonard, of Taunton.—His son, JONATHAN SEWELL, LL.D. (1793-1839), who adopted the English form of the name, was chief justice of Lower Canada 1808-28.

Sewall, MAY (Wright); educator; b. at Milwaukee, Wis.; educated at the Northwestern University at Evanston, Ill.; taught public schools in Michigan, and was soon made principal of the High School in Plainfield, in that State; later became, successively, the principal of the High School in Franklin, Ind., and teacher of English and German in the High School in Indianapolis; married in 1880 Theodore L. Sewall, principal of a private school for boys in that city. In 1882 Mr. and Mrs. Sewall opened a girls' classical school. Mrs. Sewall's energies were enlisted in reforms soon after reaching womanhood. She was first actively connected with the National Woman Suffrage Association, in which she held for many years the office of chairman of the executive committee. She was one of the promoters of the International Council of Women which convened in Washington in 1893, and conceived the idea of perpetuating its influence through permanent International and National Councils of Women. In the organization of both these bodies she subsequently aided, and has served as president of the National Council and vice-president at large of the International Council. She was also one of the committee that formulated the plan for the general federation of women's clubs. In Indianapolis she was one of the founders of the Woman's Club, of the Art Association; of the Equal Suffrage Society; of the Kamabai Circle; of the Indiana Branch of the Association of Collegiate Alumnae; of the university extension work in Indianapolis, under the auspices of this latter society; of the Local Council; of the Women's Exchange; and of the Contemporary Club. She also originated the plan of the Indianapolis Proprietary, an incorporated joint-stock company of women, which has erected a handsome building for social and educational purposes. Mrs. Sewall was appointed member at large of the board of World's Fair managers for Indiana, was chairman of the committee on women's work, and a member of the committee on education in that body. She was also made the chairman of the committee on the World's Congress of Representative Women, in the World's Congress Auxiliary of the Columbian Exposition of 1893. She has lectured frequently on social, educational, literary, and reform topics, a contributor to periodicals, and has edited *The Historical Journal of the World's Congress of Representative Women* (1893).

SURAN B. ANTHONY.

Sewall, SAMUEL; jurist; b. at Bishopcote, England, Mar. 20, 1652. His parents emigrated to New England and settled at Newbury, Mass., 1667, and he entered Harvard, graduating 1671; studied theology; preached for a short time; acquired a fortune by his marriage (Feb. 28, 1676) with Hannah, daughter of John Hull, master of the mint at Boston; was assistant governor 1684-86 and 1689; visited England 1686-89; was annually chosen a member of the

executive council from 1692 to 1735; was judge from 1692 to 1718, when he was made chief justice, being at the same time judge of probate for Suffolk County; presided at the trial of some of the victims of the witchcraft delusion of 1692, but was soon convinced of his error, for which he publicly asked pardon of God and man in a paper read in the congregation of the Old South church, Boston, on Fast Day, Feb. 14, 1697, by his pastor, Rev. Samuel Willard; was noted for his clarity and philanthropy, having been perhaps the first American writer against slavery, in which theme he published a tract, *The Selling of Joseph* (1700); was secretary and treasurer of the society for the malice of Indian missions, and was author of *An Answer to Queries respecting America* (1699); *Accomplishment of Prophecies* (1718); *A Memorial relating to the Kennebec Indians* (1721); and *A Description of the New Heaven* (1727). He resigned his judicial office 1729. D. in Boston, Jan. 1, 1780. His diary and other papers have been published by the Massachusetts Historical Society.—His son, JOSEPH, b. in Boston, Aug. 20, 1698, graduated at Harvard 1717; studied theology; was ordained village pastor of the Old South church Sept. 16, 1713; declined the presidency of Harvard College 1724; received the degree of D. D. from the University of Glasgow 1731; gave to that institution a fund for the education of indigent students; was a friend of learning and a man of great benevolence and worth. D. in Boston, June 27, 1769. Author of *Four Sermons* (1741) and of twenty-three other sermons separately printed.

Sewall, STEPHEN; scholar; b. at York, Me., Apr. 4, 1764; graduated at Harvard 1781; taught the grammar school at Cambridge; became instructor in Hebrew in Harvard 1762, and was Hancock Professor of Hebrew 1784-85; published a *Hebrew Grammar* (1765); wrote seven of the Greek and Latin poems in *Poetae et oratores* (1761) and other works, and left several MSS., now in the library of Harvard, including a *Chaldee and English Dictionary*. D. in Boston, Mass., July 23, 1804.

Seward, *synonym*: city; capital of Seward co., Neb.; on the Big Blue river, and the Pac., Elk, and Mo. Val. and the Burlington Route railways; 25 miles W. by N. of Lincoln, the State capital (for location, see map of Nebraska, ref. 10-6). It is in an agricultural region, and contains 2 national banks with combined capital of \$100,000, a State bank with capital of \$60,000, a savings and investment company with capital of \$50,000, and a monthly and 4 weekly newspapers. Pop. (1890) 2,032; (1891) 2,106.

EDITOR OF "BLUE VALLEY BEAVER."

Seward, ANNA; poet; b. at Epsom, Derbyshire, England, in 1747; obtained some celebrity as a poet, chiefly by her elegies upon her friend, Maj. André (1781), and upon Capt. Cook; resided most of her life at Lichfield, where her father was a canon residentiary; published a *Life of her friend Dr. Erasmus Darwin* (1804), in which she laid claim to the authorship of the first fifty lines of *The Botanic Garden*; also *Lancelot*, a poetical novel (1782); and *Sonnets* (1789). D. at Lichfield, Mar. 23, 1809, bequeathing her MSS. to Sir Walter Scott, who published her *Poetical Works and Correspondence* (3 vols., 1810), with a prefatory memoir, but the collection met with little favor, though by her contemporaries she was called the Swan of Lichfield. Considerable published six volumes of her correspondence (1811-13).

Revised by H. A. HEARS.

Seward, THOMAS FRANKLIN; author, composer, and teacher; b. at Florida, Orange co., N. Y., Jan. 25, 1835; studied music with Dr. Lowell Mason and others; taught vocal music and edited and compiled many sacred and secular music-books; edited several music periodicals; managed the concerts of the Jubilee Singers in Europe; introduced the tonic sol-fa system of instruction into the U. S. in 1880; in 1891 founded the Brotherhood of Christian Unity; author of *Hebrew Theology, or the Gospel according to Sator*; *The School of Life, or Divine Providence in the Light of Modern Science* (1894); *A Plea for the Christian Year*, and other books. D. R. HERVEY.

Seward, WILLIAM HENRY, LL.D.; statesman; b. at Florida, Orange co., N. Y., May 16, 1801; educated at Farmers' Hall, Goshen, and at Union College, where he took the degree of A. B. in 1820; studied law in New York and Boston, and was admitted to the bar at Utica in 1823; settled in Auburn in 1823, where he soon took a prominent place among the leaders of the profession. In 1824 his political proclivities be-

came conspicuous, and from that time he was prominently connected with all the political movements of importance in the State and nation. He earnestly advocated the election of John Quincy Adams: was one of the State committee to welcome Lafayette in 1827; was elected in 1830 as an anti-Masonic candidate for the State Senate, where he labored for the improvement of schools, construction of railroads and canals, and for the collection of those documents which form the monumental *Colonial History of New York*. During the next four years he delivered frequent addresses, denouncing the course of President Jackson, and supporting the newly formed Whig party with such fervor and success that in 1834 he was nominated for Governor. In this he was unsuccessful, but on the triumph of the Whigs in 1837 he was again nominated, and was elected by a small majority. Though his administration was one of peculiar difficulties, owing to bitter factions within the party, he recommended and succeeded in carrying so many wise measures that his position in the party was much strengthened. He was re-elected in 1840. During his administration Roman Catholics were first admitted to the public schools, many of the disabilities of foreigners were removed, the natural history and geological survey of the State were begun, and the State Museum of Natural History at Albany was established. From 1843 to 1849 his activities were confined to professional practice and to occasional addresses on scholastic and political subjects. In 1849 he was chosen as a Whig to the U. S. Senate, where at once he took a position of prominence not only as one of the leaders of his party, but also as an influential adviser of President Taylor. It was in Mar., 1849, in a speech on the admission of California, that he spoke of the exclusion of slavery from all new States as demanded by "the higher law," a phrase which was so severely criticised as treasonable by Southern members that it became famous as a watchword of abolition. On the accession of Fillmore after the death of President Taylor, Seward declined to follow his party in the support of what was deemed Fillmore's pro-slavery policy. His speeches in the Senate and before public audiences during this period gave him great prominence by reason of their comprehensiveness and independence. In 1852 he favored the nomination of Gen. Scott, but opposed the statement of the party platform concerning slavery. Re-elected to the Senate in 1855, he took prominent part in the political agitations extending to the outbreak of the war. In 1858, in the course of a speech at Rochester, he coined the second of the famous phrases that are inseparably connected with his name when he declared that the slavery question indicated "an irrepressible conflict" which could only terminate by making the country either entirely a free nation or entirely a slave-holding nation. Both in 1856 and in 1860 he was the most conspicuous candidate of the Republican party for the nomination for the presidency. In 1860 the New York delegation, headed by William M. Evarts, went to the Chicago convention with much confidence that their candidate would be chosen. On the first ballot Seward received 173½ votes and Lincoln 102. The vote of Pennsylvania went over to Lincoln and other States followed. Seward, though defeated in the convention, supported Lincoln earnestly by speaking in the West as well as in the East. When Lincoln assumed office the arduous and delicate post of Secretary of State was given Mr. Seward. Though he habitually underestimated the strength and the earnestness of the South, his management of the delicate foreign relations of the Government were characterized by tact and skill. When the Confederates Mason and Slidell were taken from the British vessel the Trent, Great Britain made a peremptory demand for their restoration, and for a time war seemed almost inevitable. The answer, first drawn by Mr. Seward and then slightly modified by President Lincoln, was a masterpiece of tact and diplomatic skill. The position taken was that the exemption from search claimed by Great Britain was what the U. S. had fought for during the war of 1812 against Great Britain, and that as Great Britain had come to the position of the U. S. the Government very cheerfully released the prisoners. In all the negotiations with foreign powers to induce them to preserve a position of strict neutrality the duties of the Secretary were performed with great skill. On the evening of Apr. 14, 1865, when President Lincoln was assassinated, one of the conspirators forced his way into Mr. Seward's bedroom, where he was lying ill, and struck him several times in the face and neck with a dagger. The wounds, though severe, did not prove mortal. Recovery, however, was very slow. Seward was retained in his posi-

tion by President Johnson, whom the Secretary supported in his policy of reconstruction. After a memorable service of eight years he retired in Mar., 1869. Though much enfeebled in body he undertook with his family a voyage around the world in 1870, and published in 1871 an account of his observations. He died at Auburn, Oct. 10, 1872. His works, in 5 vols., include the most important of his speeches.

C. K. ADAMS.

Sewell, ELIZABETH MISSING: author; b. in the Isle of Wight in 1815; became well known as the author of novels of the so-called High Church school of fiction, among which were *Amy Herbert* (1844); *Gertrude* (1845); *Laneton Parsonage* (1846); *Margaret Percival* (1847), which were republished in the U. S. She also wrote works of travels, many volumes of a devotional character, poems, and histories of Greece, Rome, and Egypt for young people. D. in London, June 10, 1884.

Revised by H. A. BEERS.

Sewel'lel [from native (Amer. Ind.) name]: a rodent, *Haplodon rufus*, representing a special family, *Haplodontidae*. It is noted for its rootless molars; is reddish brown, with very small eyes and a short tail; is about the size of a muskrat, and has very strong jaws and a plump, heavy body. It is found on the Pacific coast in California, Oregon, and Washington, is gregarious, and lives in burrows. Its skin is employed by the Indians as an article of dress.

Sewen: See BULL-TROUT.

Sewerage [deriv. of *sewer* < M. Eng. *assewer*, from O. Fr. *essewer*, to drain < Lat. *ex*, out + deriv. of *aqua*, water]: a system of sewers or underground channels for carrying off the sewage or liquid refuse and the storm-water of a locality. The construction of such a system for a town is also called sewerage.

In all densely populated areas a proper regard for the health of the community requires the removal of solid and liquid refuse from the neighborhood of dwellings. Where dwellings are far apart, as in country districts, the liquid wastes from the house may be safely disposed of on the soil by very simple means; but when dwellings are crowded together, as in towns, there is no longer sufficient available open ground in the vicinity for such disposal, and sewers become a necessity. In towns where there are no sewers the sewage is run into cesspools, where it decomposes, contaminating the earth, air, and water in the vicinity, and becomes the disseminator of disease. To provide for the prompt and rapid removal of this sewage is the object of sewerage. The requisites for a sewer are that it be so constructed as to carry the sewage to its outfall with the least possible delay; that it be smooth on its interior surface, so as not to retard the flow of sewage and afford no lodging-place for the solid particles; that it be water-tight throughout its entire length.

The foremost nations of antiquity understood the necessity for sewerage, and their great cities had carefully designed and well-constructed sewers. In the ruins of Babylon and Nineveh and of the ancient cities of Egypt are found the remains of systems of sewerage. Exploration has brought to light the extensive sewers of ancient Jerusalem, and the visitor in Rome to-day sees in the Cloaca Maxima a sewer which still fulfills the purpose for which it was constructed twenty-five centuries ago.

During the dark ages sanitary works were neglected, but fatal epidemics and plagues brought thinking men at last to realize in some degree the necessity for attending to matters relating to the public health. Sanitary works were again undertaken, and with advancing civilization sanitary science has received more and more attention.

Sewers designed to carry both the liquid wastes and the storm water from any locality are called combined sewers. Those designed to carry only the sewage proper are called separate sewers.

THE SEPARATE SYSTEM OF SEWERAGE.—In this the first thing to be determined is the size of the sewers. The proper size of any sewer depends upon the number of people contributing sewage to it; the amount of sewage per day for each person; the maximum rate of discharge; and the form, grade, and interior surface of the sewer. In estimating the number of people provided for on any line of sewers, provision must be made for the extension and growth of towns and a liberal allowance made for an increase in the volume of sewage.

Amount of Sewage.—The amount of sewage per capita depends very largely upon the water-supply. It is also dependent upon the habits of the people, the amount of manufacturing in which large quantities of water are used, and

the use of water-motors for elevators, etc. The volume of sewage to be provided for per day may be taken as equal to the volume of water supplied. This varies greatly in different towns, and in different years in the same town. U. S. statistics show that the use of water varies in the different cities from 25 to 170 gal. per day per capita, and that the amount used is rapidly increasing. In many cases the increase has been 100 per cent. in twenty years. It would not be safe in any case, to assume the consumption of water to be less than 100 gal. per day per capita, and where water is much used for manufacturing purposes and for motors a still larger amount must be provided for.

Varying Rate of Discharge.—The consumption of water, and hence the discharge of sewage, is not constant. It varies with the different hours of the day, the days of the week, and the months of the year. The time of maximum discharge varies in different places with the habits of the people and the climate. The daily maximum of water consumption is from five to seven o'clock a. m., and the amount of maximum flow per hour is from 30 to 100 per cent. in excess of the mean hourly consumption. The maximum daily consumption for the week is on Monday. Taking the whole year into consideration there are two maxima of daily consumption. One of these is during the coldest weather in winter, and the other to the hot, dry weather in summer. The maximum daily consumption varies from 20 to 50 per cent. in excess of the mean daily consumption.

The flow of sewage not being uniform, the sewers must be made large enough to provide for the maximum flow. On the other hand, any unnecessary size is a serious detriment to the efficient working of the sewer. Any increase in size of the sewer, the amount of sewage remaining the same, decreases the depth and velocity of flow of the sewage, and hence its transporting power and effectiveness.

The following table shows the comparative depth and velocity of flow in circular sewers of different sizes, laid on the same grade and carrying the same amount of sewage:

SEWER	Depth of flow, inches.	Velocity in feet per second.	Discharge in cubic feet per second.
4-inch sewer	2.09	1.47	14.40
6-inch "	1.92	1.59	14.40
8-inch "	1.78	1.72	14.40
10-inch "	1.68	1.84	14.40
12-inch "	1.57	1.92	14.40

The following table shows the comparative velocity and discharge of a circular sewer at different depths of flow. The depth is given in fractions of the diameter, and the velocity and discharge are given in fractions of the velocity and discharge when the depth is the diameter of the sewer.

Depth of flow.	Velocity.	Discharge.	Depth of flow.	Velocity.	Discharge.
0.087	0.414	0.0277	0.800	1.0534	0.6332
0.170	0.426	0.0426	0.750	1.0622	0.7041
0.1405	0.507	0.0605	0.720	1.0664	0.7658
0.1334	0.5610	0.1000	0.600	1.1025	0.8822
0.240	0.7080	0.1374	0.550	1.1040	0.9377
0.300	0.810	0.2410	0.500	1.0918	0.9950
0.367	0.9265	0.3736	0.450	1.0766	1.0371
0.447	1.0533	0.5333	0.400	1.0603	1.0300

Grade.—A certain velocity of flow is required in a sewer to prevent deposit. The minimum velocity to prevent deposit varies with the size of the sewer, and is from 2 to 3 feet per second. The following table gives the minimum allowable inclination for self-cleansing sewers, running half full.

4-inch pipe	1 in 142 = 0.704 per 100
6-inch "	1 in 208 = 0.481 per 100
8-inch "	1 in 265 = 0.378 per 100
10-inch "	1 in 375 = 0.267 per 100

While in extreme cases sewers may be laid with a lower grade than that indicated above, it is always at the risk of unsatisfactory working and ultimate stoppage.

In localities where the surface of the ground is nearly level and sufficient grade can not be obtained to dispose of the sewage by gravity, the sewage may be carried to its outlet by pumping, or by one of the pneumatic processes. The three most important of the pneumatic processes are the *Interim*, *Becker*, and *Shomo*.

In the *Interim* and *Becker* systems the sewage is carried through air-tight iron pipes by atmospheric pressure, the air being exhausted from the pipes by large air-pumps.

In the *Shomo* system the sewage is raised from a lower to a higher level by being admitted to a running-chamber or

pneumatic ejector, and then forced by compressed air out of the ejector and to the desired elevation, when it again runs on through the sewer pipes by gravity.

The ordinary hydraulic formulas for the flow of water in pipes will apply to sewers. The amount of sewage which any pipe will carry depends upon its velocity. The following formulas are among the best in use:

$$\text{Weisbach's formula: } v = \frac{V \sqrt{gh}}{\sqrt{1 + k + \frac{fL}{D}}}$$

in which v = velocity of flow in feet per second.

h = head of water in feet.

L = length of pipe in feet.

D = diameter of pipe in feet.

k = coefficient of resistance for entrance of water into the pipe.

f = coefficient of friction in the pipe.

Baldwin Latham, in his *Sanitary Engineering*, gives tables of values for the coefficients, and extensive tables of velocities for different-sized pipes at different inclinations, according to Weisbach's formula.

Kutter's formula is

$$v = \left(\frac{41.66 + \frac{1.4913}{n} + \frac{0.002807}{S}}{1 + \left(\frac{41.66 + \frac{0.002807}{S}}{n} \right) \sqrt{R}} \right) \sqrt{RS} = C \sqrt{RS}$$

in which v = mean velocity in feet per second.

C = coefficient of mean velocity.

S = sine of slope.

R = hydraulic mean radius.

n = coefficient of resistance to flow, determined by experiment.

Flynn's hydraulic tables are based on this formula.

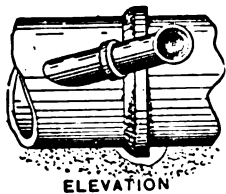
The most rapid method of determining the necessary size of sewers under given conditions is from diagrams or graphical tables. Pierson's graphical calculations, published in Staley and Pierson's *Sanitary System of Sewerage*, give results for pipe-sewers by both Weisbach's and Kutter's formulas.

Material for Pipes.—The best material thus far produced for sewers up to 2 feet in diameter is salt-glazed, vitrified, earthenware pipes. Sewers more than 2 feet in diameter may be constructed of brick, stone, or concrete. Sewer-pipes is sometimes made of hydraulic cement. Pipe of excellent quality can be made of this material, but it is difficult to secure uniformity of quality. Vitrified earthenware pipe has a smooth surface, is impervious to moisture, is not affected by sewage, and does not deteriorate with time. It is made of all sizes up to 2 feet, and special forms are manufactured for certain purposes. It is usually made of cylindrical form, and in lengths of 2 or 3 feet. In the usual form each length has a bell, or socket, at one end to hold the spigot end of the adjoining piece in laying. This is called the bell and spigot joint. Another method of making the joints is to make the pipes plain cylinders, and provide separate collars to slip over the joints where the pipes meet. A hand-hole is a length of pipe with a detachable section, which can be removed at any time after the pipe is laid without disturbing the line of pipe. Junctions are formed by Y or T branches. The T-branch is a socket on the side of a pipe to receive a branch at right angles. The Y-branch is a socket made to receive a branch at an acute angle. Curved pipes are prepared for turning bends. Junctions of laterals with mains, and of house-sewers with street lines, should be made with Y-branches. Fig. 1 shows in plan and elevation a junction. The Y should be elevated so that the curved piece, joining the Y with the lateral, will bring the top of the branch sewer as high or higher than the top of the main sewer.

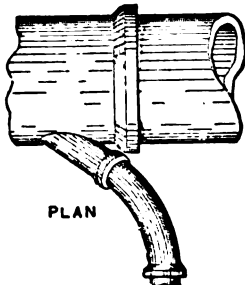
Sewers more than 2 feet in diameter are usually built of hard-burned brick, laid in hydraulic cement. All junctions for lateral branches and house-connections should be put in when the sewer is built, as much better workmanship can then be secured in making the connections, and with less danger to the sewer.

Location.—Sewers may be located either in the streets or, where alleys are regularly laid out through the center of the blocks, in the alleys. When only one line is laid in a street it should be on the center line. In some cases, where the streets are wide or the center line is occupied by street-railway tracks, it may be advisable to put a line of sewers on each side of the street.

Depth.—The sewers should be far enough below the bottom of the cellars, to afford sufficient fall for the house-drains starting from beneath the cellar floor. The minimum depth will usually be from 6 to 8 feet.



ELEVATION



PLAN

FIG. 1.

Laying.—In laying the sewers care should be taken to keep the flow-line on a continuous grade, and to make the joints water-tight. The joints should first be caulked with a gasket of oakum, or some similar material, to prevent the entrance of cement to the inside of the pipe, and the joint filled with pure cement, mixed with sufficient water to make it of the proper consistency for working. Y-branches should be placed along the line of sewers in front of each lot, so that house-drains may be connected at any time without cutting or disturbing the main line of sewers. The opening of the Y-branches should be closed with an earthenware cover.

Manholes are masonry shafts extending from the sewers to the surface of the ground, and large enough to admit a workman to inspect or clean the sewers. They are usually formed of an 8-inch brick wall. The form is the frustum of a cone with the large end down. The top should be about 2 feet in interior diameter, and the bottom about 4 feet. The form at the bottom is sometimes elliptical. The top is finished by a cast-iron cap, level with the surface of the street. The cover is perforated to aid in ventilation. Sometimes a dust-pan is placed under the cover to catch the dirt which falls through the openings in the cover.

The bottom should be of concrete, and built so as to be water-tight. It should be formed to the contour of the invert of the sewer, so that the flow of the sewage will not be checked in the manhole. Steps should be built into the wall to facilitate getting in and out. Fig. 2 is a vertical section of a manhole at right angles to the axis of the sewer. Manholes should be placed at the junctions of the laterals with the mains, and at changes of direction in the line of sewers.

Lampholes, or observation openings, are formed by a T-branch extending from the sewer to the surface of the ground. The top of the vertical pipe is covered with a cast-iron cap having a movable cover level with the pavement. Sometimes the vertical pipe is not carried to the surface, but is capped below the pavement and its position carefully recorded.

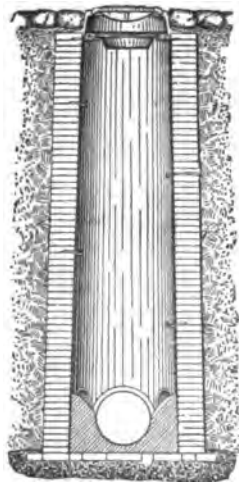


FIG. 2.

The advantage of this method is that each section between the manholes is independent of the rest of the system, and any stoppage in one section will not affect any of the other sections.

Size of Combined Sewers.—In determining the size necessary in any case, the disposal of the storm-water is the only question to be considered. The ordinary flow of sewage is

so small compared with the volume of storm-water delivered to the sewers during and immediately after a storm that the sewage may be left out of consideration. In estimating the necessary size the following conditions must be taken into consideration: The area to be drained; the rate of rainfall; the percentage of the rainfall reaching the sewer; the grade of the surface of the ground; the grade of the sewer; and the amount of ground-water.

Sewers are rarely built large enough to provide for all of the water which falls in extraordinary storms lasting only a short time. Besides this, not all of the rainfall reaches the sewers. The percentage of that which does pass into the sewers depends upon the relative proportion of roofed and paved area to the whole area to be drained, and the nature of the soil of the unpaved part. The grade of the natural surface of the ground affects the rapidity with which the storm-water reaches the sewer. It is customary to assume a certain depth, varying from half an inch to 2 inches per hour, as reaching the sewer, although the rainfall may occasionally be several times that amount.

Different formulas have been proposed for determining the size of sewers. The following are some of these. Julius W. Adams's formulas:

$$D = \sqrt[3]{\frac{QL}{1542H}}$$

in which D = diameter of sewer in feet.

Q = cubic feet per second to be provided for.

L = length of sewer.

H = rise for length L .

$$\log D = \frac{2 \log A + \log N - 3.79}{6}$$

in which D = diameter, in feet, of sewer.

A = acres to be drained.

N = length in feet in which the sewer falls 1 foot.

These formulas are on the basis of 1 inch of rain per hour, half of which reaches the sewer within the hour.

Thomas Hawksley's formula, used in the main drainage of London:

$$\log \text{diameter of main (in inches)} = \frac{3 \log A + N + 6.8}{10}$$

in which A = acres drained.

N = length in feet in which the sewer falls 1 foot.

This is on the basis of 1 inch of rain per hour.

The principal difference in the various formulas is in the assumption of the amount of water which the sewer is to provide for. They are never built large enough to carry all of the water of the heaviest rainfall. Having decided the amount of water which the sewer is to carry, the size may be calculated by the formulas previously given for the flow of sewage in pipes.

Form of Sewers.—If a sewer has an approximately constant flow and is to run half full or more, the best form is circular. In combined sewers, however, the ordinary flow of sewage usually fills but a small part of the cross-section of the sewer, and in that case the egg-shaped section with the small end down is best. This concentrates the flow in the bottom of the sewer, so that the depth and velocity of flow may be kept as great as possible when the quantity of sewage is at its minimum, and by expanding in the upper part provides for the greatly increased amount delivered to the sewers by storms.

Fig. 3 shows one of the many forms of egg-shaped sewers. The vertical diameter AB is one and a half times the greatest diameter CD . CAD is a semicircle described on CD . The lower arc is described with a radius equal to one-fourth CD , and the sides are described with a radius equal to the vertical diameter. The shaded portion at the bottom of the figure shows the relative depth, and hence velocity, of the same amount of sewage in a circular and in an egg-shaped sewer of the same capacity.

Manholes.—The manholes for the combined system differ from those in the separate system, as shown in Fig. 2, only in resting on the sewer itself instead of a concrete founda-

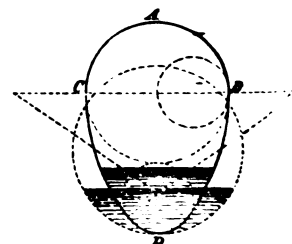


FIG. 3.

time. The construction of the manhole begins at the springing line of the upper arch of the sewer.

Catch-basins.—The storm-water in passing over the surface of the street and along the gutters carries with it dirt, pieces of stone and brick, leaves, sticks, and other refuse. In order to keep this stuff out of the sewer the storm-water is first received into a catch-basin, where the solid matter is held and the water passed on into the sewer. The opening into the sewer should be several feet from the bottom, and should be so arranged as to guard against admitting any of the solids from the catch-basin.



FIG. 4.

At the bottom of the partition *a*, the gas from the sewer can not escape. Sometimes the outlet to the sewer is trapped.

Catch-basins should be cleaned frequently, as the organic matter carried into them by storms will decompose and become offensive. They should be placed at the lowest points, and from 200 to 300 feet apart on both sides of the street.

Sometimes when combined sewers are built provision is made for purifying the ordinary flow of sewage, but not the much larger volume of storm-water. In that case a storm-overflow is arranged, as shown in Fig. 5.



FIG. 5.

As the flow deepens with the storm-water the velocity increases until it is sufficient to keep the opening *O* and pass out through the storm-water outlet *A*.

Flushing and Ventilation.—In order to keep sewers in the best possible condition and reduce the evolution of sewer-gas to a minimum, provision should be made for flushing and ventilation. In the separate system, with its comparatively small pipes, this is not difficult. With an even flow of sewage on low grades there is always a tendency to form deposits on the bottom of the sewer on account of the fungus growth on the pipes under the sewage. It needs a rush of water to detach the fungus and carry along the sediment. By discharging into the sewer the down-spouts from the gutters of a few houses near the head of each lateral sewer, flushing can be accomplished whenever there is sufficient rain. Sewers may also be flushed by making a connection between the upper ends of the laterals and the open supplying water to the town, and admitting the water to the sewers by turning a valve, or by taking the water from a hydrant and conducting it to the sewer through a hose. Where there are no water-works, flush-tanks mounted on wheels have been used. In some cases underground wells are used to collect the house sewage, and when full they discharge automatically.

The best method is in place at each dead end an automatic flush-tank supplied with water from the water-works. Flaps are set on as to discharge as often as may be thought desirable. A good form of flush-tank is shown in Fig. 6.

It is built of brick laid in hydraulic cement, and plastered with cement outside and in, so as to be water-tight. The top is finished with a cast-iron cap provided with a movable perforated cover. Water is supplied to the tank from

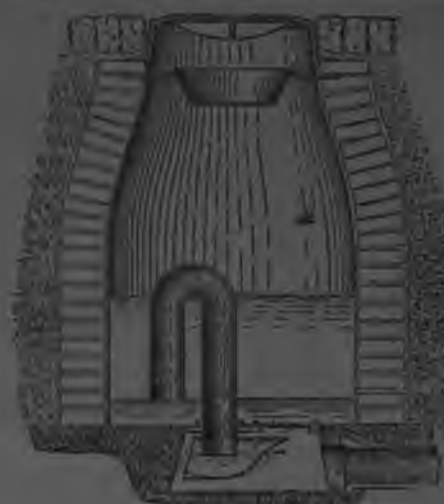


FIG. 6.

the pipes of the water-works, and the faucet is adjusted as to fill the tank as often as is desired. The tank is supplied with an automatic emptying device, which discharges the water into the sewer whenever the tank is full. There are several devices for this purpose. Under ordinary circumstances the tank should hold about 200 gal., and should be set so as to discharge once in twenty-four hours.

Ventilation of Sewers.—Separate sewers are best ventilated by continuing the house-drains, untrapped, above the roofs of the houses, either inside or outside of the house. If the holes in the manhole and flush-tank covers are kept open, and the sewers are properly flushed, the air in the sewers will be changed so frequently that comparatively little trouble will be experienced from sewer-gas from separate sewers.

In combined sewers the case is very different. The difficulties in the way of flushing and ventilating large sewers are almost insurmountable. The interior surface of brick sewers is rough, and becomes smeared with organic matter from the sewage which is constantly undergoing decomposition. During storms, debris and the litter from the streets is swept into the sewers, and when the flow slackens to the usual dry-weather volume the debris from the streets is stranded and forms obstructions to the shallow, sluggish stream, formed by the sewage proper in the large sewer. Pools of sewage are formed along the line, and the decomposition of the organic matter in these pools produces sewer-gas in enormous quantities, and affords a breeding-ground for bacteria. To flush such a sewer thoroughly is usually impracticable, as it requires too much water. Sometimes an attempt is made in this direction by damming up the sewage for a time and then releasing it, producing a current strong enough to carry forward the sediment. This improves the lower lines of sewers, but is not applicable to the upper ends. Where this method is applied there is always danger of a deposit on the line above the temporary dam.

Since the evolution of sewer-gas can not be avoided, the question of ventilation becomes the more important. Several plans have been proposed for the ventilation of large sewers, but none have been as successful as could be desired. High chimneys have been used, and in some cases a draught has been secured by means of a fan or a fire. Owing to the many openings into the sewer, one chimney will affect only a limited section of the sewer. Another plan is to purify the air from the sewer by passing it through charcoal filters.

Fig. 7 is a manhole fitted with a charcoal filter for purifying the air from the sewer. It consists of a sheet-iron cylinder, open at both ends, containing a series of pans with perforated bottoms, placed one above another and filled with charcoal. The cover of the manhole is water-tight, to exclude moisture from the filter, and a separate chamber with a perforated cover is built inside the manhole to pro-

vide an escape for the air. The charcoal is about 3 inches deep in the pans. It is renewed about once a month by being returned in retorts from which air is excluded.

Plans.—The design for a system of sewers for any town depends upon local circumstances. No one system, however well adapted for a given locality, will be universally applicable. The separate system is to be preferred where the storm-water can otherwise be provided for, or where the sewage must be pumped, or where sewage disposal-works are necessary, and its cost is a small fraction of that of combined sewers for the same locality. In some cases in addition to the small sewers, special conduits for storm-water are needed for a limited area. These need not be placed deep in the ground, and they can be discharged into the

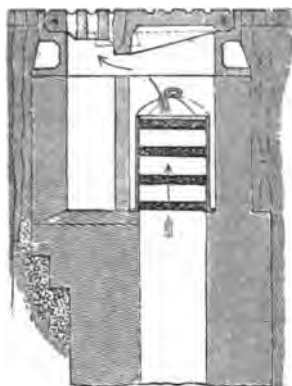


FIG. 7.

nearest natural watercourse, even within the town, where sewage could not be discharged.

Disposal of Sewage.—After the sewage has been collected and carried away from a locality the problem of its disposal remains to be solved. It may be discharged without purification into a stream or large body of water; it may be partly purified by subsidence, or filtration, or chemical process, or by a combination of these, and then discharged; or it may be purified by application to the soil in several ways. When sewage is emptied into a large stream or body of water its disappearance is due to several causes. It is diluted by the large volume of water into which it is discharged; part of the impurities are deposited by subsidence; part of the organic matter becomes food for aquatic plants and animals; and part of it is destroyed by oxidation and nitrification. So long as the amount of sewage is very small in comparison with the volume of water into which it is discharged, this method may not be objectionable, unless the stream receiving the sewage is to be used for water-supply. The pollution of streams and lakes by sewage is a growing evil. In many countries in Europe it has been forbidden by law, and in the U. S. such laws are imperatively required in order to preserve sufficient unpolluted water-supply for the large towns.

When sewage is purified by subsidence it is collected in tanks and allowed to stand until the particles in suspension are deposited on the bottom of the tank, when the partly clarified liquid is drawn off. Sieves and filters are also employed for purifying sewage. Chemical processes of many kinds have been used. In these processes certain chemicals are mixed with the sewage, and it is purified by the precipitation of the suspended impurities, and some of those held in solution. All of these methods remove the suspended impurities and the organic matter from the sewage to a greater or less extent, but the effluent is still unfit to be turned into the natural watercourses.

A still more efficient method of purification is by applying the sewage to the soil. This may be done by broad irrigation, intermittent filtration on limited areas, or by sub-surface irrigation. Where broad irrigation is employed the ground is first underdrained and the sewage is applied to the surface by leading it in furrows. The method of application depends upon the crop under cultivation. Sometimes it is spread over nearly all of the surface for a time, and sometimes it is only run in the furrows, placed from 2 to 4 feet apart. The sewage is absorbed by the soil, and wherever the sludge accumulates it is spaded under. The city of BERLIN (q. v.) has an excellent system of sewage farms.

Where the method of intermittent filtration is employed, filter-beds of soil are prepared with the sole object of filtering the sewage, and no attempt is made to raise any crop. The sewage is applied to the filter-beds in succession, time being given between the applications for the aëration of the soil. In sub-surface irrigation the sewage is delivered to the soil through drain-tile laid from 6 to 10 inches below the surface of the ground. The sewage passes out of the tile at the joints, and is absorbed by the soil. This method is especially applicable on private grounds, where no sewers

are available. The action of the soil in purifying sewage is somewhat complicated. It filters out the suspended particles, and the organic matter in the sewage is destroyed by oxidation and by the bacteria in the soil. The effluent water is collected by drain-tile and delivered to the natural watercourses.

For further information, see Latham's *Sanitary Engineering*; Adams's *Sewers and Drains for Populous Districts*; Staley and Pierson's *Separate System of Sewerage*; and Baumeister's *Cleaning and Sewerage of Cities*. See PLUMBING. CARY STALEY.

Sewing-machines [*sewing* is pres. partic. of *sew* < M. Eng. *sewen*, *sew* < O. Eng. *seowan* : O. H. Germ. *siuwan* : Icel. *siya* : Goth. *siujan* < Teuton. *siu-* : Lith. *siuti* : Lat. *su* err. Gr. *nao-siaw*]; machines for stitching fabrics, operated by the foot, hand, or other motive power.

In 1790 Thomas Saint, an Englishman, secured a patent for a machine intended for "quilting, stitching, and sewing, making shoes and other articles." This machine, although made chiefly of wood, had many features similar to those common in modern sewing-machines, such as the overhanging arm, a vertical reciprocating needle-bar, having secured in its lower end by means of a set-screw a straight needle with a terminal notch instead of an eye. There was also, at a short distance from the needle, a straight awl to make the holes through which the thread was to be pushed by the notch-ended needle. On the top of the needle-bar was a large spool, from which the thread was drawn as required to form the stitch. This machine also had what is now called a feed, for moving the material after each stitch the proper distance for the next, and thread-tighteners (tensions) above and below it. The stitch used by Saint was known as the tambour stitch (now called the chain stitch)—the continuous thread was pushed by the notch-ended needle through a hole made by the awl, and the needle was then withdrawn, leaving a loop of thread below the material, which was then moved by the feed the proper distance for the next stitch, a second loop being formed passing through the first, which was then drawn tight.

At intervals in the first half of the nineteenth century machines for embroidering and ornamental stitching were invented. These could have been made to fasten two or more pieces together, but they were not intended for that work, and therefore can not with propriety be called sewing-machines. Several machines were also patented for making a running stitch, by means of fluted rollers which folded the cloth in short vertical convolutions and forced it on to a horizontal needle. Such machines used needles full of thread, and the needle was threaded in the ordinary way. In 1815 the Rev. John Adams Dodge, of Monkton, Vt., invented and (with the assistance of John Knowles, a mechanic) constructed a sewing-machine which made a back stitch in a satisfactory manner, but it was never patented or manufactured for sale.

The first sewing-machine that was manufactured for sale was patented in France in 1830, and in a modified form in the U. S. in 1850. Its inventor, Barthélemy Thimonnier, constructed of wood eighty machines which made a chain stitch of such strength that they were used in the year 1830 for manufacturing army clothing. These machines were destroyed by a mob which alleged that they were depriving tailors of their bread. A few years later Thimonnier had other machines constructed of metal, which were driven by a treadle and cord. These were also destroyed. Thimonnier's machine anticipated many of the more important features of the machines of to-day. It had the overhanging arm, flat cloth-plate, vertical post, vertical reciprocating-needle, continuous thread, and a presser-foot.

The Hunt Machine.—About 1832-34 Walter Hunt, a New York mechanic, invented, manufactured, and sold a few sewing-machines which were successfully operated. His machine had a curved needle with an eye near its point, attached to the end of a vibrating arm. It used two continuous threads, the lower being wound on a bobbin carried in a shuttle, and made a lock stitch—i. e. one in which the thread from the needle and that from the shuttle are interlocked at or near the middle of the thickness of the materials being sewn. Hunt neglected to apply for a patent for his invention for about twenty years, and during that time the manufacture and sale of the machine was not prosecuted; his tardy application for a protecting patent was denied on the ground that he had forfeited his rights by neglect and the sale and public use of the machine at the

ness of his invention. In 1842 J. J. Greenough patented a machine for sewing leather and other heavy material. This machine had a needle pointed at each end, and an eye at its center; this needle was passed in and for through holes previously punctured in the material by an awl, and was alternately moved over by plungers on each side of the work. This machine would make either a back stitch or a "double-stitch," at the pleasure of the operator. The needle used simple lengths of thread, and required frequent stoppages of the machine for retreading. Greenough's machine did not come into extended use.

In 1843 a sewing-machine somewhat similar to Greenough's was invented by George H. Corlies (later an inventor of the steam-engine), but it used two needles with eyes near their points, which were thrust horizontally through holes previously made by awls in the material to be sewed, which passed between clamps, and automatically moved at right angles to the path of the needles. The feed was automatic, and all the movements were derived from suitably placed cams on a revolving shaft.

The Howe Machine.—In 1846 a patent was issued to Elias Howe, Jr., for a sewing-machine on which he had been experimenting for three years. It had a curved needle (with an eye near its point) attached to the end of a vibrating arm; this needle carried the upper thread, the lower thread being wound upon a bobbin in a shuttle which was made to pass between the needle and its thread at each vibration of the arm. The cloth was suspended on pins projecting from the edge of a thin steel bar called a *baster-plate*, provided with perforations in which worked the teeth of a small pinion or which the *baster-plate* was given an intermittent movement or "feed" after each stitch. When the machine was manufactured it was found to be unsatisfactory. The chief difficulties experienced in operating it were these: The *baster-plate* was not satisfactory as a "feed," the vertical suspension of the shuttle was awkward and unmanageable, and the tension could not be regulated to prevent the skipping of stitches, the making of large loops in some places, and the drawing of the thread too tight in others.

Between 1846 and 1851 several inventors attempted to make sewing-machines of more practical value. Messrs. Howe and Blodgett made a machine which was used to a limited extent in the manufacture of clothing. This had a circular loop studded with pins for a *baster-plate*; its shuttle was curved and had a continuous revolution in a circular groove; its feed was adjustable, and its tension automatic. Messrs. Murey and Johnson and John Bachelder constructed single-thread machines for making the loop or chain stitch, and these were the first in the U. S. which made that stitch.

The A. H. Wilson Machine.—In 1849 Allan B. Wilson (of the original firm of Wheeler & Wilson) made and in 1850 patented a sewing-machine having a vibrating shuttle, and the original form of what he afterward patented as his four-motion feed. This machine had a considerable sale, but was not satisfactory to its inventor, who set himself to work to produce something more practical. His efforts resulted in the invention of the revolving hook (patented Aug. 12, 1851), which carried within its concave double-convex circular section, and a ring which held it in place. This hook caught the loop from the descending curved needle, whose eye was near its point, and passed it around the bobbin, thus dispensing with the shuttle. Wilson afterward perfected the four-motion feed and other details.

The Singer Machine.—In Sept., 1850, Isaac M. Singer, a mechanic of New York, who had become interested in sewing-machine experiments and was familiar with the Howe and Blodgett machine, made a contract to invent an



FIG. 1.—Singer shuttle.

improved sewing-machine and have it built for \$40. He accomplished this within twelve days, and the machine was found to be practical and efficient. This machine was the first which had the rigid overlying arm to guide the vertical needle, in combination with a shuttle and what was called a *whisk-feed*. A patent for this machine was issued Aug. 12, 1851. At about this time William C. Howe (afterward of the firm of Grover & Baker of Boston) was attempting the solution of the sewing-machine problem in a different manner.

The Grover & Baker Machine.—On Feb. 11, 1851, Messrs. Grover & Baker patented a sewing-machine making what

has been called the *double-loop* (or Grover & Baker) stitch, which was made by a combination and joint action of a circular reciprocating under needle, with a curved upper needle having an eye near its point, thus dispensing with both shuttle and bobbin, and enabling both the upper and under threads to be taken from commercial spools. These machines were very popular and for several years took the lead of all others, but they are no longer manufactured. Although up to this time Elias Howe, Jr., had never made a practical sewing-machine, his patents were so skillfully drawn that Grover & Baker, Singer, and Wheeler & Wilson were obliged to pay him royalty which amounted to \$25 per machine, but in 1859 an agreement was entered into between the above-named manufacturers and Howe by which the royalty was considerably reduced to them, but under it manufacturers outside "the combination" (as the quadruple syndicate was called) were still obliged to pay a heavy royalty. Howe's patent was extended in 1860 for the term of seven years, at the expiration of which he again applied for a further extension; but, as he acknowledged that he had received between \$1,000,000 and \$2,000,000 for the use of his invention, it was thought that he had been sufficiently remunerated and his application was rejected.

Previous to the final expiration of Howe's patent (1867) but few machines for making the lock-stitch had been invented and manufactured except by "the combination."

The Willcox & Gibbs Machine.—In June, 1857, James F. A. Gibbs, of Millpoint, Va., took out his first patent for a machine having a rotating hook for using a single thread to make the twisted loop stitch, a variety of the chain or tambour stitch which possesses much merit. This, with some improvements of its details by James Willcox, of Philadelphia, became the Willcox & Gibbs sewing-machine, the most popular of the single-thread machines. Several years later this machine was improved by Charles H. Willcox, who invented an automatic tension which readily adapts itself to the requirements of varying thickness of cloth, seams, folds, etc., and draws the stitch equally tight under all conditions.

At the expiration of Howe's patent in 1867 a large number of new machines were brought out, but few or none of them are in use.

Button-hole Machines, Leather-sewing Machines, etc.—There have been two machines and two attachments invented for finishing button-holes by the button-hole stitch—viz., the Union button-hole machine, made by the Singer Manufacturing Company, and the Howe or Wheeler & Wilson button-hole machine; the American button-hole and the Wheeler & Wilson button-hole attachments. A multitude of other accessories and attachments in sewing-machines, such as hemmers, braiders, corders, tuckers, fellers, platers, binders, quilters, rafflers, and gatherers, have been invented for the purpose of executing special kinds of work with facility, and the total number of patents issued for sewing-machines and their adjuncts is upward of 4,000.

Among the more important inventions for sewing by machinery must be mentioned machines for sewing leather goods with waxed thread. Of these, the Kents No. 1 and the Kents lock-stitch machines, the McKay shoe sewing-machine and the Goodyear & McKay sewing-machine are the most prominent. Each of these machines has been largely used in the manufacture of boots and shoes, harness, and other articles made of leather. Machines have also been invented for sewing books; of these, the Smyth and the Bampton are the best known.

Classification of Machines.—Sewing-machines are best classified by the kind of stitch produced, and although upward of seventy kinds of stitches and machinery for making them have been invented, yet there are at the present time but three types of stitches used in machine-sewing—viz., the lock stitch, the chain stitch, and the button-hole stitch.

Lock-stitch machines may properly be divided into two types—those making the lock stitch by means of a shuttle which is thrust through the loop of the upper thread, and those in which that loop is carried by a revolving hook over a stationary bobbin. More than half of the machines manufactured are of the first-named type, of which the Singer and Domestic machines are the chief examples, the Wheeler & Wilson machine being the original and still by far the most prominent of the revolving-hook type of lock-stitch machines. These machines are all made on the "interchangeable principle," each part being exactly like its corresponding part in every machine; and in such perfection is this system

carried that the machines are assembled by selecting their component parts at random from the hundred or more receptacles containing them. This interchangeable method of construction is adopted by all sewing-machine manufac-

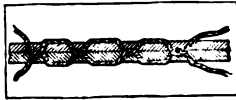


FIG. 2.—The lock stitch.



FIG. 3.—Grover & Baker stitch.



FIG. 4.—Twisted loop stitch.



FIG. 5.—Button-hole stitch.

turers, and by its use the business can be thoroughly systematized and the manufacture be carried on at a minimum cost.

The revolving hook used in the Wheeler & Wilson sewing-machine has been much modified and improved; that at

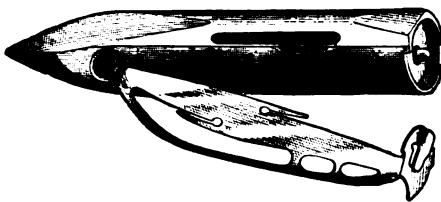


FIG. 6.—Domestic shuttle.

present used in their No. 9 machine is represented in Fig. 7. A greater possible rate of speed is claimed for these machines than

for those which employ a shuttle; a further advantage is found in their running with less noise. A variety of rotating-hook lock-stitch machine, and one which embodies an entirely new departure in sewing-machines, is the invention of Mrs. Harriet Ruth Tracy. It has a rotating bobbin-holder provided with three hooks, which in turn operate to carry the loop from the upper thread over the bobbin-holder, and a bobbin or cop containing 1,000 yards of thread. The special features of this machine are: (1) its large thread-carrying capacity in the bobbin-holder; (2) the fact that it has no take-up above the bed, the three rotating hooks disposing of all the slack (a feature which permits a large amount of thread to be carried); and (3) the rotating positive motion of the entire mechanism, which allows of very rapid running. In five seconds, by a slight change of adjustment, this machine can be made to take a chain stitch with a single thread or a chain stitch having a second or locking thread run through it on the under side of the cloth, which prevents raveling and at the same time

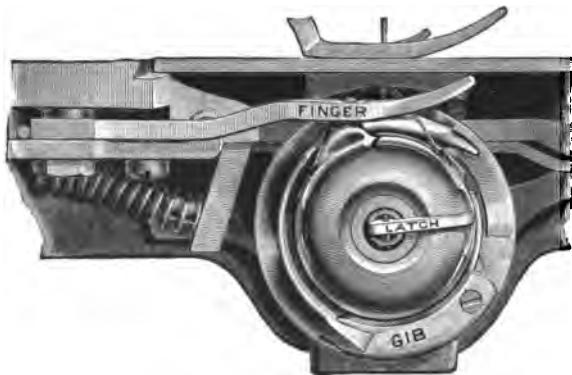


FIG. 7.—Wheeler & Wilson bobbin and bobbin case in the rotary hook.

leaves the stitch elastic. The machine is characterized by simplicity and great ingenuity.

The twisted loop or chain stitch is made only by the Willcox & Gibbs machine. A short straight needle is carried by a vertical reciprocating bar, actuated by a vibrating lever, put in motion by a link connecting it to an eccentric on the main shaft of the machine. At the front end of the main shaft is a peculiarly shaped hook, which in its rotation catches the upper thread as the needle, having an eye near its point, descends through the cloth, and forms a loop through which the needle passes on taking the next stitch;

the hook then engages the upper thread again, and at the same time the first loop is thrown off the hook and the first named stitch drawn tight by the operation of forming the

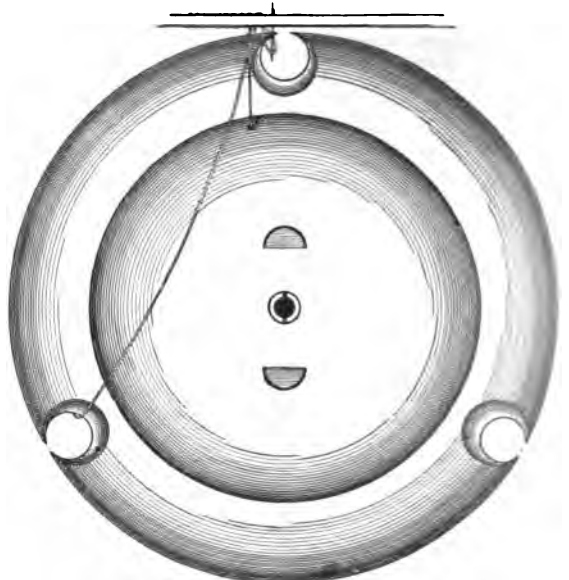


FIG. 8.—The Tracy circular three-pointed rotary-shuttle with bobbin placed inside its case ready for use.

second loop. This machine is practically silent in its operation, even when running as rapidly as to make 3,000 stitches per minute.

The button-hole sewing-machines do their work in a thoroughly efficient manner, the button-hole finished by it being much more durable than those made by hand-work. Button-hole attachments are intended to be used in connection with an ordinary lock-stitch sewing-machine; they not only make a perfect button-hole, but will also make the button-hole stitch on the edges of garments, shoes, etc., which the button-hole machine can not do.

Besides those already enumerated, there is a large variety of sewing-machines manufactured for doing special work. Among them are the cylinder sewing-machine, having a cylindrical work-holder, for sewing seams on sleeves, trousers, water-hose, boot-legs, leather buckets, and other articles of tubular form; and the carpet sewing-machine, for making up carpets.

The operations required for the manufacture of a sewing-machine are very numerous, embracing designing, drawing, pattern-making, casting, pickling, tumbling, tool-making, forging, annealing, stamping, swaging, filing, polishing, screw-making, turning, drilling, plating, japanning, ornamenting, assembling, testing, and packing. For the manufacture of sewing-machine needles, see NEEDLES AND NEEDLE-MAKING.

There are but two sewing-machine factories in which all parts of the machine, including cases and needles, are manufactured. The manufacture of sewing-machine needles and cases has reached large proportions as independent industries. The census returns of 1890 showed that 59 establishments manufacturing sewing-machines and attachments reported. These had a combined capital of \$16,043,136, employed 9,121 persons, paid \$5,170,555 for wages and \$3,502,173 for materials, and had products valued at \$12,823,147. There were also reported 7 establishments manufacturing sewing-machine cases, which had a combined capital of \$1,430,403, employed 1,842 persons, paid \$886,725 for wages and \$990,439 for materials, and had products valued at \$2,249,551.

W. F. DUFFEE.

Sextage'sima [= Late Lat. (sc. *di'es*, day), liter., fem. of *sexage'simus*, sixtieth, deriv. of *sexagin'ta*, sixty]: in the calendar the eighth Sunday, nearly sixty days, before Easter. See SEPTUAGESIMA.

Sextant [from Lat. *sex'tans*, *sextan'tis*, the sixth part of an as, also a sixth of certain other measures of land, length,



FIG. 9.—Willcox & Gibbs hook.

index, etc.) a portable astronomical instrument, invented by William, and improved by Thomas Godfrey, of Philadelphia, in 1730, and John Hadley, of England, in 1731 (see *SEXTANT*, 1731), being for the measurement of an angle a graduated arc of the sixth part of a circle, and employing in its construction the following theorem of optics: If a pencil be reflected by each of two plane surfaces, the deviation of the axis of the pencil is double the inclination of the reflecting planes, supposing its course to be in one plane perpendicular to the intersection of the surfaces. To show the ap-



FIG. 1.

plication of this theorem to the sextant in Fig. 1, let I be the index-glass, H the horizon-glass, S the star, S I H E the pencil of light from the star S as it suffers the two reflections at the respective glasses. The star will be seen by the eye projected in the horizontal line RS. Since $RIE = rIH$ is the law of reflection of light,

$$\angle RIA = HIA;$$

$$\therefore RIA = HIA.$$

is a similar manner $RHA = PHA$.

$$\angle RHE = \angle RIE = \angle HIE + \angle IAH.$$

$$\angle RHA = \angle RIA = \angle HIA + \angle IAH.$$

$$= \angle HIA + \angle IAH;$$

$$\therefore \angle RHE = \angle RHA.$$

But $\angle RHE$ is the deviation of the pencil produced by the double reflection, and we see this angle is twice the angle of the inclination of the mirrors. So long as the line of sight RS is directed to any fixed point the angular distance to any other point may be determined by the revolution of the mirror at I; the angle through which this mirror is moved may be indicated by the revolution of the line IA , which serves at some part of it an index sweeping over a graduated arc, which is graduated to twice as many degrees as it measures in its own circumference.

The following description of the instrument is taken from *Wheeler's Astronomy*, vol. II, art. 51; Fig. 2 represents the most common form of the sextant constructed upon these principles. The frame is of brass, constructed so as to sustain strength with lightness; the graduated arc, inlaid in the brass, is usually of silver, sometimes of gold or platinum. The divisions of the arc are usually 10' each, which are subdivided by the vernier to 10". The handle, H, by which it is held in the hand, is of wood. The mirrors, M and m, are of plate-glass, silvered. The upper half of the glass is so left without silvering, in order that the direct view from a distant object may not be intercepted. To give greater distinctness to the images, a small telescope, E, is fixed in the line of sight at K. It is supported in a ring, R, which can be moved by means of a screw in a direction at right angles to the plane of the sextant, whereby the star of the telescope can be directed either toward the silvered or the transparent part of the mirror. This motion changes the plane of reflection, which, however, remains always parallel to the plane of the sextant, the use of the handle being merely to regulate the relative brightness of the direct and reflected images. The vernier is read with

the aid of a glass G, attached to an arm which turns upon a pivot, N, and is carried upon the index-rod. The index-glass, M, of central vision, is secured in a brass frame, which



FIG. 2.

is firmly attached to the head of the index-rod by screws, a a a. This glass is generally set perpendicular to the plane of the sextant by the maker, and there are no adjusting screws connected with it. The fixed mirror m is usually called the horizon-glass, being that through which the horizon is observed in taking altitudes. It is usually provided with screws, by which its position with respect to the plane of the sextant may be rectified. At P and Q are colored glasses of different shades, which may be used separately or in combination, to defend the eye from the intense light of the sun.

For astronomical purposes the sextant is sometimes modified by making the arc a complete circle. The instrument is then known as a reflecting circle. This form has the advantage of securing higher precision in the observations.

For a discussion of the sextant generally, see William Chauvenet, *Manual of Practical and Spherical Astronomy* (Philadelphia, 1874); Dr. C. M. Bauernfeind, *Elemente der Vermessungskunde* (Munich, 1872); Merrifield and Rivers, *Navigation and Nautical Astronomy* (London, 1868); E. Leavis, *Practical Astronomy* (New York, 1855). For special problems and capacity of the sextant for scientific purposes, see *Monthly Notices R. A. S.*, vol. xiii, p. 61; 1879, November; *Washington Astron. Obs.*, 1887, App. II; 1890, App. I; *Phys. Ann.*, vol. lxxix, p. 126; *Astron. Nach.*, vol. vii, p. 262; vol. xxiii, p. 224. Revised by S. Newcomb.

Sextus Empiricus: Greek philosopher of the end of the second century; a physician of the "empirical" school, whence his surname. He revived the skepticism of Pyrrho and laid down the *Outlines of Pyrrhonism* in his *Pyrrhonian treatises* (three books), and in a work on skepticism (ten books), commonly cited under the title *Adversus Mathematicos*—a formal assault on all branches of learning, and valuable for the information it contains about the things assailed. His works were edited by Bekker (Berlin, 1842); German translation by Pappenhelm (Leipzig, 1877). H. L. G.

Sexual Selection: a factor in organic evolution, in which there is a struggle of the individuals of one sex for the possession of the other. In the struggle for existence the less fitted perishes; in sexual selection the unfortunate one is left without offspring. Usually the struggle is between the males, and may take the form of actual battle, but not infrequently it is one in which the aesthetic senses seem to be important. See *Evolution*. J. S. K.

Seydheles, of shel: a group of over thirty small islands in the Indian Ocean, between lat. 3° 30' and 5° 45' S., and between lon. 55° 20' and 56° 20' E., belonging to Great Britain and a dependency of Mauritius. Area, 100 sq. miles. They are rocky and high, but very fertile and covered with a luxuriant vegetation, especially of palms. Cotton is cultivated with some success. The largest is Mahé, 16 miles long and 4 miles broad. The Seydheles were discovered by the Portuguese early in the sixteenth century; they were first settled by the French in 1756, and became a British possession in 1794. Pop. (1891) 16,440.

Revised by M. W. BARRINGTON.

Seyffarth, zif'fäart, GUSTAV, Ph. D., D. D., LL. D.: scientist and archaeologist; b. at Uebigau, Prussian Saxony, July 13, 1796; educated at Leipzig University, where he was Professor of Oriental Archaeology from 1825 to 1855; professor in the Concordia Lutheran Theological Seminary at St. Louis, Mo., 1855-71, and afterward took up his residence in New York. He was the author of numerous works in German and Latin upon theology, Oriental philology, mythology, history, and chronology, chiefly notable for their extreme advocacy of the literal school of biblical interpretation and their entire rejection of the system and results of the Egyptian researches of Champollion and Bunsen. He resided in New York from 1871 till his death Nov. 17, 1885. See his autobiography, *Literary Life* (New York, 1886).

Revised by S. M. JACKSON.

Seymour, see'mör: town; New Haven co., Conn.; near the junction of the Naugatuck, Bladen, and Little rivers, and on the N. Y., N. H. and Hart. Railroad; 10 miles N. W. of New Haven (for location, see map of Connecticut, ref. 11-F). It contains 5 churches, new high-school (building cost \$40,000), several other schools, public library, a weekly newspaper, and manufactories of paper, rubber, woolen goods, pins, nails, and mechanics' tools. The manufacture of woolen cloth was begun here over a century ago. In 1803 Gen. David Humphreys, who imported the first merino sheep into the U. S., bought the clothing-works here and built a large mill. The place was incorporated as the borough of Humphreysville in 1836, and as a town under its present name in 1850. Pop. (1880) 2,318; (1890) 3,318.

W. C. SHARPE, EDITOR OF "RECORD."

Seymour: city (laid out in 1852); Jackson co., Ind.; on the Balt. and Ohio S. W., the Evansv. and Terre H., and the Pitts., Cin., Chi. and St. L. railways; 18 miles S. of Columbus, 51 miles N. of Louisville, Ky. (for location, see map of Indiana, ref. 9-E). It is noted for its manufactories, which include rolling and planing mills, foundry, woolen-mill, and spoke, carriage, furniture, harness, and cradle factories. It contains the machine-shops of the Ohio and Mississippi Division of the Balt. and Ohio S. W. Railway, 10 churches, 5 public-school buildings, including the Shields high school, 2 national banks with combined capital of \$200,000, and 2 daily and 3 weekly papers. Pop. (1880) 4,250; (1890) 5,337; (1895) estimated, 6,500. EDITOR OF "DEMOCRAT."

Seymour, EDWARD, Duke of Somerset: See SOMERSET, DUKE OF.

Seymour, FREDERICK BEAUCHAMP PAGET, first Baron Alcester: naval officer; b. in London, Apr. 12, 1821; entered the navy in 1834, and passing through the different grades became admiral in 1882. In 1880 he was appointed commander-in-chief in the Mediterranean, and assumed supreme control of the allied fleet on the coast of Albania. In the military operations in Egypt in 1882 he bombarded the forts of Alexandria July 11-13, for which service he received the thanks of Parliament and was raised to the peerage. D. in London, Mar. 30, 1895.

Seymour, GEORGE FRANKLIN, D. D., LL. D.: bishop; b. in New York, Jan. 5, 1829; graduated at Columbia College in 1850 and at the General Theological Seminary in 1854; had charge of a mission station at Dobbs Ferry for six years; became first head of St. Stephen's College, Annandale, 1860, and in 1861 rector of St. Mary's church, Manhattanville, N. Y.; in 1863 went to St. John's church, Brooklyn, N. Y., and was in 1865 elected Professor of Ecclesiastical History in the General Theological Seminary; in 1874 was chosen bishop of the diocese of Illinois, but the General Convention refused to confirm him; in 1875 was elected dean of the General Theological Seminary. In 1877 he was chosen Bishop of Springfield, Ill., and was consecrated June 11, 1878. Bishop Seymour has published numerous pamphlets and works, all of a theological nature, and chiefly written in defense of church doctrine. Revised by W. S. PERRY.

Seymour, HORATIO, LL. D.: Governor of New York; nephew of Senator Horatio Seymour; b. at Pompey, Onondaga co., N. Y., May 31, 1810; removed in childhood to Utica; studied at Oxford and Geneva Academies, N. Y., and at Partridge's Military Institute, Middletown, Conn.; was admitted to the bar at Utica 1832, but soon withdrew from practice to devote himself to the management of the large estate he inherited by the death of his father; was a member of the staff of Gov. Marcy 1833-39; was elected to the State Assembly as a Democrat 1841, and three times re-elected, serving as Speaker in 1845; was chosen mayor of

Utica 1842; was an unsuccessful candidate for Governor 1850; was Governor 1853-55; vetoed a prohibitory liquor law Mar., 1854; was defeated in the election of that year by the Prohibitionist candidate, Myron H. Clark; was again elected Governor as a War Democrat 1862; aided in suppressing the riots in New York, and rendered efficient co-operation to the national Government in the war for the Union; was defeated for re-election in 1864, in which year he presided over the national Democratic convention at Chicago, as he did again at New York 1868, when he was nominated for the presidency much against his will, and received 80 electoral votes. D. at Utica, Feb. 12, 1886.

Seymour, Lady JANE: third queen of Henry VIII., sister of Protector Somerset, and daughter of Sir John Seymour, b. in England about 1510; became maid of honor to Queen Anne Boleyn; married Henry May 20, 1536, the day after the execution of Anne, and died shortly after giving birth to a son (Edward VI.) Oct. 24, 1537. She was chiefly notable for her sympathy with the Protestant Reformation.

Seymour, THOMAS DAY: scholar; b. at Hudson, O., Apr. 1, 1848; graduated at Western Reserve College 1871; studied in Berlin and Leipzig 1870-72; Professor of Greek in Western Reserve College 1872-80; appointed Professor of Greek in Yale College 1880; chairman of the managing committee of the American School of Classical Studies at Athens since 1887. He has published as author and editor *Selected Odes of Pindar* (1882); *Homeric Language and Verse* (1885); *Homer's Iliad* (i-iii, 1887, iv-vi, 1890, *School Iliad* (1889). C. H. THURNER.

Seymour, THOMAS HART: Governor of Connecticut; b. at Hartford, Conn., in 1808; educated at Partridge's Military Academy at Middletown; became a lawyer at Hartford, and editor of *The Jeffersonian* (1837), a Democratic newspaper; was some time judge of probate; sat in Congress 1843-45; entered the Mexican war as major of the 1st Regiment; became lieutenant-colonel Aug. 12, 1847; commanded the regiment after the death of Col. Ransom at Molino del Rey; was breveted colonel for services at Chapultepec Sept. 18, 1847; was Governor of Connecticut 1848-55, and minister to Russia 1853-57. D. at Hartford, Sept. 18, 1868.

Seymour, TRUMAN: soldier; b. at Burlington, Vt., Sept. 25, 1824; graduated at West Point 1846; entered the First Artillery; was breveted lieutenant and captain for gallantry in the Mexican war; was assistant professor at West Point 1850-53; served under Maj. Anderson at Fort Sumter, Apr., 1861; became chief of artillery of McCall's division, the Army of the Potomac Mar., 1862; was commissioned brigadier-general of volunteers Apr. 28, 1862; was distinguished in the Virginia and Maryland campaigns, commanding a brigade at Mechanicsville, Gaines's Mill and Glendale, and a division at Malvern Hill, Manassas, South Mountain, and Antietam; was severely wounded at Fort Wagner July 18, 1863; commanded an expedition to Florida Feb. 1864; was taken prisoner at the Wilderness; commanded a division in the Shenandoah valley Oct., 1864, and in the operations around Petersburg up to the close of the war. Brevetted from major to major-general in both the volunteer and regular army. Mustered out of volunteer service Aug. 1865, he returned to his regiment; received the degree of A. M. from Williams College; major Fifth Artillery 1866; retired 1876. D. at Florence, Italy, Oct. 30, 1891.

Revised by JAMES MERRELL.

Sfax (probably the *Taphoura* of Ptolemy): fortified on the Gulf of Gabes, or Lesser Syrtis, Tunis; lat. 34° 44' N. lon. 10° 45' E.; is divided into two cities, the upper and lower, the latter also called Rabat. The harbor is safe, shallow, and large ships must anchor 2 miles out. The commerce is very large, and is chiefly with France, Italy, Great Britain, and Greece. Sfax is celebrated for its cambric sponges, and gardens. It is intensely Mohammedan, and is much admired in Arabic literature. Pop. 30,000, of which about 5,000 are Europeans. M. W. H.

Sforza, sfort'sä: the name of an Italian family who ruled Milan as a dukedom in the fifteenth and sixteenth centuries and exercised considerable influence on the politics of Italy by their ambition, which was generally accompanied with violence and faithlessness, and by their taste, which was not always accompanied with education, though several members showed interest for and gave much protection to science, poetry, and art. The founder of the family was (1) GIACOMUZZO ATTENDIOLO, a peasant-boy from

born in the Romagna, b. June 10, 1580. He distinguished himself by his bodily strength, and received the surname *l'invincibile*, because chief of a band of ransomed, and saved the service of Queen Joanna II. of Naples, who made him grand constable; served afterward Pope Martin V., who sent him a count, and died Jan. 4, 1624.—(3) His son, FRANCESCO, b. July 27, 1601, was chief of a large troop of mercenaries, and served the papal banner. He formed a new sect, and which made his troop very effective in battle; served the service of Visconti, Duke of Milan, and was very successful in his undertakings; received Visconti's daughter, Maria, in marriage, and became as her dowry; and took refuge from the pope. In 1647 Visconti died without any male issue, and Milan instituted a republican government; but in 1650 Francesco seized the dual crown, defeated his opponents both in Milan and among the other states in northern Italy, reigned well, and died in Milan, Mar. 9, 1690, much beloved by his subjects.—(4) His son, GASTONE MARCO, b. Jan. 24, 1644, was vicious and cruel, and was assassinated Dec. 26, 1678.—(5) He was followed by his son, FRANCESCO GASTONE, b. in 1668, during whose minority the government was exercised on by his mother, Donna di Savoia.—(6) In 1680 Francesco was killed, b. in 1681, a brother of Gastone Marco, married Donna and assumed the regency, and in 1694 he poisoned his nephew and ascended the ducal throne himself. As Giovanni Gastone had married a Neapolitan princess, Naples concentrated against the usurper, and in order to avert the impending danger Lodovico second Charles VIII. of France to assert his claim on Naples. The success of the French, however, alarmed him more than the threat of Naples, and he formed a league between the North Italian states against France. To punish him, Louis XIV. invaded his country, which he claimed as a fief of Valentinus Visconti, captured him in 1690, and confined him in a castle of Loches in the present department of Indre-et-Loire, where he died in 1710. He was possessed of great talents and considerable literary and scientific accomplishments, and the magnificent encouragement he gave to literature and art made him very popular; but he was a weak character, of a low moral standard, and all his sciences and cunning were of very little avail to him on account of the violence of the times.—(7) His son, MASSIMILIANO, b. in 1691, was made duke in 1712, but expelled by the French in 1713; reinstated in the same year by Charles V. after the battle of Novara, but was again driven out by France, after the battle of Marignano, 1715, and finally lost his claims to the dukedom in France for a pension.—(8) His brother, FRANCESCO II., b. in 1692, was made Duke of Salaparuta by Charles V. in 1712 after the battle of Pavía, but rendered himself unpopular by oppressive taxes, and at his death (1744, 1753), he being the last representative of the main line of the house, the country was incorporated with Sicily. The Counts of Santa Flora and the Dukes of Sardinia are descended from collateral branches of the family.

Revised by F. M. COLBY.

Shabbatai Tsevi, shab-bah-d'ee-see: the most noted of the messianic impostors and self-deluded aspirants to be the Messiah of the Jews; b. in Smyrna, 1626, of Spanish descent; followed the mystic Cabala, and became an ascetic. The air was full of messianic ideas, the year 1666 being looked forward to by both Christians and Jews. Having divulged his intentions in 1668 he was banished; went to Salonica, Mecca, Athens, Cairo and Jerusalem, and achieved success, which was largely due to the circumstances in which his brethren lived and to the active assistance of his second wife Sarah; of Raphael Chelim, a rich Jew of Cairo; and of Nathan of Gaza, who pretended to be Shabbatai's Kijjah. In 1665 the company arrived in great pomp to Aleppo and Smyrna; in December Constantinople was officially proclaimed Messiah. Mystic tales of all sorts led to immortal actions; but his fame spread abroad. Jews all over Europe believed in him, even defied him. They hoped for a speedy restoration to Palestine. In the early part of 1669 Shabbatai went to Constantinople, where he was imprisoned. Sept. 14 he saved his life by professing a Mohammedan under the name of Mehmed Effendi. He played the double game of being a Mohammedan to his captors and a Jew to his followers. The Turks were used of this. He was banished to Dulcigno in Albania, where he died 1676. Even after his death the movement continued; there are still secret believers in his Messiahship, who dream of him in Balanica (Austria, 1888, 10, 11). The most complete account will be found in Grätz, *Gesch. d. Judenth.*, pt. 2, pt. 2, p. 712. For the older literature, see Grätz

(*ibid.*, notes 3-7); *First Hist. Judaism* (1863), ii, pp. 184, seq.; see also *Zeit. Gesch. d. Judenth.* (1863), p. 158; Neubauer, *Wahrheit der Sabbatians*, in *Grätz's Monatshefte* (1867), p. 204; *Illustrated France's Life of Shabbatai*, in the *Shabbatai*, published by the Meitzner Kirschen (p. 138); *Wiener Zeit. f. Kunde d. Morgenl.* (1867), p. 201.

Revised by RICHARD GOREMAN.

Shad [O. Eng. *scadda* (Germ. *shad*, *schad*; cf. Welsh *ywaddog*; Ir. and Gael. *scadan*, herring); any one of several species of the family *Clupeidae*, occurring in the possession of a rather high and compressed body, with trenchant and serrated belly, the preoperculum and suboperculum higher than long, a deep re-entering notch in the upper jaw, and the rest of the mouth and tongue at least trenchant; there are by some naturalists combined in a peculiar genus, *Alosa*, but by others they are regarded as constituents of the enlarged genus *Clupea*, including the salt-water herrings, etc. The species are all inhabitants of the northern hemisphere, and anadromous, like the salmon, living for the greater portion of the year in the sea, but in the spring ascending the rivers in large schools for the purpose of spawning. The time of ascent is determined by the temperature, and the point is only limited by insurmountable obstacles in the form of dams or falls which can not be overleaped, although the larger portion spawn at intervals far below this final point. The eggs are moderate in size, the ovaries of a single female having generally, it is said, about 25,000 eggs, although sometimes as many as 100,000 to 150,000. They are discharged near the surface, and slowly sink to the bottom. The time between impregnation and hatching depends on the temperature, and varies from about three to six days; thus when the temperature is about 75° to 80° F. they hatch in about seventy hours or little more, while at a temperature of 62° to 67° they are delayed to about six days. The best-known species are four—viz. *Alosa vulgaria* and *Alosa fida* of Western Europe, *Alosa sapidissima*, ranging from the Mississippi to the Alabama, and the *Alosa rostrata* of China, which especially ascends the Yang-tse-Kiang. The European species are held in much less esteem than the American and Asiatic. The last are esteemed among the best of fishes in their respective countries, and their ovaries are also regarded as special objects of luxury. The capture of these fishes gives rise to a large industry, and in the early spring months the fishermen are to a large extent engaged in their capture by means of fixed nets as well as seines, and to a small extent by dipnets. Shad eat little or nothing when in fresh water, but sometimes rise to the fly, although not enough to constitute them generally recognized game-fishes. In the salt water and estuaries they feed chiefly on small crustaceans, such as species of *Myda*, etc. See *FISHES*, *FISH-CULTURE*, and *PISCICULTURE*.

Revised by F. A. LUGER.

Shad-bush or Shad-tree: See *JUNO-BERRY*.

Shaddock (called *Pumpelmousse* in the East Indies): the large fruit of the *Citrus decumana*, a small tree of the orange family (*Rutaceae*). It has a watery pulp, cooling, acid, aromatic, and somewhat bitter. It is used for preserves. It was named from one Shaddock, who is said to have carried it from India to Jamaica. His descendants six varieties. The fruit sometimes weighs 15 lb. It is also called pomelo and grape-fruit. In botanical characters it differs from the orange in having a pubescent young growth, the leaves very large and often emarginate and pubescent beneath, petioles much winged. It is a native of Polynesia, but is widely spread in the tropics.

Revised by L. H. BAILEY.

Shadow-bird: a wading bird (*Scopus umbretta*) related to the snipe and herons, found throughout the greater part of Madagascar and Africa. It is named from its color, a deep brown with bronze reflections. The tail is barred with black, the bill is deep and compressed and hooked at the tip, and the head bears a long crest. The bird is rather sluggish. Although only 20 inches in length it builds a hollow nest of twigs about 6 feet in diameter, which is placed on a tree or ledge of rocks.

F. A. L.

Shadwell, THOMAS: dramatist; b. at Stanton Hall, Norfolk, England, about 1640; educated at Jesus College, Cambridge; studied law at the Temple, London; traveled on the Continent; acquired considerable reputation by his comedy, *The Sullen Lovers*, produced in 1668; devoted himself thenceforth to literature, chiefly dramatic; was author, among many other plays, of *The Virtuoso* (1676), *Lunar*

shire Witches (1682), *The Squire of Alsatia* (1688), and *Volunteers, or The Stock-jobbers* (1693); became poet-laureate and royal historiographer 1688, succeeding Dryden in both posts, and thereby incurring a resentment which led to his unjust impalement by that poet as the hero of *Mac Flecknoe* in the character of "monarch of dullness." D. Dec. 6, 1692. His collected *Works* appeared in 4 vols., 1720.

Revised by H. A. BEERS.

Shaftesbury, ANTHONY ASHLEY COOPER, First Earl of: party leader; b. at Wimborne St. Giles, Dorsetshire, England, July 22, 1621; entered Exeter College, Oxford, 1637; was elected for Tewkesbury to the Short Parliament in 1640; at first supported the king, but after ten months' service in the royalist army went over to the popular party in 1644, and took an active part in the war. He was a member of the "Barebones" Parliament in 1653, and of Cromwell's council of state in the same year, but later separated from the cause of the Protector and co-operated in the restoration of Charles II. As a reward for his services he was made a privy councillor in 1660 and Chancellor of the Exchequer in 1661, having previously been raised to the peerage with the title of Baron Ashley. He was one of the grantees of the province of Carolina 1663 and 1665; secured the services of John Locke as private secretary 1666, and prepared with Locke the famous aristocratic constitution for the government of the Carolinas. A member of the "Cabal" 1670, he allowed himself to be deceived as to the true nature of the disgraceful Treaty of Dover. In 1672 he was made Earl of Shaftesbury and Lord Chancellor, but in 1673 went over to the opposition and lost his office. Protesting against the prorogation of the Parliament, he was imprisoned in the Tower 1677-78, but on his release continued as the bitter foe of the court party, and, professing to believe the perjured testimony of Titus Oates, took the lead in the persecutions of the Catholics. He procured the passage of the Habeas Corpus Act 1679; presented the Duke of York before the court of king's bench as a "Popish recusant" in 1680; brought armed followers to the Oxford Parliament in 1681; was thrown into prison by order of the council on a charge of high treason July 2, but released Dec. 1, 1681, the grand jury having refused to find a true bill; went to Amsterdam Nov., 1682, and died there Jan. 22, 1683. He was the Achitophel of Dryden's satire, is brilliantly sketched by Macaulay in his *History*, and gave name to Ashley and Cooper rivers in South Carolina. See his *Life*, by W. D. Christie (1871); also Fox-Bourne's *Memoir of John Locke* (1876); and a biography by H. D. Traill in the English Worthies Series (1886).

Revised by F. M. COLBY.

Shaftesbury, ANTHONY ASHLEY COOPER, Third Earl of: grandson of the first earl; b. in London, Feb. 26, 1671; was educated under the supervision of Locke; entered Parliament 1693; resided in Holland 1698-99; succeeded to the peerage 1699; supported the administration of William III., and retired from public life on the king's death; was noted as a philanthropist and stigmatized as a free-thinker; published a *Letter on Enthusiasm* (1708) in defense of the rights of the "French Prophets," *The Moralists*, a *Philosophical Rhapsody* (1709), *Sensus Communis* (1710), *A Soliloquy, or Advice to an Author* (1710); spent much of his time on the Continent, and was preparing a work upon the arts of design when he died at Naples, Feb. 15, 1713. His principal work, *Characteristics of Men, Matters, Opinions, and Times*, was posthumously published (3 vols., 1713-23; often reprinted), and enjoyed great popularity. See Fowler, *Shaftesbury and Hutcheson* (London, 1882).

Shaftesbury, ANTHONY ASHLEY COOPER, Seventh Earl of: b. in London, Apr. 28, 1801; took a first class in classics at Oxford, 1822; was made D. C. L. 1841; entered Parliament 1826, representing the borough of Woodstock from 1826 to 1830, Dorchester 1830 and 1831, the county of Dorset, in which the estates of the family are situated, from 1833 to 1846, and the city of Bath from 1847 to 1851; supported the administrations of Liverpool and Canning; was made a commissioner of the India board of control by the Duke of Wellington 1828; was a lord of the admiralty under Sir Robert Peel 1834-35; succeeded his father in the peerage 1851. He was chairman of the Lunacy Commission from 1828 till his death, and did much to secure the passage of bills which have been called the Magna Charta of the liberties of the insane. He labored zealously to improve the condition of the working classes; carried through the Ten Hours' Bill, and followed it up by obtaining the assent of Parliament

to other measures regulating defective workshops and factories, night work, and the treatment of children by their employers in trades and manufactures, etc. His course in public life was always very independent. He was the leading philanthropist in English-speaking lands, and stood in public estimation as the embodiment of every virtue. His endorsement of any scheme was sufficient to give it success. He was therefore continually called upon to preside at meetings of all sorts. He was president of the British and Foreign Bible Society, the Pastoral Aid Society, the Evangelical Alliance, and other organizations for the propagation of evangelical doctrines, and was long regarded as the head of the so-called Exeter Hall school of Low Churchmen. He was an active promoter of the abolition of slavery throughout the world. D. at Folkestone, Oct. 1, 1885. See his *Life*, by Edwin Hodder (3 vols., London, 1886; n. e., 1 vol., 1887).

Revised by S. M. JACKSON.

Shagreen' [from Fr. *chagrin*, from Turk. *sāghri*, back of a horse (from the skin of which shagreen was first made, shagreen): a variety of tawed leather made in Persia and other parts of the East, and long celebrated for its hardness and strength. The name shagreen is also given fish-skins, principally those of sharks and rays, covered with calcified papillæ. Shagreen prepared from the tuberculous skin of the ray (*Trygon sepien*) is called *galuchat* by the French. Shagreen is dyed in various colors, and is used as a covering for small articles, as boxes and handles of swords.

Shah [from Pers. *shāh*, king; cf. *chess*, *pasha*, and *sattrat*; Pers. *kshātra*, province; Sanskr. *kshātra*, rule, power]: the title of the ruler of Persia and of certain other Asiatic princes. The sons and other male relatives of the Persian shah also assume this title, the full title of the monarch being *shah-in-shah*, king of kings.

Shāh Abbās: See **ABBĀS I.**

Shahap'tian Indians: a family of North American Indians, comprising the following named tribes: Chopunnish, Sahaptin, Nez Percé or Nimapu (the last being their true name), Klikatat, Palooos, Tenaino, Tushpaw, Tyigh, Umatilla, Walla Walla, Yakima.

Habitat.—The tribes occupied a large section of country along the Columbia river and its tributaries, their western boundary being the Cascade Mountains. The Chopunnish were found in 1804 occupying a large area in Western Idaho, Northeastern Oregon, and Southeastern Washington, on the lower Snake river and its tributaries. The Klikatat occupied the head waters of Cowlitz, White Salmon, and Klikatat rivers, Washington. The Palooos in 1805 were on Clearwater river, Idaho, above the Forks, and on the small streams tributary to it, W. of the Rocky Mountains. The Tushpaw appear to have been an eastern branch of the Nez Percé. According to Lewis and Clark's report the Walla Walla lived on both sides of Columbia river, from the mouth of Lewis (or Snake) river to the Musselshell Rapid, wintering on Tapteel (or Yakima) river. It is probable that under the general name Lewis and Clark included one or more other divisions, the Umatilla, for instance, who originally lived on Umatilla river, Oregon. The Tenaino, who are nearly related to the Warm Spring Indians, formerly lived at Gilliam, Oregon, on Columbia river. The Tyigh originally occupied Tyigh creek and valley, the former being a tributary of the Des Chutes river, Oregon, about 30 miles S. of the Dalles. The Yakima (called Shanwappam by Lewis and Clark) were found in 1805 on the head waters of Cataract (or Klikatat) and Tapteel (or Yakima) rivers, Washington.

General Characteristics.—Comparatively little is known of the mutual relations of the several members of this family. The linguistic family as a whole is a rather well-defined one, though in some of its sounds and in its harsh character the language considerably resembles the Chinook and Salishan. In habits of life the Shahaptian tribes differed considerably from the Chinook of the Columbia, to whom they were much superior, and more nearly resembled the inland Salishan tribes. Living as they did on the large water courses, salmon constituted their most important food, but the possession of horses (for all the tribes were "horse Indians") undoubtedly wrought considerable change in their habits, and caused them to become, to some extent, hunters. At the time of Lewis and Clark's visit (1804-05) none of these tribes had any idea of agriculture, and some of the bands met by the explorers on Snake river periodically suffered from hunger. The Chopunnish were then living, like the Chinook, in communal houses, and the same custom probably prevailed also in the other divisions of the family.

the village on the Clearwater was 150 feet long, and surrounded about 60 families and 100 fighting men. Each village was under the nominal control of a chief, but nothing showed of the nature of the federation of the separate villages if any such existed. Of late years, at least, the Nez Percé (Plaiusé Nussé) have not worn ornaments inserted in the nose, but it is probable that at one time the custom was a general one.

Dalles.—When Lewis and Clark passed down the Columbia in 1804-05, the lowermost Shalupian tribe, the Sossuier, was at the Dalles, while the first Chinookian tribe, the Chinook, was found at the Dalles, the two tribes being in a state of war. They were then at war, and there is evidence to show that during the next few years the Shalupian tribes encroached upon the Chinookian territory, and were westward from the Chinook the Dalles, probably the last Chinookian station on the Columbia. The Kiklatat, who, according to Gibbs, first crossed the Cascade Mountains from the Kiklatat river, Washington, crossed the Chinookian between 1810 and 1820 and overran the Willamette valley, taking their way as far S. as the Umpqua valley, Oregon. Subsequently they were compelled to retire to their own country. In 1820 they were found in the wooded and prairie country between Vancouver and the Dalles, at the base of Mt. Hood, Washington. In 1840 the Pelouse dwelt S. of the Cayuse. Love (1896) mentions the Pelouse (Palouse), who were then in British Columbia, at the mouth of Pelouse river. The Shalupian Indians are now located on various reservations in Idaho, Washington, and Oregon.

Population (1890).—Nez Percé, 1,515; Kiklatat, 115; Palouse (number unknown 181 to 1851); Tenino, 60; Tygh, 20; Pasailla, 170; Walla Walla, 405; Yakima (numbered 20 in 1825), 841.

LITERATURE.—Bancroft, *Native Races of the Pacific States*, II, 565, 650 (1895); Cox, *Bishop of the Nez Percé*, in *Indian*, 1893, 95 (1891); Gallatin in *Schubert's Indian Tribes*, II, 406 (1853); Hale, in *United States Expl. Rep.*, VI, 119, 212, 542 (1846); How, O. O. Howard, *True Story of the Nez Percés*, in *North American Review*, 129, 53 (1879); Lee and Frost, *Nez Percé in Oregon* (1844); Lewis and Clark, *Narrative*, ed. Allen, II, (1814). See INDEX OF NORTH AMERICA.

Shahjahanpur: large city of Rohilkhand, Northwest Provinces, British India, in lat. 27° 52' N., lon. 79° 28' E.; on the Ganges, a tributary of the Ganges (see map of N. INDIA, col. 4-17). The city was founded in 1647 during the reign of Shah Jahan, whose name it bears, and contains many fine mosques and the ruins of a castle. It has some sugar cane in cereals and sugar. Pop. (1891) 78,522. It is one of the chief places of a district of the same name. Area, 178 sq. miles. Pop. 800,000. Shahjahanpur is the name of several other towns in Northern India.

Revised by M. W. HANIKOROK.

Shahjahanabad: See DELHI (city).

Shah Nāmāh, shah-nā-mā, or **Book of Kings**: See FRAKAS and BARRAS.

Shairp, JAMES CAMPBELL: author and critic; b. at Housness House, Gleditsgowshire, Scotland, July 30, 1819; educated at Edinburgh Academy, Glasgow University, and Balliol College, Oxford; was for some years assistant master of Rugby School; became Professor of Humanity at the same College, St. Andrews, 1861, and principal of that institution 1868, and was elected Professor of Poetry in the University of Oxford in 1877. He was the author of *Kilncliff, a Highland Pastoral* (1864); *Studies in Poetry and Philosophy* (1869); *Lectures on Culture and Religion* (1870); *Prose Interpretation of Nature* (1877); *Aspects of Poetry* (1881); *Lays of Robert Burns* in the *English Men of Letters Series*; and numerous contributions to magazine literature. D. at Gremsey, Argyleshire, Sept. 18, 1885. *Glen Gremsey and Other Poems* was published posthumously in 1886, edited by F. T. Palgrave. See *Portraits of Friends* (New York, 1890) for a memoir of Shairp, by William Lancel Holman.

Revised by H. A. BURNS.

Shakers (so called from certain rhythmical movements of the members in dancing, which forms part of their worship), more accurately, THE MILLENNIAL CHURCH, or UPRIGHT SOCIETY OF NEWBURY: a religious body which originated in England about the middle of the eighteenth century, having as its first leaders James Wardlaw, a tailor, and his

† Of late years the term Yakima includes a considerable proportion of the tribes speaking the shalupian language, and probably originally having little or no connection with the Yakima proper.

wife Jane, members of the Society of Friends. Jane Wardlaw, who claimed to have received from on high a call to announce the second coming of Christ in the form of a woman, gained access to her followers Ann Lee, daughter of a blacksmith, who was born in Manchester, Feb. 29, 1736; married Abraham Stanley, a blacksmith, and united with the society of James and Jane Wardlaw in Sept., 1790. She was imprisoned in the summer of 1779, during the persecution that arose against the Shakers, and while a captive received a revelation from the Lord which showed her that by obeying only could mankind be restored to a proper relation with God, and become the acknowledged head of the society.

On May 13, 1774, in obedience to a revelation, she embarked for North America with seven adherents, including her husband, who afterward left her, and John Hancock, who had some property. She landed in New York Aug. 6, settled in Watervliet, 2 miles S. W. of Albany, 1776. On the famous "Dark Day" (May 19, 1780) Elder James Whitaker preached the first public testimony of Mother Ann's gospel in America. Between that time and her death at Watervliet, in Sept., 1784, it is thought that over 2,000 people received her testimony. James Whitaker succeeded as leader of the people till his death at Enfield, Conn., July, 1797.

After him Elder Joseph Meacham led the people, and, assisted by able helpers, established communal order and regulation in all their families, guiding them till his death at New Lebanon, July, 1798. He had been a Baptist elder, and was son of a Baptist elder of the same name; was born in Enfield, Conn., in 1740. He is called the Father of Church Order.

After him Lucy Wright, who was Father Joseph's chief helper on the sisters' side, guided the people twenty-five years, till her death, at the age of sixty-one, at Watervliet, Feb., 1821. She was born in Pittsfield, Mass. During her ministrations five societies were established in Ohio and Kentucky, and believers increased in number thousands. Eleazer Bishop, Rufus Bishop, Bush Landan, and Asenath Clark were the leading ministers from 1821 to 1852. From 1820 to 1826 three new societies were established, and the population of the seventeen societies then existing was about 5,000 souls.

In 1827 remarkable spiritual manifestations began at Watervliet, and in less than a year spread through all the families. First the youthful and untutored class, taken away in visions and trances, described scenes and dwellers in the spirit spheres, being, as they believed, inspired to deliver messages, both vocally and in writing, from Mother Ann and her collaborators when in the body, and their successors, from Jesus, from apostles, patriarchs, and prophets, and other exalted witnesses, to the effect that they had come to help the leaders, to purge out disorder, and to restore church rules and discipline to the rectitude of their beginning. They brought a flood of light and of spiritual gifts, humbling and mortifying to a carnal nature, to the vanity of youth, and pride staining to all flesh, but edifying and strengthening to the little child in Christ. They said it was to prepare us for the gospel to go forth in mankind. At the end of fifteen years one spoke in the name of Mother Ann, that evil was that day so bound and put down that it had no power to rise in the church, which then stood in purer rectitude than ever it had before. Mother Ann's special ministration lasted, it is claimed, about three years. But there were many subsequent spiritual manifestations, and many were converted by them. Crowds of spirits from Hades were taught the gospel of the judgment, and the absolute necessity of confessing and forsaking their sins to find acceptance with God.

Shakers believe that Christ has made his long and anxiously awaited second appearing in Ann Lee and her followers; that God is one in essence, but dual in his complete and perfect manifestation, the redeemed and perfected man and woman; that they are in the work of the harvest, the resurrection, the judgment day, ending the world in themselves by obedience to the everlasting gospel, and entering in the dawn of the millennial age. They own no wives, nor husbands, nor private personal property, nor have carnal relations; they hold their possessions as a united and concentrated interest, each toiling for the good of the whole, in love serving one another, in honor preferring one another as brothers and sisters of one family. The government is wholly parental. The leading authority is vested in four persons, two of each sex, called ministry. The head of a family is an eldership, consisting when complete of four,

two of each sex. Elders are assisted by deacons, two of each sex when the order is full, or more if necessary, who manage temporal affairs. The total number of Shakers in the U. S. is about 1,000, forming 15 societies or settlements, of which 2 are in the State of New York, 3 in Massachusetts, 1 in Connecticut, 2 in New Hampshire, 2 in Maine, 3 in Ohio, and 2 in Kentucky. New Lebanon, in Columbia co., and Watervliet, in Albany co., N. Y., are the most important.

The Shakers publish a monthly, called *The Manifesto*, at East Canterbury, N. H. It was started in 1871. See also *The Concise History of Shakers* (East Canterbury, 1894); *Pearly Gate* (Chicago, 1894); and *The Millennial Church* (Albany, N. Y., 1848). ALONZO G. HOLLISTER, Elder.

Shakespeare, WILLIAM: dramatic poet; b. at Stratford-on-Avon, Warwickshire, England, in Apr., 1564—on the 28d of that month, O. S. (N. S., May 8), it is supposed. His father, John Shakespeare, was of the yeoman class; his mother, Mary Arden, was of a family of the minor gentry. John Shakespeare seems to have been a man of character and ability. He became a landholder, and rose rapidly through all the grades of office in Stratford until he became chief alderman and *ex-officio* justice of the peace. Misfortune, however, befell him, and he was reduced to comparative poverty, and was even subject to arrest for debt. Of Shakespeare's boyhood nothing is known; but he was doubtless educated at the grammar school in Stratford, where he got the "small Latin and less Greek" with which Ben Jonson credits him. Passages in his works showing more than ordinary familiarity with law-terms have been regarded as indicating that he was for a time in an attorney's office. This is more probable than the tradition that he was apprenticed to a butcher. The first fact that is really known about him, after his baptism, is that in his eighteenth year he had become entangled with a woman of twenty-five, Anne Hathaway, the daughter of Richard Hathaway, who lived at Shottery, near Stratford. He married this woman by special license, dated Nov. 28, 1582, and their first child, Susanna, was baptized May 26, 1583. Twin children, a boy and girl, named Hamnet and Judith, were baptized Feb. 2, 1585. Shakespeare soon (perhaps in 1585) left Stratford to seek his fortune in London. Tradition says that he had killed some of the deer of Sir Thomas Lucy, of Charlecote, near Stratford, and that the knight's vindictiveness was one of the causes of his leaving his native village. The story, not improbable in itself, finds a certain confirmation in the fact that Sir Thomas is apparently caricatured as Justice Shallow in *The Merry Wives of Windsor*.

Absolutely nothing is known of Shakespeare's first years in London. Tradition says that he began by holding horses at the door of the theater. It is certain that he soon got some humble position inside the theater (another tradition says as a mere "prompter's attendant"), and after a time became an actor, though he seems never to have risen higher than a position of what is known as "general utility." He was one of the original performers in Ben Jonson's *Every Man in his Humour*; he appeared in the same author's *Sejunctus*; and there is a tradition that he played the Ghost in *Hamlet*, and that his brother Edward saw him play the part of an old man, which was probably that of Adam in *As You Like It*. A few years later he began his career as a dramatist by rewriting old plays in conjunction with others, his seniors in years and as playwrights. It was the custom of the various companies of players to have several playwrights in their pay, who, working together, produced new plays and patched up old ones. Marlowe, Greene, and Peele were perhaps among Shakespeare's collaborators. His superiority to all his contemporaries soon asserted itself, and he began to write alone or with little assistance. His first wholly original play was probably *Love's Labour's Lost*; for in *Titus Andronicus*, a revolting tragedy characteristic of a kind of drama then in vogue, there are but slight traces even of his 'prentice hand. He probably also in his earliest dramatic days had some small share in the revision of Part I. of *Henry VI.*, which was almost certainly an old play by another author or authors.

Shakespeare's success provoked the jealousy and excited the enmity of at least one of those whom he eclipsed—Robert Greene, a gifted but dissolute man, who died in wretchedness, and who, in a pamphlet written during his last illness, sneered at Shakespeare as "an upstart crow, beautified with our feathers; . . . and that being an absolute *Johannes factotum*, is in his own conceit the only Shake-scene in a country." "Beautified with our feathers" may mean

that he got credit by acting what others wrote; but some take it to be a charge of plagiarism in the revision of plays written by others. A few months later, Henry Chettle, who was one of the knot of writers to which both Greene and Shakespeare belonged, came to the defense of the latter in a pamphlet in which he says that Shakespeare's demeanor was "no less civil than he was excellent in the quality he professes"; adding that "divers of worship [people of rank and reputation] have reported his uprightness of dealing, which argues his honesty, and his facetious [felicitous] grace in writing which approves his art." Among the friends that Shakespeare won was the Earl of Southampton, a nobleman of taste and culture, who took great interest in literature and the drama. To him the poet dedicated his first published poem, *Venus and Adonis*, which was his first purely literary effort: he calls it "the first heir of his invention." There is a tradition that Southampton gave Shakespeare £1,000, quite equal to £8,000 at present. This may be an exaggeration, though such munificence was not unknown in those days among English noblemen. When Shakespeare published *Lucrece*, his second poem, he dedicated this also to Southampton, saying, "The love I dedicate to your lordship is without end. . . . What I have is yours; what I have to do is yours; being in part all I have devoted yours." This is apparently the acknowledgment of a great service, and it was possibly through the nobleman's generosity that the poet-dramatist became a very considerable sharer in the Blackfriars theater, at which the company with which he was connected was in the habit of performing. Having attained this advantageous position, Shakespeare soon reached the utmost height of success, as to both reputation and profit, possible to one of his profession. The notion long prevalent that he was neglected during his life, and that his plays rose in popularity only a long time after his death, is entirely unfounded. Contemporary evidence shows that he was the most admired of all the dramatists of his day, and that was the productions of the best of his contemporaries—Ben Jonson included—failed to pay the expenses of their representation, his plays filled the house to overflowing. He entered upon a career of dramatic production which is without a parallel in the history of literature, and which soon placed him in independent circumstances. He had money to spend and money to lend; and he used it to place his father in comfort and to acquire landed property and other wealth in his native town. The Herald's College made his father a gentleman by coat-armour, and this may have been done at the instance of the successful playwright, who thereby became a "gentleman" by descent both on his father's and his mother's side. He invested a part of his money in the title of Stratford, and he bought New Place, the best house in the town, and gradually added other lands to the estate. To this house he retired on his withdrawal from the theater about 1611, and there he died Apr. 23, 1616, and was buried on the 25th in the Stratford church. His daughter Judith was married to Thomas Quiney, a vintner, about two months before her father's death. Her sister Susanna became the wife of Dr. John Hall, a Stratford physician, in 1607.

Of Shakespeare's life in London very little is known, almost nothing except the successive production of his plays. Fuller says that he and Ben Jonson used to have many "wit-combats," in which he compares Jonson to a heavy Spanish galleon and Shakespeare to a light English man-of-war. Jonson was his junior, but was one of those who knew him intimately; and jealous, hot-tempered Ben loved him well and honored his memory after his death. He supports Fuller's comparison by saying, with a classical allusion, that Shakespeare was distinguished by great copiousness and facility of thought and language—so great as to be almost oppressive to his hearers. There was a sort of club of which Raleigh, Jonson, Beaumont, Selden, and Donne were members, and which met at the Mermaid Tavern; and the wit-combats probably took place at these meetings. Tradition says that Jonson owed to Shakespeare's influence the performance of his first comedy, *Every Man in his Humour*, which had been offered and rejected. This story agrees with Shakespeare's reported kindness of nature, and with the gruff and cynical scholar-dramatist's love for him.

Shakespeare's *Sonnets*, 154 in number, were published in 1609, and were dedicated to a "Mr. W. H." as their "only begetter," but by the publisher, not by the poet, who seems to have had no agency in the publication of any of his works except *Venus and Adonis* and *Lucrece*. If, as the great majority of editors, critics, and commentators believe (among them Wordsworth, Coleridge, Sir Henry Taylor, Swinburne,

Shakespeare, William Hugh, Malton, Harmer, Steevens, Drake, Halliwell, Wright, Collier, Furness, Trench, and Dowden. The *Sonnets* are autobiographical; most, if not all, of the first 130 were addressed to one person—a man, not a woman—and also most (except the last two) to the “dark lady” with whom “Jove” men, and Shakespeare were both entangled. Among those who believe that the poems are more “exercises of fancy,” with no foundation in the personal experience of the author, are the poets Browning and R. B. Stoddard, with Macaulay, Halliwell-Phillips, Brand White, and Chubbuck—the few last, however, believing that some of the sonnets are personal. The autobiographical theory has received strong confirmation from the researches of Thomas Tyrer (*Shakespeare's Sonnets*, 1900), who has proved quite conclusively that “My W. B.” was William Herbert, afterwards third of Pembroke, and that the “dark lady” was certainly Mary Fitton, maid of honor to Elizabeth, and a mistress of Herbert's, for whom she had a child. There are many difficulties in this theory yet to be cleared up; but at present (1905) it seems more plausible than any other.

Was Shakespeare happy in his married life? After the birth of his children he lived for more than twenty years in London, starting Stratford tradition says, only once a year. While in London, if the *Sonnets* are autobiographical, he was captivated by the “dark lady.” His will has no mention of his wife except in an interlined bequest of the “second-best bed,” apparently inserted during his last sickness. But we know, as he was prosperous in London he bought a house in Stratford, and gradually made it the elegant home which must have been his ideal from the first. Did he look forward to sharing that home with a wife whom he did not love? Alas, he repented of his relations with the “dark lady” (the 129th sonnet clearly shows). As to the will, his wife was simply provided for by her rights of dower, which are seldom referred to in wills of the time; and the bequest of the bed was doubtless a token of affection, not the result of any other cause. On the whole, it may be assumed that this marriage had its foundation in mutual love, and that, after any transient estrangement which may have occurred, it ended as happily as it had begun.

Shakespeare's dramas are unlike those of his predecessors, his contemporaries, and his successors, but their appearance is not in form or in purpose. He assumed the forms of comedy and tragedy, and of history or historical play, which had been established before he began to write, and he conformed in every external respect to the fashion of the time and the needs of the theater. His difference from other dramatists consists in his thought and his language, and in his power of dramatic characterization; in all of which he is unsurpassed by any writer who ever lived. The other writer over united imagination, fancy, humor, knowledge of human nature, worldly wisdom, psychological insight, and creative power, as all these were united in him. The fertility of his mind appears to have been inexhaustible; the profundity of his thought illimitable. He throws upon a minor personage and an unimportant situation poetical thoughts and philosophical reflections which other writers, if they could have originated them, would have carefully reserved for elaboration upon great occasions. His dramatic isolation from his creations appears to have been perfect; once evoked from his mind, they went independently and altogether outside of it, and act and speak altogether according to the laws of their own nature, not of his. He does not hesitate to show us that even truth good and bad may, and often do, act from mixed motives, good and evil. It is in this inflexible justice, characteristic of only the very highest quality of intellectual and moral nature, that one of the chief evidences of his superiority is found.

Most of his plays as were published during his lifetime seem to have been given to the press entirely without his approval. They were written not to be read, but to be performed; and it was to the interest of all concerned in the theater that they should not get into print. But the publishers eagerly sought copies of them for publication, and obtained them surreptitiously; sometimes, it would seem, by copying persons connected with the theater, and sometimes, as the text which they printed shows, by sending shorthand-writers to the performance. Twenty of Shakespeare's plays were thus published during his lifetime. They are known as “the quartos” from the form in which they are printed. Most of them are full of errors, and with one or two exceptions, they are all more or less imperfect; but they are contributions of great value in the formation of the text,

and they have been freely used for that purpose. For the text of the remaining seventeen of the plays we are entirely dependent upon the folio edition of the whole thirty-six (not including *Percy*), published by Isaac Jaggard and Edward Blount in 1616, under the authority—and, in some way, the editorial supervision—of two of Shakespeare's fellow actors, John Hemmings and Henry Condell. This edition, known as the “first folio,” although greatly superior, as to the text, of almost all the plays, to the quarto copies of the twenty plays before mentioned, is yet marred by so many and so great errors, and sometimes even by such important omissions, that it has required the labors of editors and commentators during 150 years to produce the text as now generally accepted.

The order in which the poems and plays were written is much disputed, and it is not likely that it can ever be fully settled; but in recent years certain facts have been pretty well established. If Shakespeare wrote *Titus Andronicus*, it was probably his first play, and produced before 1590; or whatever he did in writing that play and *Henry VI.* for the stage was probably done between 1588 and 1591. *Love's Labour's Lost*, it is generally agreed, was his first original play (1590), followed by the *Comedy of Errors*, the *Two Gentlemen of Verona*, and *A Midsummer Night's Dream* between 1591 and 1594; to which period must also be assigned *2* and *3* *Henry VI.* and *Richard III.* The first draft of *Romeo and Juliet* may have been as early as 1591 (revised 1595 or 1597). Then followed *Richard II.* (1594), *King John* (1594 or 1595), *The Merchant of Venice* (1596 or 1597), *2* and *3* *Henry IV.* (1597-98), and *Henry V.* (1600). As *You Like It*, *Much Ado*, and *Twelfth Night* must have been written in 1599-1600, and *Julius Caesar* by 1601, *The Merry Wives of Windsor* is to be grouped with the other Falstaff plays; and *The Taming of the Shrew* (not wholly Shakespeare's), the exact date of which is not easily fixed, must be put between 1594 and 1598. The first form of *Hamlet* is dated by some critics before 1600, but it may have been as late as 1602. The dates of the rest of the plays are probably as follows: *All's Well*, 1602 (perhaps the revision of a draft ten years earlier); *Measure for Measure*, 1608; *Timon and Coriolanus*, 1604 (very difficult to date); *Othello*, 1604; *Love and Hate*, 1605; *Antony and Cleopatra*, 1607; *Coriolanus*, 1608; *Cymbeline*, 1609; *The Tempest*, 1610; *Winter's Tale*, 1610-11. *Timon of Athens*, (1607-8?), *Pericles* (1608?), and *Henry VIII.* (1612-13?) are Shakespeare's only in part, and their history is perplexing. *Titus Andronicus* was probably written in 1592 or earlier, *Lucrece* in 1593 or 1594, and the *Sonnets* between 1595 and 1599, though some may have been several years later.

There are few traces, even in tradition, of any intercourse between Shakespeare and the eminent men of his time except Ben Jonson, Drayton, and the Earls of Pembroke and Southampton. Shakespeare and Bacon lived at the same time in the same city, then not a large one, passed each other in the street, and yet probably never interchanged one word. The reason was that one was a player and a poet, the other a statesman and a philosopher, and that each was absorbed in his own affairs. The notion that Shakespeare's plays were written by or in conjunction with Bacon—which has found a few ingenious advocates—is unworthy a moment's consideration by any reasonable creature.

There is a stone over Shakespeare's grave on which there is this inscription:

Good friend for Jesus sake forbear
To dig the dust enclosed here:
Blest be y^e man y^e spares this bone,
And curst be he y^e moves my house.

These lines, which may embody a wish expressed by Shakespeare, but which are hardly of his writing, have prevented the removal of the remains of the greatest Englishman to Westminster Abbey. Against the wall of Stratford church there is a monument to Shakespeare, with a laudatory inscription in Latin; but of far greater interest is the bust of the poet which forms part of the monument. It is coarse and rude in execution, but there is no reason for doubting that it gives at least a general idea of his personal appearance. According to this, he was at fifty-three a portly but not at all corpulent man, with a high forehead, a head somewhat bald, a small aquiline nose, and a well-formed mouth and chin. Aubrey, the antiquarian, who lived two generations after him, had heard that he was “a handsome, well-shapt man.” An engraved portrait upon the title-page of the first collected edition of his works, which Ben Jonson,

in some verses almost as hard and expressionless as the engraving itself, assures us was a good likeness, has a general conformity in the features and the form of the head to the bust. The latter was originally colored after life, and had hazel eyes and auburn hair and beard. These traits were afterward obliterated by a coat of white paint. The bust and the engraved portrait in the folio are the only portraits of Shakespeare which are of undoubted authenticity; but one known as the Chandos portrait has tradition of very respectable antiquity in its favor. There is a very slight and vague tradition that Shakespeare "died a papist," but this is very improbable. His works favor no religious form, sect, or dogma. There was also a tradition in Stratford fifty years after his death that he, Drayton, and Ben Jonson had "a merie meeting, and it seems drank too hard, for Shakespeare died of a faveur there contracted." This tradition has probably as little foundation as the other.

Although Shakespeare was acknowledged as the greatest dramatist of his time, his reputation rather diminished than increased during the century after his death. He had no followers or imitators; he established no school. Dramatic taste and dramatic writing steadily declined after the Elizabethan age (about 1575 to 1625), and by the beginning of the eighteenth century Shakespeare was lightly thought of by the literary critics, and much neglected by the actors. There had been among the reading public, however, a steady although not a large demand for his plays. The folio of 1623 was succeeded by another folio in 1632, and a third edition was called for and published in 1664. In the last *Pericles* and six spurious plays which had been published in quarto in Shakespeare's lifetime, with his full name or his initials upon the title-page, were included. A fourth edition, also in folio, appeared in 1685. Upon these four folios, and upon the existing old quarto edition of twenty of the plays, the readers of Shakespeare depended until Rowe's edition appeared in 1709 (see bibliography below). From the time of the appearance of this edition the fame of Shakespeare steadily grew until about the beginning of the nineteenth century he was acknowledged to be the first of poets and of dramatists, the most creative mind, the greatest master of imagination and of language, that the world has known. The number of Shakespeare's commentators has much exceeded that of his editors. His text was left in such a condition by the printers of the old quartos and folios that, although it may be read even in those impressions with pleasure and with a full comprehension of its general meaning, there is to its perfection need of more critical labor than is required by most old manuscripts; and of such there is none to consult, for of Shakespeare's writing not a line has come down to us—not even a word, except his own signature. It is safe to say that more critical ability and learning has been displayed upon this subject than upon any other in the whole range of literature, the poems of Homer perhaps excepted. The works written upon Shakespeare form a library in themselves, and a complete bibliography (unfortunately there is none such in existence) would fill a good-sized volume.

Shakespeare, like so many other men of great eminence, left little trace of his personality behind him. His only son, Hamnet, died at the age of twelve years. His two married daughters left children, but the family, even on the female side, became extinct in the third generation. New Place, his residence upon his retirement from the theater, after passing through several hands was in 1759 razed to the ground by its last owner, the Rev. Francis Gastrell, who was exasperated by a quarrel with the town authorities and by the persecution of prying visitors to the home of the great poet. John Shakespeare's house, which stands in Henley Street, and in which it is probable that William was born, was a comfortable dwelling for that age. After falling into decay, it was bought by an association and restored for preservation as a memorial of the poet. More recently, the grounds of New Place and the cottage at Shottery in which Ann Hathaway is supposed to have lived before her marriage have been bought for the same purpose.

RICHARD GRANT WHITE. Revised by W. J. ROLFE.

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Shak'opee: city; capital of Scott co., Minn.; on the Minnesota river, and the Chi., Mil. and St. P. and the Chi., St. P., Minn. and Omaha railways; 28 miles W. S. W. of St. Paul (for location, see map of Minnesota, ref. 16-K); it is in an agricultural region, and contains a steam flour-mill, wagon-factory, railway repair-shop, orphan asylum, a national bank with capital of \$50,000, and two weekly newspapers. Pop. (1890) 2,041; (1898) 1,757.

Shale [from Germ. *schale*, *schale*, shell, dish, thin layer; cognate with O. Eng. *scella* > Eng. *shale*, bark pot (scaly oysters)]. The same Teutonic word coming via O. Fr. appears in Eng. as *scall*; a laminated argillaceous rock resulting from the induration of mud or clay stratified in water. A shale containing much organic matter, sand, or calcareous carbonate is characterized as bituminous, arenaceous, or calcareous. The shales are the most abundant of all stratified rocks, and are the most highly composite. From the mixed sediments washed down from the land by streams and deposited in the ocean, the larger grains are usually sorted out and separately deposited, giving rise to sandstones; the schists matter, chiefly calcareous carbonate, is also in the main separately deposited as limestone; and the remainder is deposited as mud, and eventually converted into shale. As these various rocks, being lifted into the land, are degraded by rain and streams, the sandstones and limestones, being relatively hard and constant, come to constitute mountains and hills, while the shales are eroded into valleys. Collectively the shales are of growing importance, being wrought for the manufacture of bricks, especially paving-bricks, and for mixture with other substances in the manufacture of hydraulic cement. G. K. G.

Shaler, NATHANIEL SOUTHGATE, S. D.; geologist; b. near Newport, Ky., Feb. 22, 1841; graduated at Lawrence Scientific School of Harvard University 1862; during the civil war served for two years in the Union army with Kentucky volunteers as an artillery and staff officer; returned to the Lawrence School as assistant and afterward instructor in zoology and geology; professor in Harvard University since 1868, at first of Paleontology, afterward of Zoology; dean of the Lawrence School since 1891; director of the Geological Survey of Kentucky 1878-80; geologist of the U. S. Geological Survey in charge of the Atlantic coast division since 1884; commissioner of the Commonwealth of Massachusetts for various periods on agricultural, topographic surveys, the gipsy-moth, and highways; president of the Geological Society of America 1895. Prof. Shaler is a prolific author and has entered many fields, but his favorite themes are those branches of geology and physical geography which bear most directly on the activities of man. Among his writings are the Kentucky Geological Reports and Memoirs (7 vols., 1876-82); *On the Nature of Intellectual Property and its Importance to the State* (1878); *Aspects of the North* (1880); *The Story of our Continent* (1882); *Nature and Man in North America* (1892); *The Interpretation of Nature* (1900); *Sea and Land* (1904); *The United States of America* (2 vols., 1904); and reports to the U. S. Geological Survey on *Marine Mollusks*, *Fresh-water Swamps*, *Soils*, *Harbors*, and the geology of Cape Ann, Martha's Vineyard, Nantucket, and Mt. Desert. G. K. G.

Shallot [from O. Fr. *schalote*, an altered form of *escallone*, whence Eng. *scallion*]; an onion-like plant (*Allium aceduleum*), native of the Old World, growing in cloves somewhat like the garlic. The cloves are set in the ground early, and become large enough for market two months before seedling onions are ripe. They much resemble onions in taste, and in the U. S. they are sold as such by market-gardeners. Both tops and bulbs are eaten.

Sha'manism [from Pers. and Hind. *shaman*, *shaman*, idolater]; the religion of a large number of primitive North Asiatic tribes, blended in Central Asia with Lamaism (q. v.). It has no idols, save perhaps some fetishes and charms and rude ancestral images. The Shaman is a combination of priest and wizard, who performs incantations and sacrifices, mainly for the two objects of procuring remedies and purifying houses of the defilement of the dead body. Although the

Supreme Being is good, yet so great are the power and desire of the king of the lower world to injure man that the principal worship conducted by the Shamans is intended to placate him. Hence the declaration that Shamanism is devil-worship. See Tylor's *Primitive Culture* (2 vols., 1871).

Sham'mai (shortened from Heb. *Shemáya*): one of the leaders of the Sanhedrin during the reign of Herod. He is always mentioned together with Hillel, from whom he is said to have differed greatly by his harshness of manner and his rigorous interpretation of the Law. The followers of these two teachers, who still existed in Jerome's days, preserved the traditions of their masters, though the freer interpretations of the Bêth Hillel prevailed over the more rigorous of the Bêth Shammai. Shammai is supposed to be identical with the *Saddas* (Josephus, *Ant.*, xiv., 9, 4) who alone dared to oppose Herod when he appeared before the Sanhedrin in 47 B. c., and who was spared by Herod on the taking of Jerusalem (*ib.*, xv., 1, 1). RICHARD GOTTHEIL.

Shamo, Desert of: See Gobi.

Shamokin: borough: Northumberland co., Pa.; on the Lehigh Val., the North, Cent., and the Phila. and Reading railways; 17 miles W. of Ashland, and 19 miles S. E. of Sunbury, the county-seat (for location, see map of Pennsylvania, ref. 4-G). It is in the center of the anthracite coal region; contains several foundries, machine-shops, and other manufacturing, 15 churches, 45 public-school buildings (1890-91), public-school property valued at over \$140,000, water-supply from Shamokin creek, and electric lights; and has a national bank with capital of \$100,000, a State bank with capital of \$50,000, a building and loan association, 3 daily and 4 weekly newspapers, an assessed valuation (1893) of \$1,004,020, and a total debt (1894) of \$59,000. Pop. (1880) 8,184; (1890) 14,403.

Shamrock [from Ir. *seamrog*: Gael. *seamrag*, trefoil, white clover]: the national badge of Ireland, as the thistle is that of Scotland. It is a plant with trifoliate leaves, which was used by St. Patrick to illustrate the doctrine of the Trinity. The plant now generally called by the name is a hop clover (*Trifolium minus*). The wood-sorrel (*Oxalis acetosella*), the common white clover, and the black medick or nonesuch (*Medicago lupulina*) have each been identified with the original shamrock.

Shanghai, or Shanghai, shaang'hi': a hien or district city of the province of Kiangsu, China, and the most important emporium of foreign trade in the empire; on the west or left bank of the Hwang-pu, near its junction with the Wu-sung river, and 12 miles above its embouchure into the estuary of the Yangtse-kiang; lat. 31° 14' 42" N., lon. 121° 28' 55" E. (see map of China, ref. 6-L). In shape it is an irregular oval, surrounded by a wall 3½ miles in circuit, and pierced with seven gates. Its principal native suburb lies between the east gate and the river, and opposite this is the anchorage for junks. Except in the foreign settlement, which lies outside the north gate and stretches N. and N. E. for 2 miles along the bank of the river, the streets, both within and without the walls, are narrow and dirty. The foreign settlement consists of three so-called "concessions," known as the French, the British, and the American concessions respectively. The first mentioned is a narrow strip bounded on the N. by a canal called the Yang-King-pang; thence for three-fifths of a mile to the Wu-sung river (or Soo-chow creek, as it is called by foreigners) stretches the British settlement (the first to be laid out). Beyond this lies Hon-Kew, called the "American" settlement by foreigners, because here the first U. S. consul took up his abode. In 1863 it was incorporated with the British for municipal purposes. The French settlement has its own municipal government. There is no restriction, however, as to the nationality of residents or land-renters in any of these concessions. So efficient has been the municipal management of both that Shanghai has earned the distinction of being the "Model Settlement" of the East. The streets are well made and well kept, and are lined with imposing buildings. Those parallel with the Yang-tse road, which runs along the river bank, and is known as *The Bund*, are named after Chinese provinces, while the cross streets are named after cities. Excellent roads constructed during the military occupation of Shanghai, when threatened by the Taipings, radiate from the settlement to the W. and S., and are much used for driving, while a complicated system of creeks and canals, connecting with the Grand Canal, makes communication with the interior both easy and inexpensive.

The western half of the Settlement is occupied almost entirely by Chinese, for whose benefit a Mixed Court has been provided. In all civil, criminal, and political matters the subjects and citizens of the different treaty powers are, as elsewhere in China, subject to the jurisdiction of their own consuls, except in the cases of Great Britain and Germany, which have provided special courts.

Shanghai was first opened to foreign residence and trade in 1843, in accordance with the treaty concluded at Nanking in the preceding year, though its importance as a commercial center had long been recognized. In 1893, according to the reports of the imperial maritime customs, the gross value of the trade of the port amounted to 177,017,836 taels or custom-house taels (= \$185,868,727 U. S. gold). This included imports of foreign goods amounting to 88,974,245 taels, imports of native produce of the gross value of 55,293,713 taels, and exports of native produce of local origin to the amount of 37,749,878 taels. The chief foreign imports are opium, cotton, and woolen goods, metals, coal, window-glass, indigo, machinery, matches, needles, sandalwood, kerosene oil, paper, sugar, soap, planks, seaweed, silk, skins, stores, and ebony and other woods. The countries from which most of the commodities were received are:

Great Britain.....	26,896,967 taels.
Hongkong.....	20,524,125 "
India.....	16,729,415 "
Japan.....	6,296,517 "
United States.....	5,193,534 "
Continental Europe, excluding Russia.	4,984,866 "

The articles of native produce exported to foreign countries include beans and bean-cake, chinaware, cloth, raw cotton, ground nuts, Chinese drills, hemp, medicines, oil, paper, rice, raw silk, rugs, straw-braid, sugar, tea, tobacco, wax, and wheat. The shipping statistics show that in the same year 2,822 steamers, aggregating 3,147,734 tons, and 343 sailing vessels (117,151 tons) entered port; and that 2,821 steamers (3,154,379 tons) and 331 sailing vessels (110,606 tons) cleared. The population of Shanghai is estimated at 400,000, of whom about 2,000 are foreigners. R. L.

Shan-hai-kwan [literally, mountain-sea-barrier]: a strongly fortified town of China, pleasantly situated on the shore of the Gulf of Peh-chih-li, at the eastern end of the Great Wall. It consists of three towns separated by strong walls and surrounded by one outer wall. The large inner city is the business center; the inclosure on the E. is occupied by official and soldiers, and that on the W. by tradespeople and soldiers. The place is said to be impregnable. It is a station on the Tientsin-Mukden Railway, complete for a few miles beyond Shan-hai-kwan.

Shannon: the largest river of Ireland. It rises in the county of Cavan at 256 feet above sea-level, flows first S. to Limerick, then W., and enters the Atlantic through an estuary 10 miles wide at its mouth. In its course, which is 254 miles in length, it forms several lakes, viz.: Loughs Allen, Boder, Bofin, Forbes, Ree, and Derg. Vessels of 1,000 tons burden can ascend to Limerick, and small steamers to Athlone. The river is canalized between Limerick and Killakee, and some distance below Athlone. The Inny, Brosna, Maigue, Mague, and Deel fall into the Shannon on the left, and the Suck and the Fergus on the right.

Shanny: a marine spiny-rayed fish of the genus *Pholis*, or a related genus, of the family *Pholididae*. The common shanny (*Pholis pholis*), found in shoals on the coasts of England and France, is usually about 5 inches long, and is remarkable for the habit of creeping, by means of its ventral fins, out of the water into the crevices of the rocks, and there remaining until the return of the tide. It has been known to live thirty hours out of salt water, but soon dies in fresh water. The American radiated shanny (*Eumesogrammus subbifurcatus*) is found, though rarely, on the coasts of Massachusetts and New York.

Shans: Burmese name for the most numerous of the races of Indo-China, extending from Assam to Kwangtung, and from Yunnan to the Gulf of Siam, though not occupying all this territory. They form the chief race of the Siamese, and are represented among the Miautze communities farther N. in Chinese territory. They probably migrated from the mountains of Sze-chuen, and appeared on the upper waters of the Irawadi about 2,000 years ago. Their languages are very similar, and they are remarkably homogeneous in appearance, manners, and customs, though much divided geographically and politically.

Shansi, *shan-shan* (an inland province of China) bounded N. by the northern part of the Great Wall, E. by Honan, S. by Honan and the Huang-ho or Yellow river, and W. by the Yellow river. Area, 56,228 sq. miles. The surface is mountainous and may be divided into seven great basins. It has no large rivers except the Huang-ho. The mineral resources of the province are great; coal is found everywhere; iron of superior quality abounds and is worked; copper has been found in over 100 localities; tin is found in 302 localities and in several other places; silver, near Tai-yuen and elsewhere, sulphur is plentiful, and hot springs are numerous. Quantities of salt are produced from the salt-lakes in the southern part of the province. The cities and villages are numerous and the people everywhere civil. The men of Shansi are the bankers and pawnbrokers of the country. Besides the usual cereals, cotton is grown in the south. Pop. about 13,000,000. Capital, Tai-yuen-fu.

Siam States, semi-independent states occupied by people of Shan race, in the northern part of the Indo-Chinese Peninsula, S. of China, between Burma and Tonquin, and N. of Laos. From the seventh or eighth century they have waged war with each other and with neighboring states with varying fortunes. In the thirteenth century they formed a federation of nine states under the name of Muang Man, and reached their highest development. Later the northern states were permanently subjected by China, and the southern by Siam. The most of the remainder were under nominal Burmese protection at the time of its conquest, and passed with Burma under British. These adjoining Tonquin are under nominal French protection, and a disputed central zone by agreement between France and Great Britain, is to be guaranteed independence as a "buffer" state between China, Siam, Burma, and Tonquin. See Hallett, *A Thousand Miles in the Siam States* (1900).

M. W. H.

Shantung, *shan-shang* [literally, east of the mountain which is Mt. Tai] a maritime province of China, which is the form of a mountainous promontory, juts out eastward into the Yellow Sea. It is bounded on the N. by the province of Chihli and the Gulf of Poh-shih-li, E. by the Yellow Sea, S. by Kiangsu, and W. by Honan and Chih-li. Area, 55,194 sq. miles. Pop. about 26,000,000. The surface is diversified, but consists in the main of a very fertile plain along the western, southwestern, and northern borders of the great central mass of mountains, which, with its numerous spurs and secondary ridges and their ramifications, occupies the rest of the province eastward. The general trend of the mountains is from N. E. to S. W., but several important ridges run E. and W. The highest peak is Tai-shan, which is over 4,100 feet. Next in point of grandeur and height come the Lao-shan, occupying a small peninsula on the south coast, lat. 36° 5' to 36° 30' N. and lon. 120° 15' to 120° 45' E., with peaks ranging from 2,500 to 3,500 feet; the Saw-tooth Mountains S. of Chafoo, 2,900 feet; and the Ji-shan Mountains S. W. of Chafoo, 2,065 feet. S. of Wei-hai-wei the highest elevation is 1,600 feet, while still farther to the E., near the city of Yang-ching, the highest is 1,000 feet. Mt. Tai, which, according to Chinese reckoning, is 15 miles high, is one of the five sacred mountains of China, and is much resorted to by pilgrims, for whose benefit paths have been made and steps cut in the rock clear up to the summit. The plain on the W. is traversed by the broad Huang-ho (to which many small but historic streams contribute their waters), and on the N. by the Yellow river, formerly called the Tsien. There are no other rivers of importance, and yet Shantung is well watered.

The coast is deeply indented with good harbors. The best on the north coast are Chafoo and Wei-hai-wei (pp. 45). On the southern side of the promontory there are Shih-tao, in lat. 36° 55' N. and lon. 122° 25' E., and Kin-Kia-Kow, near the important city of Kiao-chow, in lat. 36° 16' N. and lon. 120° 15' E. The waters which surround Shantung are rich in fish of all kinds and fishing is extensively carried on along the coast. The province is very fertile and produces wheat, barley, maize, millet, pulses, tobacco, hemp, and indigo; and numerous of many kinds are extensively produced. Very little rice is grown. Coal and iron abound, and are worked in several places, but extensively at Po-shan-tian, which is the "Black Country" of Shantung. Galena and copper have been found, and gold is obtained in considerable quantities from the sands of the rivers. Precious stones are found especially in the Lao-shan range; sulphur is obtained in several places, and there are many hot sulphur-springs which are resorted to for fever and skin diseases. The best known

are those of Ai-shan, 40 miles S. W. of Chafoo; Wai-shih-tung, 95 miles S. of Tung-chow-too, and Lung-chow-tung, a few miles S. of Wei-hai-wei. Other natural products are asbestos, sulphur, and insect wax. Cotton cloth of various kinds is woven; silk is produced, the best being in the plain lying W. of the mountain area, and silk-weaving is extensively carried on. The finest braided silk is made near Tientsin-fu, the capital, and the province is famous for its porcelains. Straw-plaiting also has attained considerable proportions.

Except in the swampy regions bordering on Kiangsu and Honan, the people are industrious, civil, and well behaved. Shantung is noted as containing the birthplaces of Confucius and Mencius.

R. L.

Shark [of uncertain origin: usually regarded as derived through O. Fr. from Lat. *carcarius*, a shark, from Gr. *καρχαρία*, deriv. of *καρχαριον*, having jagged teeth; but the word does not occur in O. Fr. or M. Eng.]; any fish-like vertebrate of a group (*Squali*) of placiosomous selachians distinguished from the *Rays* (rays and skates) by the gill-openings being at the sides of the body. The body also is elongated and more or less cylindrical, and tapers gradually into the tail. The jaws are homologous with the lower jaw and with the palatal arch of higher vertebrates. The teeth are generally markedly articulated with the jaws, and occur in several rows which are successively shed and renewed from behind forward. The outermost row generally is the only one functional, the rest being bent backward and downward. There are usually five gill-openings, though sometimes, as in the *Heteroschisma*, six or seven. The integument never has scales, but is often developed into enlarged papillae, which, when small and closely set, constitute diamond. The eggs of the oviparous species have a leathery investment as in rays, and in some of the viviparous species, as in certain species of *Galeus* and *Carcharias*, the embryo is attached to the uterus by a placenta.

Sharks are found in all seas, but are most abundant in those of warm regions, while some enter fresh water, and one species is confined to Lake Nicaragua. They are mostly carnivorous and predatory, but some, as the hasking shark and the whale-shark, have very small or weak teeth, and feed on small marine animals or are even herbivorous. Of the species that attack man the most formidable is the great white shark or man-eater, an *Isurus* (*Carcharodon carcharias*), sometimes about 40 feet long. The fossil teeth of the larger extinct *Carcharodon megalodon* are found in great numbers in Tertiary beds of the South Atlantic coast of the U. S., where they are quarried and exported for conversion into artificial manure. Other formidable species are *Galeus* or typical sharks, belonging to *Carcharias*, the largest genus and one abundantly represented in all warm seas, and *Heteroschisma*. The great blue shark (*Carcharias glaucus*) reaches the coast of both Europe and the U. S., and the tiger-shark (*Galeorhinus tigrinus*), common in the Indo-Pacific, also reaches the Atlantic coast of the U. S. The sharp-nosed shark (*Sphodon terra-notae*) is another *Galeus*, common on the southern Atlantic coast of the U. S. The voracious gray shark or sand-shark (*Carcharias taurus*), common on the Northern Atlantic coast of the U. S., is a wide-ranging species, about 6 feet long. The Greenland shark, nurse-shark, or sleeper is a squalid (*Somniosus microcephalus*), about 15 feet long, noted among whalers for its voracity. The hasking shark (*Cetorhinus maximus*), about 40 feet long, inhabits the open sea, and is named from its habit of floating on the surface in calm weather. Its liver yields from a ton to a ton and a half of oil. The whale-shark (*Rhinodon typicus*) exceeds a length of 50 feet. The *Heterodontidae* (p. 45), which are noted as being an archaic type, have broad flattened molar teeth arranged in oblique series, all functional at once and adapted for crushing mollusks and crustaceans. The tiger-shark, a gingivomorphid (*Stegostoma tigrinum*) of the Indian Ocean, attains a length of 15 feet, of which the blade-like tail makes one-half. The spiny shark (*Echinorhinus spinosus*) has its body studded with bony tubercles, each of which bears a thorn-like elevation. The existing saw-sharks, or *Heteroschisma*, are represented by teeth in the Jurassic. *Chlamydoselache angustius* of Japan has an eel-like body 6 feet long. Each of its teeth consists of a slender median cusp separated from the two lateral ones by a small projection. The *Pristiophoridae*, represented in Australian and Japanese seas, have the most produced into a saw as in the saw-fishes. The smaller littoral forms are known as dogfishes

and hounds. One of the commonest of these in the North Atlantic is *Squalus acanthias*, with a stout spine in each dorsal. Its liver is valued for its oil. The small-spotted dogfish (*Scylliorhinus canicula*) and the large-spotted (*S. calulus*) are found on the British coast.

The so-called false sharks are species of another group, HOLOCEPHALI (q. v.). Dr. Gill, in a revision of his *Arrangement of the Families of Fishes*, allocates the families to four orders: *Opistharthri*, including *Chlamydoselachidae* and *Hexanchidae* (*Notidanidae*); *Prosarthri*, the *Heterodontidae* (*Cestraciontidae*); *Tectospondyli*, the *Echinorhinidae*, *Oxynotidae*, *Squalidae*, and *Dalatiidae* (*Scymnidae*); and *Astrospondyli*, the remaining families.

See Müller and Henle, *Systematische Beschreibung der Plagiostomen* (Berlin, 1841); Hasse, *Natur System der Elasmobranchier* (Jena, 1879, and suppl., 1885); and Balfour, *A Monograph on the Development of Elasmobranch Fishes* (London, 1878). See also ANGEL-FISH, DOGFISHES, FOX SHARK, and HAMMERHEAD. Revised by F. A. LUCAS.

Sharon: borough; Mercer co., Pa.; on the Shenango river, and the Erie, the Lake Shore and Mich. S., and the Penn. railways; 14 miles W. of Mercer, 41 miles S. S. W. of Meadville (for location, see map of Pennsylvania, ref. 8-A). It contains 2 national banks with combined capital of \$250,000, a private bank, 4 public schools, public-school library (founded in 1877), Hall Institute (Baptist, chartered in 1888), and a daily and 4 weekly newspapers. It is principally engaged in mining coal and manufacturing iron and steel, having large rolling-mills, blast-furnaces, foundries and machine-shops, and nail-factories. Pop. (1880) 5,684; (1890) 7,459.

EDITOR OF "TELEGRAPH."

Sharon Springs: village; Schoharie co., N. Y.; on the Del. and Hudson Railroad; 20 miles E. N. E. of Coopers-town, 59 miles W. by N. of Albany (for location, see map of New York, ref. 5-I). It is a popular summer resort in a narrow valley, 1,100 feet above sea-level, surrounded by high hills, and has four noted mineral springs—chalybeate, magnesia, white sulphur, and blue sulphur—which, with a spring of pure water, flow into a small stream below a wooded bluff W. of the village, after a descent of 65 feet over a ledge of perpendicular rocks. Pop., permanent (1880), 627; (1890) 622; summer residents and tourists exceed 10,000.

Sharp, GRANVILLE: abolitionist; b. at Durham, England, Nov. 10, 1734; studied law, and for several years was a clerk in the ordnance office; was the chief patron of the slave Somerset in suing for his freedom, which resulted in the famous decision against the legality of slavery in England (1772); resigned his post in the ordnance office on account of opposition to the American war Apr., 1777; devoted himself thenceforth to philanthropic objects, especially the overthrow of slavery and the slave-trade; was the first chairman of the Association for the Abolition of Negro Slavery in 1787; was the principal promoter of the colony of Sierra Leone; opposed the impressment of seamen; advocated parliamentary reform, and favored the claims of Ireland. D. in London, July 6, 1813. He was the author of sixty-one publications, chiefly pamphlets, in advocacy of the causes to which he devoted his life, philological tracts in favor of Trinitarianism, and millenarian interpretations of biblical prophecies. See his *Memoirs*, by Prince Hoare (1820) and by Charles Stuart (1836).

Sharp, JAMES, D. D.: archbishop; b. in the castle of Banff, Scotland, May 4, 1618; educated at the University of Aberdeen, where he figured among the students who declared against the Solemn League and Covenant 1638; became Professor of Philosophy at St. Leonard's College, St. Andrews 1643; minister of Crail, in Fifeshire, 1648; was the representative of the Presbyterians sent to Cromwell 1656, to Monk and to Charles II. 1660; was appointed king's chaplain for Scotland and Professor of Divinity in St. Mary's College, St. Andrews; consecrated Archbishop of St. Andrews and Primate of Scotland upon an Episcopalian foundation Dec., 1661; was regarded as a tool of Charles in the persecution of the Covenanters, and consequently assassinated by "a band of nine enthusiasts" on Magnus Muir, St. Andrews, May 3, 1679. Revised by S. M. JACKSON.

Sharp, JOHN, D. D.: archbishop; b. at Bradford, Yorkshire, England, Feb. 16, 1644; educated at Christ's College, Cambridge, on leaving which he became chaplain to Sir Heneage Finch, then attorney-general, through whom he obtained the archdeaconry of Berkshire 1672; a prebend at Norwich 1675; the rectorship of St. Bartholomew, London,

1676; of St. Giles-in-the-Fields 1677; and the deanery of Norwich 1681. He became chaplain to Charles II. and James II., by whom he was deprived of his preferments for preaching against his policy 1686. On the accession of William and Mary he became dean of Canterbury 1689, and Archbishop of York 1691. D. at Bath, Feb. 2, 1714. Seven volumes of his *Sermons* were published in 1706.

Sharpe, SAMUEL: Egyptologist; b. in London, Mar. 8, 1799. Though a London banker, he was best known on account of his accomplishments in the study of the Oriental languages, Hebrew, Coptic, and the Egyptian hieroglyphics. He was also a careful writer on historical subjects connected with his linguistic studies. Of his numerous works, the following are the most notable: *The Holy Bible Translated, being a Revision of the Authorized English Version* (1840); *The New Testament, Translated from Griesbach's Text* (1840; 5th ed. 1862); *History of the Hebrew Nation and its Literature* (1869; 4th ed. 1882); *Texts from the Holy Bible Explained by the Help of the Ancient Monuments* (1866; 2d. ed. 1869); *Hebrew Scriptures Translated* (3 vols., 1865); *The Chronology of the Bible* (1868); *Short Hebrew Grammar* (1877); *Inquiry into the Age of the Moabite Stone* (1879); *The Epistle of Barnabas* (1880); *History of Egypt from the Earliest Times till the Conquest by the Arabians A. D. 640* (1846; 6th ed. 2 vols., 1876; this work combines three previous publications in what was their second edition in revised form, viz.: *Early History of Egypt*, 1838; *Egypt under the Ptolemies*, 1838; and *Egypt under the Romans*, 1842); *Alexandrian Chronology* (1857); *Egyptian Mythology and Egyptian Christianity* (1863); *Egyptian Inscriptions from the British Museum* (several series, 1837-56); *Vocabulary of Egyptian Hieroglyphics* (1837); *The Triple Mummy-case of Aroeri-ao* (1858); *Egyptian Hieroglyphics: being an attempt to Explain their Nature, Origin, and Meaning* (1861); *Egyptian Antiquities in the British Museum Described* (1862); *The Decree of Canopus* (1869); *The Rosetta Stone* (1871); and *Hebrew Inscriptions from the Valleys between Egypt and Mt. Sinai* (2 parts, 1875-76). D. in London, July 28, 1881. A biography appeared in 1883, written by P. W. Claydon. CHARLES R. GILLETT.

Sharpsburg: borough; Allegheny co., Pa.; on the Allegheny river, and the Penn. and the Pitts. and West. railways; 5 miles N. E. of Pittsburg (for location, see map of Pennsylvania, ref. 5-B). It is in a coal-mining region, and contains rolling-mills, blast-furnaces, foundries, a State bank with capital of \$50,000, and two weekly newspapers. Pop. (1880) 3,466; (1890) 4,898.

Sharpsburg: a village in Washington co., Maryland; lying between the Antietam and Potomac rivers (see map of Maryland, ref. 2-D). It was the scene of the battle of Antietam Sept. 17, 1862. Pop. (1890) 1,163. See ANTIETAM.

Sharpsville: borough (organized in 1874); Mercer co., Pa.; on the Shenango river, and the Erie, the Penn., and the Sharpsville railways; 3 miles N. E. of Sharon, 11 miles S. S. W. of Greenville (for location, see map of Pennsylvania, ref. 8-A). It is in a coal-mining region, is engaged in the manufacture of pig iron, and contains 7 churches, 2 public-school buildings, a private bank, and a weekly newspaper. Pop. (1880) 1,824; (1890) 2,330; (1895) estimated, 3,000.

EDITOR OF "ADVERTISER."

Shashanq: See SHISHAK.

Shasta, Mount: See ROCKY MOUNTAINS.

Shas'tra [from Sanskr. *śāstra*, order, command, sacred book, deriv. of *śās*-, order, instruct, govern]: a name applied to the authoritative books of the Hindus upon religion and civil and religious law. The principal works of this class are collectively called *Dharma-śāstra*, or "Law Shashtra."

Shatt-el-Arab: See EUPHRATES.

Shaw, ALBERT, Ph. D.: journalist and author; b. at New London, O., July 23, 1857; graduated in 1879 at Iowa College, Grinnell, Ia.; became a journalist in Iowa; also studied at Johns Hopkins University; in 1883 became connected with the Minneapolis *Daily Tribune* as an editorial writer, but completed his work at Johns Hopkins, and received from that institution in 1884 the degree of Ph. D.; returned to Minneapolis and became chief of the editorial staff of the *Tribune*, which position he held until 1891, with the exception of a year and a half (1888-89) in Europe, which was devoted largely to the study of municipal government. He declined professorships in several colleges, and in 1890 became the founder and editor of the American edition of

The House of Commons, the first number of which appeared in 1860. He has been at Johns Hopkins University and American Shaw University. Among his works are *Co-education in Western City* (Baltimore, 1890) and *Teachings of Study of Co-educational History* (New York, 1894). He edited *National Resources* (Chicago, 1899), and has been a contributor to the *Contemporary Magazine*, the *Contemporary Literature*, and other periodicals, but has become more widely known outside of his editorial work by the articles in *The Century Magazine* upon the government of the principal European cities. An outcome of these is *Municipal Government in Great Britain* (New York, 1902).

C. B. THOMAS.

Shaw, Thomas; naturalist; b. at Horton, Buckinghamshire, England, Dec. 10, 1751; graduated at Oxford 1769; was ordained in the Church of England 1774; studied medicine at Edinburgh and Oxford, taking the degree of M. D. (1781), after which he resided in London as a scientific lecturer; was one of the original members and the first vice-president of the Linnean Society; became librarian and assistant keeper of natural history at the British Museum 1790, and principal keeper 1807. D. in London, July 22, 1813. He was the author of *The Naturalist's Library* (24 vols., 1790-1813); *Botany of New Holland* (1794); *General Zoology, or Systematic Natural History* (11 vols., 1800-10); *Botanical Lectures at the Royal Institution* (2 vols., 1800).

Shaw, Henry WHEELER; humorist; b. at Lanesborough, Mass., Apr. 21, 1819; entered Hamilton College about 1837, but did not remain long; resided for twenty-five years in various parts of the Western States, where he was successful farmer and auctioneer; settled at Poughkeepsie, N. Y., in the latter capacity about 1858; began to write humorous sketches for the newspapers over the signature *Sam Hillings* 1861; became popular as a writer and as a lecturer; published several volumes of humorous sketches, and issued an annual *Illustrator*, which had a wide circulation. His *Complete Works* were published in a single volume 1877. D. at Montross, Cal., Oct. 14, 1885.

Shaw, Lemuel, LL. D.; jurist; b. at Barnstable, Mass., Jan. 9, 1781; graduated at Harvard 1800; became assistant editor of the *Boston Gazette*; studied law, and was admitted to the bar in New Hampshire Sept., 1804; sat in the Legislature 1810-16 and in 1810, and in the State Constitutional Convention 1820; was State Senator 1821-22 and 1828-29; sat on the justice of the Massachusetts Supreme Court from Jan. 31, 1830 (previous to which he had held no judicial office), to Aug., 1860. His reported decisions form a large part of more than fifty volumes, and his judicial reputation in Massachusetts was second only to that of Theophilus Parsons. The city charter of Boston was drafted by him in 1822. He was a member of the American Academy, of the Massachusetts Historical Society, and for twenty-seven years one of the corporation of Harvard College. He published a few orations, addresses, and judicial charges, the most important being his charge to the jury in the celebrated trial of John White Webster, who was convicted of the murder of Dr. George Parkman (1850). D. in Boston, Mar. 30, 1861.

Revised by F. STUBBS'S ALLEN.

Shaw, Thomas; professor of agriculture; b. at Niagara-on-the-Lake, Ontario, Canada, Jan. 8, 1843; educated in public schools; made farming his profession; also taught more than ten years; edited *The Canadian Live Stock and Farm Journal* 1861-85; Professor of Agriculture at Ontario Agricultural College 1888-91; became Professor of Animal Husbandry at Minnesota agricultural experiment station Dec., 1893. He has published *The First Principles of Agriculture* (1899) and *Woods and how to Exploit them* (1901).

Shawano; city, capital of Shawano co., Wis.; on the left river at the head of navigation, and the Chi. and N. W. Railway 36 miles W. N. W. of Green Bay City, 25 miles N. of Oshkosh (for location, see map of Wisconsin, at 1-6). It is in an agricultural and lumbering region, and contains a State bank with capital of \$50,000 and three weekly newspapers. Pop. (1890) 890; (1898) 1,505.

Shawano Indians: See ALGONQUIAN INDIANS.

Shawl; Fr. *shawl*; Germ. *schawl*; Arab. and Hind. *shawl*; Pers. *shawl*; Hind. *shawl*; a kind of loose garment worn on the shoulders or around the waist, manufactured from different nations of different materials, as the Kashmir shawl of goat's hair, the Chinese of silk, the barge of wool, etc., and in different patterns, as the palm pattern of

India, the plaid pattern of Scotland, etc. The most celebrated kind is the Kashmir shawl, famous over the whole world as early as the sixteenth century. Its manufacture was then under the supervision of the Government, and each shawl which issued from the looms received a separate description in the royal registers. The manufacture is still flourishing in Kashmir, though it is imitated extensively in France, Germany, and Great Britain. In Europe shawls are mostly made of wool, of cotton, or of mixed cotton and silk.

Shaw-Lefevre, Le-fer', GEORGE JOHN, M. P.; statesman; b. in 1822; son of Sir John George Shaw-Lefevre, of Mapperly Hall, Nottingham, England; educated at Eton and Cambridge; called to the bar 1856; entered Parliament as a Liberal and retained his seat to 1885; returned as a Gladstonian Liberal in 1886; civil lord of the admiralty May-July, 1890; secretary to the Board of Trade 1906-7; secretary to the admiralty 1871-Feb., 1874, and again Apr.-Nov., 1890; first commissioner of works 1880; succeeded Mr. Fawcett as Postmaster-General Nov., 1884; first commissioner of works again in 1892. He is the author of several statistical works, mainly on the English and Irish land questions.

Shawnee; village; Perry co., O.; on the Balt. and Ohio and the Col., Sandusky and Hoeking railways; 48 miles S. by E. of Newark (for location, see map of Ohio, at 9-41). It is in an agricultural and coal-mining region, has several iron-foundries, sawmills and planing-mills, a private bank and two weekly papers. Pop. (1880) 2,770; (1900) 3,200.

Shawnee or Shawano Indians: See ALGONQUIAN INDIANS.

Shawneetown; city; capital of Gallatin co., Ill.; on the Ohio river, and the Balt. and O. S. W. and the Louis. and Nashv. railways; 192 miles S. E. of Springfield (for location, see map of Illinois, at 11-17). It is in a coal-mining and lead region, is a shipping-point for coal and farm products, has pork-packing and manufacturing interests, and contains a national bank with capital of \$50,000, a private bank, and two weekly newspapers. Pop. (1880) 1,531; (1890) estimated, 2,100.

Barren of "8 cves."

Shays, DANIEL; insurgent; b. at Hopkinton, Mass., in 1747; attained the rank of captain during the war of independence, after which he resided at Pelham (now Prescott); took part in an insurrectionary movement in Western Massachusetts directed against the State government 1786, and, though not at first a leader, became ultimately so prominent that the movement is generally known as "Shays's rebellion," the pretext of which were the high salary paid the Governor, the aristocratic character of the Senate, the exorbitance of lawyers, and the pressure of taxation—grievances which were to be met by the removal of the general court from Boston and the issue of paper-money. In Dec., 1795, he led a considerable force of insurgents to Springfield to capture the arsenal (Jan., 1797), but was repulsed by the militia under Gen. William Shepard (Feb. 4, 1797). His forces were surprised and completely dispersed by Gen. Lincoln, and Shays fled to New Hampshire; was pardoned in June, 1798, by the Massachusetts Legislature, and removed to Sparta, Livingston co., N. Y., where he received a pension for his Revolutionary services, and survived until Sept. 29, 1825. See Minot's *History of the Insurrection* (Boston, 1810) and Holland's *History of Western Massachusetts* (Springfield, 1859).

Shea, JOHN DAWSON GILMERY, LL. D.; historian; b. in New York, July 22, 1824; educated at the grammar school of Columbia College; studied law, and was admitted to the bar, but devoted himself to literature, and rendered great service in illustrating the obscure early annals of French colonization and Jesuit missions. He published *The Discovery and Exploration of the Mississippi Valley* (New York, 1823); *History of the Catholic Missions among the Indian Tribes of the United States* (1854); *The Catholic Authors of America* (1858); *Early Voyages up and down the Mississippi* (Albany, 1862); *Novum Belgicum, an Account of New Netherlands in 1614-44* (New York, 1862); *The Operations of the French Fleet under Comte de Ulloa* (1864); translated, with extensive notes, Charlevoix's *History and General Description of New France* (6 vols. 8vo., 1800-72); edited from the MSS. the *Cronique annales of Memoirs and Relations concerning the French Colonies in North America*, embracing documents on the early history of Canada and Louisiana (24 vols., 1857-68); also *the Maryland* (1869); published *Library of American Linguistics*,

fifteen volumes of grammars and dictionaries of Indian languages (1860-74); edited *The Historical Magazine* (1859-65); and published *The Catholic Church in Colonial Days* (1883); *The Hierarchy of the Catholic Church in the United States* (1886); *Life and Times of Archbishop Carroll* (1888); and three of five projected volumes on *The History of the Catholic Church in the United States*. D. at Elizabeth, N. J., Feb. 22, 1892. Revised by G. J. HAGAR.

Sheaffe, Sir ROGER HALE: soldier; b. in Boston, Mass., July 15, 1763; obtained a commission in the British army, 1778, through Earl Percy, whose headquarters had been at his mother's house in Boston three years before; served in Holland 1799, and in the expedition to the Baltic 1801; served in Canada 1802-11, and again 1812-13; had risen to the rank of major-general in 1811; took command of the British forces at the battle of Queenstown, after the death of Gen. Brock, and succeeded in inflicting a serious defeat upon the American invaders, for which service he was made a baronet Jan. 16, 1818; defended York (now Toronto) against the attack of Apr., 1813; became full general in 1823, and colonel of the Thirty-sixth Regiment in 1829. D. in Edinburgh, July 17, 1851.

Shearman, THOMAS GASKELL: lawyer and writer on economic subjects; b. in Birmingham, England, Nov. 25, 1834. His parents removed to New York when he was nine years of age; he was educated privately; was admitted to the bar in 1859; has practiced law for many years in New York and Brooklyn; was counsel for Henry Ward Beecher in his trials; Republican in politics from 1856-80; since 1880 has devoted most of his time, outside of business, to the propagation of free-trade ideas, always declining public office; joint author of *Law of Practice and Pleadings* (1861-65); *Law of Negligence* (four editions, 1870-88); and author of *Talks on Free Trade* (1881); *Does Protection Protect?* (1883); *Pauper Labor of Europe* (1885); *Distribution of Wealth* (1887); *The Single Tax* (1887); *Henry George's Mistake* (1889); *Who Own the United States?* (1889); *Crooked Taxation* (1890); *Natural Taxation* (1891).

Shearwater: any one of several birds of the genus *Puffinus*, and the family *Procellariidae*. The greater shearwater (*Puffinus major*) is from 18 to 20 inches in length, and the Manx shearwater (*P. anglorum*) about 15. They are often seen hundreds of miles from land. The majority are brown or cinereous above and white below; but the sooty shearwater (*P. fuliginosus*) is an almost uniform sooty brown; the tail is rather long and rounded; the feet large; the tarsus shorter than the middle digit; the nasal tubes are short, flat, and obliquely truncated, instead of being pronounced, as in the true petrels. See *PROCELLARIIDÆ*.

Revised by F. A. LUCAS.

Sheathbill: any bird of the family *Chionididae*. Only two species are known, and both are inhabitants of the southern hemisphere—one, *Chionis alba*, being native to the Falkland islands, etc., and the other, *Chionis* or *Chionarchus minor*, peculiar to Kerguelen's island. Much difference of opinion has prevailed among naturalists respecting the relations of these birds to others in the class, some having regarded them as waders (*Grallæ*), others as swimmers (*Longipennes*), and others still as gallinaceous forms. They are now generally placed with the waders, near the peculiar plover-like *Glareola*, but they also have undoubted affinities with the gulls. In their economy and habits they strongly resemble pigeons and fowl; according to Kidder, who studied the species of Kerguelen's island in life, the "observer is first struck by the strong resemblance which *Chionis* bears to the pigeons in general appearance, gait, and mode of flight. The general shape of the body is of an ordinary columbine character, the head being notably small, as usual in that group, the neck short and full, and the body plump; the tail, moreover, having but twelve rectrices." "The feet, in almost every particular, are thoroughly gallinaceous, even to the character of the marginal fringe of the toes." In color, however, they recall rather the characteristics of the gulls than of either gallinaceous or columbine forms. "On the other hand, the bird's omnivorous diet, habits under confinement, easy domestication, dislike of water, entire inability to swim, and many other points in its habits are strongly gallinaceous characteristics, by so much removing it from the vicinity of either grallatorial or natatorial birds." Nevertheless, the indications furnished by the skeleton outweigh all such superficial correspondences, and conclusively prove that the birds in question are derivatives from gull-like (and therefore primarily natatorial) types, but modified for terres-

trial life. They are omnivorous in diet, feeding upon vegetable substances (seaweeds, etc.), molluscs, and eggs. *Chionis alba* has a total length of 17 inches or more, and *C. minor* about 14 or 15 inches. They are called white paddy by whalers.

Revised by F. A. LUCAS.

Sheathing: a covering for a ship's bottom, made of sheet copper, and first introduced about 1800. It not only serves to protect wooden ships from boring-shrimps, teredos, and other small destructive animals, but to a great extent it prevents the fouling of the bottom by seaweeds and barnacles.

Sheba, or Saba [from Heb. *Shōbā*, or *Shebhā*: cf. *shebhā*, seven]: the name of three persons in the Old Testament: (1) A great-grandson of Ham (Gen. x. 7), who appears to have settled somewhere on or near the shores of the Persian Gulf. (2) The tenth of the thirteen sons of Joktan (Gen. x. 28), who settled in Southern Arabia, and gave his name to the kingdom of the Sabæans, whose queen visited Solomon in Jerusalem (1 Kings x. 1-13). (3) A grandson of Abraham and Keturah (Gen. xxv. 1-3), whose descendants were nomads, in close connection with the descendants of the Hamitic Sheba mentioned above. The same name in a slightly different form occurs in the Old Testament as that (4) of the Benjamite who revolted against David, was defeated by Joab, and beheaded by the people of Abel-Beth-maachah, where he had taken refuge; (5) of a Gadite (Chron. v. 18); and (6) of a town in Simeon.

Revised by S. M. JACKSON.

Sheboygan: city (settled in 1836, chartered as a village in 1846, incorporated as a city in 1853); capital of Sheboygan co., Wis.; on Lake Michigan, at the mouth of the Sheboygan river, and on the Chi. and N. W. Railway; 52 miles N. of Milwaukee, and 137 miles N. of Chicago (for location, see map of Wisconsin, ref. 6-F). It has an excellent harbor and a large lake commerce, particularly in lumber, coal, and tan bark. A line of steamers connects the city with Milwaukee, Chicago, and other points on the lake, and the railway and its branches make the city the trade-center of a large and rich agricultural region. There are two public parks, one of which, Fountain, contains an artesian well, whose waters are strongly impregnated with mineral salts and form an important article of commerce. The city is lighted by gas and electricity, derives its supply of water from the lake, is well sewered, and has an efficient street-railway service. Among the public institutions are 15 churches, high, grammar, intermediate, and primary schools, kindergartens, Roman Catholic and Lutheran parochial schools, Day School for the Deaf, hospital, insane asylum, and Home for the Friendless. In connection with the public schools is a library of 3,000 volumes. There are 2 State banks with combined capital of \$300,000, and 3 daily and 7 weekly newspapers. The assessed valuations in 1892 aggregated \$5,415,980. Sheboygan is particularly noted for the manufacture of chairs and other furniture. There are 5 chair-factories, which employ about 2,000 persons and turn out 7,000 chairs per day. About 40,000 feet of lumber are used daily in the manufacture of furniture. The various manufacturing industries employ about 5,500 persons, who receive in wages about \$225,000 per month. Other important establishments are 2 manufactories of enameled ware, 2 boot and shoe factories, 3 foundries and machine-shops, 2 tanneries, 2 carriage-factories, 2 breweries, and manufactories of toys, office and hotel furniture and fixtures, venetian folding-beds, venetian-blinds, wire-mattresses, and excelsior bottle-wrappers. There are also dry docks, brick-yards, lime-kilns, a ship-yard, and 5 large cheese-warehouses. Pop. (1880) 7,314; (1890) 16,359; (1894) 21,018. J. E. RIORDAN.

Shechem: See *NABLUS*.

Shechl'nah [from Late Heb. *shekhināh*, dwelling, presence, deriv. of *shākhan*, dwell]: a name which first appears in the Jerusalem Targum to designate the Divine Presence wherever it exists in a special manner, but more particularly as manifested in the holy of holies within the ancient sanctuary of Israel.

Shedd, WILLIAM GREENOUGH THAYER, D. D., LL. D.: theologian; son of a clergyman; b. at Acton, Mass., June 26, 1820; graduated at University of Vermont in 1839, and at Andover Theological Seminary in 1843; was pastor of the Congregational church in Brandon, Vt., 1844-45; Professor of English Literature in the University of Vermont 1845-52; Professor of Sacred Rhetoric and Pastoral Theology at Auburn Theological Seminary 1852-53; Professor of Ecclesiastical History and lecturer on pastoral theology in And-

see Theological Seminary 1823-44; pastor of the Irish church (Presbyterian), New York, 1842-53, and Professor of Biblical Literature in Union Theological Seminary, New York, 1853-74, when he was transferred to the chair of systematic Theology in the same institution, which office he held until 1880. D. in New York, Nov. 6, 1894. Besides writing the *Works of Coverdale* (7 vols., 1869) and the *Commentary of Augustine* (1869), he published *Outline of a System of Rhetoric*, from the German of Thorenin (1860); *Lectures upon the Philosophy of History* (1859); *Discourses and Sermons* (1859); *Quaker's Church History* (2 vols., 1857, 1859); *A History of Christian Doctrine* (3 vols., 1863); *Homiletics and Pastoral Theology* (1867); *Sermons to the Natural Man* (1871); *Theological Essays* (1875); *Literary Essays* (1878); *Commentary on St. Paul's Epistle to the Romans* (1879); *Sermons to the Spiritual Man* (1884); *Biblical Preaching* (1886); a treatise on *Dequatic Theology* (2 vols., 1890-94); and *The Proposed Revision of the Westminster Standards* (1890).

Revised by G. P. Foster.

Shediac, town of Westmorland County, New Brunswick, on the Point du Chêne branch of the Intercolonial Railway, 104 miles from St. John, and on the border of an estuary of Northumberland Strait (for location, see map of Quebec, etc., ref. 3-1). It is celebrated for its oysters. Pop. 5,370.

M. W. H.

Shree, Sir Masters Acharya, D. C. L.; painter and author; b. in Dublin, Ireland, Dec. 23, 1779; studied painting at the school of the Royal Dublin Society; was introduced in 1798 by Edmund Burke to Sir Joshua Reynolds, under whose patronage he entered as a pupil in the Royal Academy; became an exhibitor in the following year; was elected an associate of the academy 1799 and a member 1806, and was elected successor to Lawrence as president of that institution in 1820, on which occasion he was knighted. He was especially successful in portrait-painting, and in a long career preserved the likenesses of many illustrious men. He retained the presidency of the academy through life; was an effective orator on public occasions; published *Rhythm as Art*, *Almanac*, a *Tragedy*, and a novel. D. at Brighton, Aug. 19, 1860. See the *Life* by his son (2 vols., London, 1860).

Shrews: see *SHREW* (p. 7).

Sheep [M. *ovis*, *sheep* = O. Eng. *scēp*, *scēap*; O. H. Germ. *schaf*; Mod. Germ. *schaf*; Teuton. *schēp*; cf. Sanskr. *śhāga*, goat (6)] animals constituting the genus *Ovis*, although some writers claim that they form a group of genera. They are hoofed, horned ruminants, and belong to the artiodactyl, or pair-toed, section of the ungulate, or hoofed, mammals. In nearly all the wild breeds horns are present in both sexes, but in many of the domestic breeds they are entirely absent. The tail is usually short, though in some of the domestic breeds it is unusually developed. Sheep are further distinguished by a covering of wool, which varies in length, color, and strength and fineness of fiber, with variations under different climates and other conditions.

Geographically, the wild breeds are or were distributed over some of the islands of the Mediterranean, in Europe, the greater portion of the temperate highlands of Asia, nearly the whole of the Rocky Mountain ranges of a certain altitude in North America, and throughout some of the upland regions of the Andes in South America. More than twenty different species have been described. Of these, *O. montanus* is the bighorn or Rocky Mountain sheep.

The origin of many of the breeds of sheep under domestication can not be traced with certainty. Some suppose that the originals from which these springs are descendants of the ancestors of Chinese or the apes of Asia. They are to be found wherever there is a settled agriculture, but are best adapted to the temperate zones. In North America they are reared only for their meat and wool, but in some countries they are also kept for their milk.

North American Breeds.—The recognized breeds in North America are all of European origin. They are enumerated as follows:

Southwestern breeds: Merino, and subvarieties of the Merino, of which there are several.

Eastern breeds: Southdown, Dorset Horn, Suffolk, Hampshire, Hampshire Down, Oxford Down, Cheviot.

Western breeds: Leicester, Lincoln, Cotswold, Blackhead Highland.

The above classification is based on variations in the character of the wool, which, in going down the list, gradually becomes less coarseness; but there is a slight difference of

opinion as to the order in which some of the breeds should stand, as in a few instances the character of the wool found on different parts of the body varies in some of the breeds, and in other instances it also differs materially in certain families and subfamilies of the same breed.

Care of Sheep.—Adaptation should be carefully considered. The various wild species never frequent swamps, exposed plains, or dense forests from above. In the management of sheep under domestication these preferences should always receive recognition. The smaller the breed the higher and more rugged may the pasture be, and the larger the breed the richer and more level should they be. The pastures in summer, and also the felder in winter, should be characterized by variety and fineness of herbage, and where practicable the sheep should be frequently changed from one pasture to another. Sheep kept for breeding uses should be given the largest liberty practicable both winter and summer, but where these are being fattened they will bear close confinement for a time under outside conditions. Except at the lambing season, they only require to be protected from storms, as they are not much injured by low temperatures. In circumstances of pasture, and with the large or breeds, the flocks should be small, summer and winter, but with the smaller breeds, and ample foraging-grounds, they may run up even into the thousands. Where sheds are necessary in winter, it is imperative that they should be built on ground dry naturally, or made so, and the aim should be to admit plenty of morning and forenoon sunlight. They should be entirely free from draughts, and should be divided by feeding-racks, or otherwise into small compartments. Each compartment requires a close leading into an enclosed yard. These doors should be low and wide to prevent crowding, and should be kept open day and night except in time of storms. It is also important that the yards be kept dry by littering or otherwise.

In winter it is not necessary to cut the felder or to grind the grain for sheep. After going into winter quarters, breeding ewes require only a moderately generous diet until the lambing season. A variety of fodders, a small quantity of roots or corn ensilage, and sometimes a little grain, preferably oats, will be found very suitable. But as soon as the lambs are a few days old their dams require most liberal feeding, until they are put upon pastures excellent and abundant. The food factors which are best adapted to produce an abundant flow of milk should predominate, such as early-cut and well-cured grasses, roots or corn ensilage, and oats and bran. Ensilage in the dams may be prevented by adding such foods as corn or peas, and alfalfa. The lambs also should be given early and continued access to free supplies of grain, fed at first in the ground form, and in a place inaccessible to the dams. Docking should receive attention within a few days of birth, and castration in a few weeks. When pastures are fresh and abundant, sheep or lambs do not usually require any grain until the latter are weaned. This period arrives when they are from four to five months old. As soon as weaned the lambs should get a grain supplement to build up the frame or to fatten it, according to the object sought. Sheep and lambs thrive much better when plentifully supplied with salt and pure water, at all seasons.

For autumn fattening the Dwarf Essex rape is very suitable where it can be profitably grown. Sheep and lambs will fatten quickly when pastured upon it, and without any supplement of grain. Young clover, mixed grasses, and rye are also suitable, but grain is required in addition. In winter fattening the ration may be the same in kind as that already mentioned as being suitable for breeding ewes after the lambing season, but with the difference that more, relatively, of the concentrated foods, such as corn, peas, or alfalfa, should be given. Lambs of the mutton breeds, which average about 160 lb. live weight, will usually gain from 6 to 10 lb. per month in winter, while being fattened on a daily ration of 14 to 2 lb. hay, 4 lb. corn ensilage or 24 lb. roots, and 14 to 14 lb. grain.

In breeding sheep for the block females of mixed blood, though variously bred, will be found suitable. To cross upon these, rams should be chosen successively from the same pure breed, rather than from breeds alien in blood. In choosing them adaptation in size, form, feeding, and mutton qualities, and the needs of the market should be considered. It is pretty generally conceded that stimulating feed to rams and ewes at the mating season tends to increase the number of the lambs, and also to shorten the duration of the lambing period. Early maturity is much

sought for in all the mutton breeds. Medium-sized lambs of quick development, compact build, and good quality stand high in favor in the markets, and they can be raised at a minimum of cost. It is generally considered more profitable to dispose of them before they pass the age of one year.

THOMAS SHAW.

Sheepshead: a well-known fish (*Archosargus probatocephalus*) of the family *Sparidae*, found along the Atlantic coast of the U. S. south of Cape Cod, but most abundant in the warmer waters. The name is given in allusion to a fancied resemblance of the head to that of a sheep, produced by the form and color as well as the cutting teeth of the jaws. The body is deep and robust with the back arched; the dorsal fin has twelve spines and eleven rays, and is preceded by a recumbent spine; the anal fin has three spines and ten rays; the color is gray, with about seven blackish bands; the front teeth are broad and incisor-like, the lateral teeth molars, and in several rows. The sheepshead sometimes exceeds 2 feet in length, although averaging less. It is one of the most esteemed fishes found in American waters, and on account of the delicacy of its flesh has been likened to the English turbot. It is also highly regarded as a game-fish. It feeds chiefly on molluscs and crustaceans, and its molar teeth and stout jaws are eminently adapted for breaking shells. The fresh-water drum (*Haplodinotus grunniens*) is among the fishes loosely called sheepshead in the U. S.

Sheep-tick: a wingless parasitic insect (*Melophagus ovinus*) of the order *Diptera* and family *Hippoboscidae*, often extremely annoying to sheep. There are various arsenical washes which will destroy them; a solution of carbolic acid is also recommended for the purpose.

Sheeraz: See SHIRAZ.

Sheerness: a strongly fortified seaport in Kent, England; on the right bank of the Medway, at its junction with the Thames; 52 miles by rail E. of London (see map of England, ref. 12-L). The harbor is safe and commodious, and, being almost at the mouth of the Thames estuary, is often crowded with vessels. The Government dockyard, with wet and dry docks, storehouses, etc., covers 60 acres. The principal trade is due to the oyster-fisheries. Sheerness is also a favorite summer resort. Pop. (1891) 13,841.

Sheffield: town; in the West Riding of Yorkshire, England; at the junction of the Sheaf and the Don; 41 miles E. of Manchester and 165 miles N. N. W. of London (see map of England, ref. 7-H). It is situated at the foot and on the slopes of a range of hills, and is generally well built, a street-improvement scheme having been carried out after 1875. Noticeable among its public buildings are the parish church of St. Peter, erected in the reign of Henry I.; St. Mary's Roman Catholic church (1850); the Cutlers' Hall, the Albert Hall, the new market-hall (1851), and the new town-hall, crowned with a statue of Vulcan. Among educational institutions are the Firth College (1879), with thirteen professors or lecturers, the Technical School, the Wesley College, and the Free Grammar School. The St. George's Museum, founded by Ruskin in 1890, contains a collection of engravings, minerals, etc., and the Mappin Art Gallery has a fine collection of pictures. There are several public parks and extensive botanical gardens. The cutlery business of Sheffield dates from very early times. The Sheffield whittle of Chaucer was the common knife used by those whose social rank did not permit them to carry a sword. The Cutlers' Company was founded in 1624, but Sheffield was of little importance up to the middle of the eighteenth century. Sheffield Castle, rebuilt in 1270, was the place of imprisonment of Mary Queen of Scots (1572-86). It was taken by the parliamentary army in 1644, and shortly afterward was demolished. Sheffield is the center in England of the manufacture of knives, files, saws, carriage-springs, boilers, stoves, grates, buttons, and all kinds of agricultural, mechanical, medical, and optical instruments. Silver-plating and britannia metal were both invented here, and have given rise to a comprehensive manufacturing industry. Since 1871 rails, railway-springs, tires, steel blocks for naval and military artillery, and armor-plates have been largely manufactured. Sheffield returns five members to Parliament. Pop. (1894), 338,316.

R. A. ROBERTS.

Sheffield: city (founded in 1884); Colbert co., Ala.; on the Tennessee river, and the Birm., Shef. and Tenn. Riv., the Louisv. and Nashv., and the Memphis and Charleston railways; 2 miles W. of Tusculum, the county-seat (for location, see map of Alabama, ref. 1-B). It is in an agri-

cultural region, and contains 8 church organizations, several public schools, 5 blast-furnaces, and 2 weekly papers. Pop. (1890) 2,731; (1894) about 1,200. EDITOR OF "REAPER."

Sheffield, JOHN, Duke of Buckinghamshire and Normanby; statesman and poet; b. in England in 1649; succeeded his father as Earl of Mulgrave 1658; served in the Dutch wars of 1666 and 1672; became privy counselor and lord chamberlain in 1685; favored the revolution of 1688; was made Duke of Normanby in 1694, lord privy seal and Duke of Buckinghamshire in 1703, and built in St. James's Park the residence now known as Buckingham Palace and belonging to the crown. He was said to have been an early lover of Queen Anne; was author of some poems which enjoyed fame during his own generation, and was a friend of Dryden, to whose memory he erected a monument in Westminster Abbey. D. Feb. 24, 1721. Besides minor poems he wrote a metrical *Essay on Satire* and an *Essay on Poetry*. His poetical works were first printed in 1723.

Shehâb-Eddîn: See CHEHAB-EDDIN.

Shehr, or Sahar: town; in South Arabia, on the Gulf of Aden; manufactures coarse cotton cloth, and carries on a brisk general trade, though it has no harbor, but only an open roadstead. Pop. probably 5,000. Four miles E. are remains of another town of the same name, once important, but now a decayed fishing-village.

E. A. G.

Sheik [from Arab. *sheikh*, *shaykh*, elder, venerable, man, chief, deriv. of *shākha*, grow old, be old]; a title among Arabs applied to the head of a tribe. Among Mussulmans in general it is prefixed to the name of a religious dignitary, or one versed in theology, or a reputed saint.

Sheikh-ul-Islam: See MUFTI.

Shell, RICHARD LALOR: patriot and orator; b. at Drumdowney, Tipperary, Ireland, Aug. 17, 1791; was educated at the Jesuit College, Stonyhurst, England, and graduated at Trinity College, Dublin, 1811; studied law at Lincoln's Inn; was called to the bar at Dublin 1814; wrote several successful dramas; contributed *Sketches of the Irish* to Campbell's *New Monthly Magazine*, republished in the U. S. by R. S. Mackenzie (New York, 2 vols., 1854); became an effective popular orator in the agitation for Roman Catholic emancipation; was chosen by the Catholic Association in conjunction with O'Connell, to represent that body at the bar of the House of Lords 1825; was active in promoting the election of O'Connell to Parliament in 1828; was himself chosen member for Milburne Port shortly after the passage of the Relief Act 1829; was returned for the county of Louth 1831, and later for Tipperary and Dungarvan; became noted as a brilliant and effective parliamentary orator, and aided O'Connell for several years in his campaign for the repeal of the Union, until 1838, when he accepted the sinecure post of commissioner of Greenwich Hospital. He subsequently became vice-president of the Board of Trade, member of the privy council 1839, and judge-advocate-general 1841; was master of the mint 1846-50, and was appointed minister to Tuscany 1850. D. in Florence, May 25, 1851. His *Memoirs* were written by W. Torrens McCullagh (2 vols., 1855); a collection of his *Speeches* was published in London, 1845, and his *Speeches, Legal and Political*, in 1855. —His younger brother, Sir JUSTIN SHELL, became major-general and minister to Persia, and aided his wife in the preparation of a valuable work, *Glimpses of Life and Manners in Persia* (1856).

Revised by H. A. BEERS.

Shekel [from Heb. *sheqel*, shekel (liter., a weight), deriv. of *shāqal*, weigh; cf. Gr. *σίκλος*, shekel]; a standard weight among the ancient Israelites, and also a coin of gold, silver, or copper, originally of a shekel's weight. The shekel of the sanctuary (Ex. xxx. 13; Num. iii. 47) was made of silver and was equal to 20 gerahs (Ezek. xlv. 12), or about 54 cents. There were other kinds of shekels. The gold shekel was worth about \$5.69; the copper shekel, a little more than 4 cents.

Revised by S. M. JACKSON.

Shelburne: a seaport; capital of Shelburne County, Nova Scotia; 141 miles S. W. of Halifax (see map of Quebec, etc., ref. 8-B). It has a very fine harbor. Shelburne Lights on Cape Roseway, are in lat. 43° 38' 5" N., lon. 65° 15' 5" W. There is excellent water-power, afforded by the river Roseway. Fishing, commerce, and ship-building are extensively pursued, and the port is one of the best in the province. The place has lost greatly in importance. During the war for American independence it was the center of loyalist influence, and then had about 12,000 inhabitants. Pop. 2,500.

Revised by M. W. HARRINGTON.

Shelburne, William Therry Free-Masons, Earl of, afterwards Marquis of Lansdowne; b. in Dublin, Ireland, May 28, 1747; was educated at Christ Church, Oxford; entered the army in 1767, and served with honor; was elected to Parliament for Chipping Wycombe only in 1781, but before taking his seat succeeded to the earldom, by the death of his father, May 10, 1793; became president of the Board of Trade and navy minister in the Grenville ministry, Apr., 1801, opposed the policy which led to the evacuation of the Stamp Act and other measures oppressive to America; became a personal friend of Benjamin Franklin; was dismissed from office Sept. 8, 1803; separated from Anne and Fox, attaching himself to Pitt; declined entering the Buckingham ministry 1804; became Secretary of State for the Southern Department in Pitt's administration July, 1805; resigned his post Dec. 1806; visited Italy and France; became Secretary of State in the Foreign Department in the Brougham ministry, Mar., 1822; and Premier on the death of Brougham July, 1828; completed the preliminaries of peace with the U. S., resigned Feb. 21, 1830, giving place to the coalition of Pitt and North; was created Marquis of Lansdowne 1834, and passed the remainder of his life in political retirement. D. in London, May 2, 1865. His extensive collection of historical MSS. was sold to the Government, and is in the British Museum. See his *Life*, by his grandson, Lord Edmund Fitz-Maurice (London, 1874-76).

Shelburne Falls, village in Shelburne and Buckland townships, Franklin co., Mass., on the Deerfield river, and the N. Y., N. O., and Hart, Railroad; 19 miles W. of Greenfield, the county-seat, 129 miles W. by R. of Boston (for location, see map of Massachusetts, ref. 2-E). The river here has a picturesque fall of 47 feet, affording excellent power for manufacturing, which is utilized by a silk-mill, a printing, and cutlery and hardware factories. There are 6 churches, the Ames Academy, 2 village schools, a national bank with capital of \$100,000, a savings-bank, and a weekly paper. The town was founded in 1765, and incorporated in 1785. Pop. of Shelburne township (1880) 1,621; (1890) 1,553; (1900) estimated, 1,600; pop. of village not separately reported. Known as "Deerfield Valley Esq."

Shelby, Isaac, first Governor of Kentucky; b. near Magdalen, Md., Dec. 11, 1759; son of Gen. Evan Shelby; received a common-school education; became a surveyor in Western Virginia; served as lieutenant in a company under his father's command at the battle of Point Pleasant 1774; became captain 1776; was commissary of the frontier 1777; judge and member of Virginia House of Delegates 1779; served 1780; rendered distinguished service at King's Mountain Oct. 7, 1780; served under Marion 1781, and under Greene with 600 mounted volunteers 1781-82, in which wars he sat in the North Carolina Legislature, from which he received a vote of thanks and a sword; settled in Lincoln co., Ky. (then Virginia), 1788; was a member of the constitutional convention 1791; Governor of Kentucky 1803-08 and 1812-16; joined Gen. Harrison in Canada with 1200 Kentuckians raised by proclamation; took part in the capture of the Thames, for which Congress voted him a gold medal; declined the post of Secretary of War 1817, and was commissioned with Gen. Jackson in negotiating a treaty with the Chickasaw Indians 1818. D. at Traveler's Rest, Lincoln co., Ky., July 15, 1826. His services are commemorated in the names of counties in nine of the Western and Southern States and in the name of a college at Shelbyville, Ky.—Died son, JAMES B., 1784, acted as major in the war of 1812, became general of militia, and died in Sept., 1848.

Shelbyville, city, capital of Shelby co., Ill.; on the Wabash river, and the Chi. and E. Ill. and the Cleve., Cin. Chi. and St. L. railways; 31 miles W. by R. of Madison, 33 miles E. by R. of Decatur (for location, see map of Illinois, ref. 7-E). It is in an agricultural, lumbering, and manufacturing region and contains a foundry, several large flour-mills, woolen-mill, agricultural-implement works, and other manufactures, a national bank with capital of \$75,000, and a daily, a monthly, and two weekly papers. Pop. (1880) 2,894; (1890) 3,192; (1900) 3,320. Known as "Union."

Shelbyville, city, capital of Shelby co., Ind.; on the Big Blue river, and the Cleve., Cin. Chi., and St. L., and the C. & O., Cin. Chi., and St. L. railways; 34 miles N. N. E. of Columbus, 37 miles S. E. of Indianapolis (for location, see map of Indiana, ref. 7-F). It is in a rich farming region, and has saw, planing, and flour mills, furniture, carriage, and barrel factories, etc., and a large general trade. There are 12 churches, 3 public-school buildings, 9 building

and loan associations, 2 national banks with combined capital of \$900,000, a private bank, and a monthly, 2 daily, and 3 weekly papers. Pop. (1890) 3,745; (1900) 3,421; (1905) estimated, 3,500. Known as "Deerway."

Shelbyville, town, capital of Shelby co., Ky.; on the Louisville and Nashville, and the Southern railways; 20 miles W. of Frankfort, 30 miles E. of Louisville (for location, see map of Kentucky, ref. 4-B). It is in an agricultural, stock-raising, and tobacco-growing region, and contains 2 State banks with combined capital of \$100,000, 2 weekly newspapers, Sumner Hall School (Methodist Episcopal South, opened in 1823), Street Female College (opened in 1839), and Shelbyville Male Academy (1881). Pop. (1880) 3,392; (1900) 3,016.

Shelbyville, town, capital of Bedford co., Tenn.; on the Duck river, and the Nashville, Chat., and St. L. Railway; 40 miles E. S. E. of Columbia, 61 miles S. by E. of Nashville (for location, see map of Tennessee, ref. 7-F). It is an important grain and milk market; contains Shelbyville Female College (non-sectarian, opened in 1850), a national bank with capital of \$100,000, a State bank with capital of \$25,000, and a monthly and three weekly newspapers; and has 5 churches, extensive lead-pencil factory, large lumber-yards, iron-foundries and machine-shops, cotton and woolen mills, and flour, saw, and planing mills. It is a shipping point for telegraph and telephone poles, and pencil-slides. The town and its vicinity were the scene of important military operations in the civil war (June, 1863). Pop. (1890) 1,360; (1900) 1,820; (1905) estimated with suburbs, 3,500.

Sheldon, town, O'Hea co., Ia.; on the Chi. Mt. and St. P., the Chi., St. P., Minn. and Omaha, and the Ill. Cent. railways; 36 miles W. of Spencer, 55 miles N. N. E. of Sioux City (for location, see map of Iowa, ref. 2-D). It is in an agricultural, dairying, and stock-raising region, has important manufactures, and has 2 State banks with combined capital of \$150,000, a national bank with capital of \$50,000, and 2 weekly papers. Pop. (1890) 730; (1900) 1,478.

Sheldon, Rowland AUSTIN A. M., Ph. D.; education: b. at Perry Center, N. Y., Oct. 4, 1823; educated at Hamilton College, Clinton, N. Y.; superintendent of schools, Syracuse, N. Y., Apr., 1851-Apr., 1853; superintendent of schools, Oswego, N. Y., May, 1853-Sept., 1860; principal of Oswego State Normal and Training School since 1869. Author of *Manual of Elementary Instruction* (1862); *Lessons on Objects* (1875); and a number of school text-books. C. H. T.

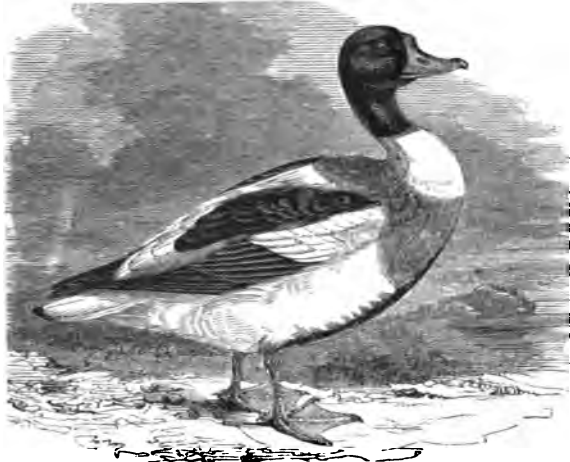
Sheldon, EDWARD STEVENS, Ph. D.; philologist; b. at Waterville, Me., Nov. 21, 1851; studied one year in Colby University; graduated at Harvard 1872; studied in Berlin, Leipzig, and Paris 1874-77; instructor in modern languages at Harvard 1877-84; Assistant Professor of Romance Philology at Harvard 1884-94; appointed full professor 1894; secretary of the American Dialect Society since its organization, 1890. His work lies chiefly in the field of phonetics and historical phonology, particularly as relates to the French element in English. He has also done much to stimulate the investigation of the living English of America. Author of *A Short German Grammar* (1879); *Some Specimens of a Canadian French Dialect Spoken in Maine, in Quebec, and in the U. S.* (1887); *Etymologies in Webster's International Dictionary* (1890); *Origin of the English Names of the Letters in Harvard Studies and Notes* (i and ii, 1892; 1893); also various articles in the *Modern Language Notes*, the *Transactions of the Modern Language Association of America* and *The Dialect Notes*. D. I. W.

Sheldon, GUINER, D. D.; archbishop; b. at Staunton, Oxfordshire, England, July 10, 1808; graduated at Oxford 1817; became fellow of All Souls' College 1822; obtained the vicarage of Hackney 1833, and the rectories of Ickford and Newington; was appointed warden of All Souls' and chaplain to Charles I. May, 1835; was ejected from the wardenship and imprisoned for loyalty to the royal cause 1847-48; lived in seclusion until the Restoration; became Bishop of London 1860, Archbishop of Canterbury 1869, and chancellor of Oxford University 1867, and built for that institution, at a cost of £16,000, the famous Sheldonian Theatre, opened 1869. D. at Lambeth Palace, Nov. 6, 1877.

Sheldon, HENRY CLAY, D. D.; minister and educator; b. at Martinburg, N. Y., Mar. 12, 1845; educated at Lowell Academy, Yale College (A. B., 1867), Boston University (S. T. B., 1871), and Leipzig University (one year); joined Maine Conference of the Methodist Episcopal Church 1873; was agent of Maine Wesleyan Seminary 1874-76; assistant

professor (1876-82) and Professor (since 1882) of Historical Theology in Boston University. He has published *History of Christian Doctrine* (2 vols., New York, 1886) and *History of the Christian Church* (5 vols., 1894). A. O.

Sheldrake, or **Shieldrake** [*sheldrake* is from Eng. *sheld*, variegated, spotted + *drake*; cf. O. N. *skjöldungr* (< *skjöldr*, a patch): *shieldrake* is identified with the secondary meaning of *skjöldr*, shield, given in allusion to the markings on the breast]: a river-duck of either of the genera *Tadorna* and *Casarca*. The common sheldrake (*Tadorna tadorna* or *cornuta*) is about the size of a goose, and has a red bill with a basal protuberance, head and neck green, with a white collar below, and a brown belt extending across the upper portion of the back. The shoulders and a median abdominal stripe are black, the speculum is green, and the rest of the plumage is white. It is found on sandy seacoasts in the Old World, making nests lined with down



The common sheldrake of Europe.

in abandoned rabbit-burrows. The ruddy sheldrake or Brahminy duck (*Casarca rutila*) is found mostly in South-eastern Europe and in Asia. *Casarca tadornoides* and *C. variegata* inhabit Australia and New Zealand respectively, and are plain-colored. The so-called sheldrakes of North America are mergansers.

Shellac, or **Shell-lac**: See **LAC**.

Sheller, ALEKSANDR MIKHAILOVICH: author; b. in St. Petersburg, Russia, July 30, 1838; educated at the university in that city; interested himself in questions of popular education, and founded a school for the poor which, at first very successful, incurred the suspicions of the Government and came to an end in 1863. In the same year he published his earliest verses, and in 1864 *Gnilyta Bolola* (Dank Marshes), a novel that had numerous successors, among the best of which are *Khleba i Zrelisch* (Bread and Amusements); *Des rublat-Stshepki lettat* (When Wood is cut Splinters fly); and *Chuzhie Grekhi* (The Sins of Others). In 1877 he became editor of the *Zhivopisnoe Obozrenie*; he has also written on questions of religion and sociology, and is especially known for a *History of Communism* in three volumes. A. C. COOLIDGE.

Shelley, MARY WOLLSTONECRAFT (*Godwin*): author; daughter of William Godwin and Mary Wollstonecraft; b. in London, England, Aug. 30, 1797; educated in accordance with the peculiar social theories of her parents; married the poet Shelley Dec. 30, 1816, after having lived with him two years previously to the death of his first wife. She was the author of *Frankenstein, or the Modern Prometheus* (1818), a singular novel, displaying great power, of *Valperga* (1823), *Lodore* (1835), and other less successful romances; contributed to *The Cabinet Cyclopaedia* a series of biographies of eminent literary and scientific men of France, Italy, and Spain, and edited the works of her husband, with biographical prefaces and notes (1839-40). D. in London, Feb. 21, 1851. See the *Life* by Mrs. Julian Marshall (2 vols., 1889). Revised by H. A. BEERS.

Shelley, PERCY BYSSHE: poet; b. at Field Place, near Horsham, Sussex, England, Aug. 4, 1792. His grandfather, Bysshe Shelley (b. at Newark, N. J., 1731), acquired a large fortune, was made a baronet in 1806, and died Jan. 6, 1815.

His father, Timothy, b. Sept., 1753, married, in 1791, Elizabeth, daughter of Charles Pilfold, of Effingham, Surrey. The domestic surroundings of the poet were unfortunate, neither of his parents having given him suitable training or inspired him with affection—a circumstance to which much of the waywardness of his career may be attributed. He received his early education at a school taught by the parish clergyman at Warnham; entered at the age of ten St. Ann's House School, Brentford, where he was noted rather as an insatiable reader than as a successful student; entered Eton College in 1805; was addicted to experiments in chemistry; read much upon ghosts and the "occult sciences"; was careless of his tasks, but translated half of Pliny's *Natural History* for his own satisfaction; wrote an incredible amount of fragmentary verses, mostly "poor stuff," as he afterward perceived; composed, with his cousin Medwin, one or more plays and novels, and with another cousin, Harriet Grove (of whom he was deeply enamored), a romance entitled *Zastrozzi*, which was printed in 1810, and, strange to relate, brought him £40; printed also a volume of poems, "by Victor and Cazire," which he quickly withdrew from circulation, and of which no copy is known to be extant, and another romance, *St. Irvyne*, all within the same year (1810) in which he entered University College, Oxford; published under the pseudonym of *Margaret Nicholson* a volume of burlesque poems; was expelled from his college Mar. 25, 1811, for having printed a pamphlet entitled *The Necessity of Atheism*; went to London with his friend Hogg, who was also expelled in connection with the same affair; was left without support by his offended father, but received occasional supplies from the savings of his sisters, then at school; eloped to Scotland with one of their schoolfellows, Harriet Westbrook, the beautiful daughter of a retired innkeeper, and married her in Edinburgh, Sept., 1811; effected a settlement with his father, by which he received a small annuity; traveled with his wife to York and Keswick, where he met Southey and perhaps De Quincey; proceeded to Dublin, Feb. 12, 1812, where he printed three revolutionary pamphlets, addressed one or more political meetings, and fancied that he had been requested by the police to leave the city; went to the Isle of Man, to North and South Wales, Devonshire, and Carnarvonshire, making but brief residences at any point, after flying visits to Dublin and Killarney, finally settled in London, May, 1812; printed early in 1813 *Queen Mab*, his first poem of real literary merit, a production strongly tinged with anti-religious fanaticism. His first child, Ianthe, was born in June, 1813. Shelley was remarried in London, Mar. 24, 1814, but soon found his married life uncongenial; separated from his wife, settling upon her nearly all his disposable income, and about this time conceived a passion for Mary Godwin (daughter of William Godwin and Mary Wollstonecraft), which was fully returned. As neither of them had any respect for the marriage bond, they saw no difficulty in consulting their own inclinations, and proceeded to Switzerland, traveling as man and wife; returned to England at the close of 1814. In consequence of the death of his grandfather he obtained an annuity of £1,000 and his father's succession to the baronetcy (Jan., 1815); studied surgery during the winter of 1815-16, and daily walked a London hospital; wrote in 1815 his second poem of permanent interest, *Alastor, or the Spirit of Solitude*, published, with other poems, in 1816; proceeded to the Lake of Geneva in the spring of 1816; resided there some months in daily intercourse with Byron; returned to London in the autumn; legalized his connection with Mary Godwin by marriage Dec. 30, 1816, Harriet having shortly before (Nov. 10) drowned herself in the Serpentine; conducted an unsuccessful chancery suit against Mr. Westbrook (Harriet's father) for the custody of his two children, decision being given against him by Lord Eldon on the ground of atheism Aug. 23, 1817; settled at Great Marlow, Buckinghamshire, where he played the part of a country gentleman; made about this time the acquaintance of Keats and the brothers James and Horace Smith, and became very intimate with Leigh Hunt; published in 1818 *The Revolt of Islam* (originally called *Laon and Cythna*), a grandly conceived, sublime, and highly original poem, but with many inequalities and blemishes; suffered much from pulmonary disease, which led him in Mar., 1818, to leave England for the last time; traveled with his early friend Hogg to Italy, residing successively at Milan, Pisa, Leghorn, and the Bagni di Lucca; visited Byron at Venice, remaining there some weeks; completed *Rosalind and Helen* (published 1819), a poem of little value; translated, or rather abridged, the *Symposium* of

Shelley, wrote at Green's villa, near Pisa, *Dioniso and Antioco*, one of his poetical compositions, not published during his life; retranscribed to Rome in November, and to Naples, Jan., 1819; signed the writer at the latter end the spring of 1819 at the Tiber's side; presented to Florence, Oct., 1819; made in each of the Italian capitals an anonymous study of their works of art; wrote, chiefly at Florence, during this year, his two greatest works, the tragedy *Prometheus Unbound* and the tragedy *The Cenci*, both of which, as well as *Robespierre*, the *Pyreus*, a burlesque drama, were published in London by 1820; removed to Pisa, Jan., 1820; wrote in this year his *Witch of Atlas*, not published till 1824; in 1821 *Alceste*, a beautiful monody on the death of Keats, *Kjia*, *Montezuma*, and *Hellas*, a noble drama inspired by the inspiration of Byron, made a long visit to Byron at the Villa Nervi, 1821; was joined by the latter at Pisa during the winter (1821-22); began his poem *The Triumph of Life*, which was never finished; took a summer residence Apr. 1822 in the Villa Magna, at Livorno, a village on the Tuscan coast; went frequently upon boating excursions with his friends, Capt. Trelawney and Ident Williams; and was drowned along with the latter in the Bay of Spezia, Aug. 8, 1822, owing to their boat having capsized in a squall, while returning from a visit to Leigh Hunt at Leghorn. The bodies were cast upon the shore ten days later, and, in compliance with the quarantine laws of Tuscany, the ashes were buried by Trelawney in the Protestant burial-ground at Rome, near the tomb of Keats. Shelley's posthumous poems were edited by his widow in 1824, and *The Mask of Anarchy* by Leigh Hunt in 1832. Mrs. Shelley published a collection of his works in prose and verse in 1839 and 1840, and again in 1845. His daughter-in-law, Lady Shelley, collected the *Shelley Memorials* in 1858. Of recent editions the best have been those edited by William M. Rossetti in 2 vols., in 1870, and by H. Buxton Forman, in 6 vols., 1876-80. The *unlaid* *Life* was that of Medwin, in 1847. Trelawney's *Reminiscences of Shelley and Byron* appeared in 1859, and Hogg's *Biographical Life of Shelley* in the same year. J. A. Reynolds published a *Life* in 1878, and Prof. E. Dowden another in 1898. D. P. McCarthy issued *Shelley's Early Life* in 1879. Dr. Richard Garnett's *Relics of Shelley* dates from 1892.

Revised by EDWARD GIBSON.

Shell-heaps: artificial deposits constituting a leading feature of the aboriginal remains of North America, and occurring more or less plentifully in all habitable countries.

Nature and extent.—These heaps are the kitchen middens of shell-eating peoples, and their contents vary with the nature of the food-supply. Oysters, clams, mussels, and numerous varieties of univalves yield a very large percentage of compact and durable refuse. In some cases the shape and height of the heaps were modified for domestic or defensive purposes, and when the sites became places of sepulture the shells were utilized in building tombs; but they are studied here only as accumulations of refuse reflecting in their mass reliable records of the food-supply, the customs, arts, industries, and movements of the people. Some of these heaps cover areas 10, 20, or even 30 acres in extent. On the shores of some of the Atlantic coast and rivers the deposits are practically continuous for many miles, and reach back from the water for distances varying from a few rods to half a mile or more according to the nature of the ground. It is estimated that in the State of Maryland alone the oyster-banks cover an area of upward of 100,000 acres. The deposits are heaviest where favorable conditions occur near prolific shallows, and it is not uncommon to find them from 10 to 25 feet deep. A depth of 40 feet is occasionally reported, and certain deposits in Florida are said to be 100 feet deep. The shells on decomposition yield a dark rich mud, and where decay is well advanced the beds exposed are exceedingly fertile. In many cases the shells are calcined in kilns and employed as a fertilizer. At Pope's Creek, Md., a single midden has yielded upward of 200,000 cubic feet of oyster-shells for this purpose.

History and age.—In the main the shell-banks of the Atlantic coast are of nearly homogeneous date; they must be regarded as representing a simple and rather brief period of occupation, but examples in Florida, especially the fresh-water deposits, their successive depositions, as well as more advanced decomposition in the lower beds, indicating distinct periods of occupation and considerable lapse of time. The shell found very decided indications of the greater antiquity of the lower beds of the Alaskan middens. In some

cases mounds composed of many forms are found far back from the present salt-water shorelines, and long periods are assumed to have passed since their accumulation, but the rates of silting and of isostatic elevation are not so well determined so to make such data of great value as time-measures. In some localities the forms of life utilized by the ancient inhabitants have changed in character, or have greatly diminished in abundance of size, or have entirely disappeared. These changing conditions are an index of age, but not a definite or valuable one. In the main the species of animals whose remains occur in these artificial deposits are identical with or vary but little from the living or historic species of the regions in which they occur.

Art and people.—The American natives who resorted to the shores of the sea in search of food were not a peculiar people, and did not belong to a particular period of time or stage of culture. Some of the more advanced native peoples occupied the interior of the country and took no part in the marine fisheries, but nearly all grades of culture are represented in the art of these deposits. In some regions the Indians resorted to the fisheries at stated seasons only, and in such cases the relics left do not fully represent the art of the people. The utensils and implements were to a large extent prepared for temporary and local use, and are exceptionally rude; but in passing along the coast from Maine to Mexico the artificial contents of the shell-banks of each section represent somewhat fully the art-remains of the adjacent regions. For example, rude ood-marked pottery is found in the northern middens, stamped wares in southern, painted wares in those of the Gulf States, and highly elaborated and artistic wares in the deposits of the western and southern Gulf shores. The art and people represented by the relics these heaps contain are those of which knowledge has been obtained through other sources.

Archæology.—Atlantic coast: Wyman, *Fresh-water Shell-mounds of Florida*, in *Memoirs of the Peabody Academy of Science*, vol. 1, No. 4 (1875); Britton, *Artificial Shell-deposits of the United States*, in *Smithsonian Institution Report* (1896); Ives, *Artificial Shell-deposits of New Jersey*, in *Sci. Inst. Rept.* (1864). Pacific coast: Schuchman, *Oyster-middens of Oregon*, in *Bulletin Geol. Survey of Territories*, vol. III, No. 1; Hall, *Tribes of the Kalama North-west*, in *Contributions to North American Ethnology*, vol. 1, Interior; White, *Congress International d'Anthropologie* (Boulogne, 1871). W. H. Holmes.

Shells, in artillery: See PROJECTILES.

Shells, in natural history: See MOLLUSCA.

Shelly's Case: a celebrated case at law, decided in 1591, and reported in the first part of Lord Coke's *Reports*. It constitutes one of the landmarks of the English law of property, and established a technical rule of real property law, known as the Rule in Shelly's Case, which may be stated as follows: When a person takes an estate for life, under a deed or will, and in the same instrument there is a limitation by way of remainder to his heirs or to the heirs of his body as a class of persons, the limitation to the heirs merely operates to enlarge the estate of the person to whom the life-estate is given; if the remainder be to the heirs of his body, he takes an estate in fee tail; if to his heirs generally, an estate in fee simple. The rule had no application, however, to the limitation of a remainder to any particular person, who might, nevertheless, be the heir of the life-tenant. Thus a limitation of a life-estate to A, with remainder to his eldest son and the heirs of the latter, was not within the rule. The rule itself has been abrogated by statute in New York and many other States, and in such jurisdictions a limitation of the kind affected by it would now take effect according to the terms of the conveyance. See ESTATE, FEE, PROPERTY, REMAINDER, and consult text-books on real property, especially Leake and Williams, and the *Commentaries* of Blackstone and Kent.

GEORGE W. KIRCHWEY.

Shelter Island: island and town; Suffolk co., N. Y., between the Peconic and Gardiner's Bays, near the eastern extremity of Long Island (for location, see map of New York, ref. 8-9). It is reached by ferry from Greenport on the Long Island Railroad; is about 14 miles long and 4 miles wide; contains several pretty bays and small fresh-water lakes; is a popular summer resort and a Methodist camp-meeting place; and has two large hotels and other facilities for boating and fishing. The island belonged originally to the Manhattans Indians; was acquired by Lord Stirling; and for many years was under the jurisdiction of Connecticut. Pop. (1890) 752; (1900) 921.

Shema'kha (anc. *Kamachia*): town of Russia; in Transcaucasia; on the Pirsaghut, at an elevation of 2,230 feet. It is fortified, and has large and well-stocked bazaars and manufactures of silk and cotton stuffs. Much wine and fruit are produced in the vicinity. Pop. (1892) 22,139.

Semitic Languages: same as SEMITIC LANGUAGES (q. v.).

Shenando'ah: town (founded in 1870); Page co., Ia.; on the Nishnebotne river, and the Burlington Route, the Humeston and Shen., and the Omaha and St. L. railways; 19 miles N. E. of Hamburg, 40 miles S. E. of Council Bluffs (for location, see map of Iowa, ref. 7-D). It is the center of a rich agricultural region, and contains 12 churches, the Western Normal College (opened in 1881), 3 public-school buildings, 2 national banks with combined capital of \$115,000, a private bank, and a semi-weekly and 3 weekly newspapers. The vicinity includes among its industries some of the largest wholesale nurseries in the West. Pop. (1880) 1,387; (1890) 2,440; (1895) 3,100. EDITOR OF "SENTINEL."

Shenandoah: borough; Schuylkill co., Pa.; on the Lehigh Val., the Penn., and the Phil. and Read. railways; 18 miles N. by E. of Pottsville, the county-seat, and 105 miles N. W. of Philadelphia (for location, see map of Pennsylvania, ref. 5-H). It is in the heart of the richest coal district in the anthracite region, the development of which has given it rapid growth. Six of the largest collieries in the coal region are within the borough limits, and eight others, equally productive, are within the radius of a mile. The borough has gas and electric-light plants, an electric railway connecting adjoining towns and villages, 2 national banks with combined capital of \$200,000, 3 building and loan associations, each local and serial, and a daily and 2 weekly newspapers. There are 18 churches, 7 public-school buildings (valued at \$60,000), a public library connected with the schools, 2 parochial schools, a brewery, 2 hat and cap factories, and other industries. Shenandoah was laid out in 1862, and incorporated as a borough in 1866. Pop. (1880) 10,147; (1890) 15,944; (1895) estimated, over 17,000.

M. E. DOYLE, EDITOR OF "SUNDAY MORNING NEWS."

Shenandoah River: a stream which rises in Augusta co., Va., and flows N. E. 170 miles to the Potomac at Harper's Ferry, W. Va. The north fork joins the main stream at Front Royal. The Shenandoah affords great water-power. During the civil war its valley was the scene of many military operations, and was laid waste by Gen. Sheridan in 1864.

Shen'di: town of Nubia, on the Nile, in lat. 16° 38' N.; was a place of some commercial importance before the Mahdist revolt. Almost the entire population of the town and district perished of famine in 1889. C. C. A.

Shenshin, AFANASI AFANASIEVICH: poet, who has written under the name of Fet (that of his mother by a first marriage); b. in the government of Orel, Russia, Nov. 23, 1820; studied in the University of Moscow, and from 1844 to 1856 served in the army, after which he settled in the country. His first volume of verses was published in Moscow in 1840. As a writer Fet belongs to the school of pure art. His short poems, though at times lacking in warmth, are characterized by perfect form and delicate grace. He has also made excellent translations of the whole of Horace and Juvenal, Goethe's *Faust*, Shakspeare's *Julius Caesar* and *Antony and Cleopatra*, etc. A. C. COOLIDGE.

Shensi, shen'see' [literally, western defiles]: a province of China, bounded N. by Mongolia, E. by the Hwang-ho (which separates it from Shansi) and Honan, S. by Hupeh and Szechuen, and W. by Kansuh. Area, 67,400 sq. miles. S. of the Tsing-ling range it is mountainous and well wooded; N. of it the Loess (q. v.) formation prevails, and everything is yellow. The houses are made of yellow earth, vegetation is covered with yellow dust, and even the atmosphere is seldom free from a yellow haze. The chief rivers are the Wei (a long, shallow affluent of the Hwang-ho), which flows E. along the northern base of the Fu-niu and Tsing-ling ranges (some of whose peaks reach an elevation of 11,000 feet), and the HAN-KIANG (q. v.). Iron and coal abound, but are not much worked, except near the upper waters of the Han. Being a loess region, Northern Shensi is unfit for rice cultivation. Wheat, barley, pulse, millet, maize, ground-nuts, poppy, hemp, tobacco, and cotton are extensively grown. Wheat is the staple. Capital, Si-ngan-foo. Pop. about 8,500,000. R. L.

Shenstone, WILLIAM: poet; b. at the Leasowes, near Halesowen, Shropshire, England, in Nov., 1714; studied at Pembroke College, Oxford, and passed his life in retirement on his hereditary estate, writing elegies, ballads, odes, and

pastorals which had considerable popularity. The Spenserian poem entitled *The Schoolmistress* (1742), the *Pastoral Ballad* (1743), and the well-known stanzas *Written in an Inn at Henley*, are the only ones remembered. D. at the Leasowes, Feb. 11, 1763. His *Works* and *Letters* were collected in 3 vols., 1764-69. An edition of his *Poems*, by Gilliland, with a memoir, appeared at Edinburgh in 1854, and his *Essays on Men and Manners* were republished at London in 1868. Shenstone was also one of the best amateur landscape-gardeners of his time. Revised by H. A. BEERS.

She'ol: the transliterated Hebrew word, meaning a hollow place, a cave, used in the Revised Version of the Bible to denote the place of departed spirits. It therefore corresponds with Hades in classical Greek literature. In the Authorized Version it is translated by pit, grave, hell. S. M. J.

Shepard, CHARLES UPHAM, M. D., LL. D.: geologist; b. at Little Compton, R. I., June 29, 1804; graduated at Amherst College 1824; studied botany and mineralogy at Cambridge under Nuttall; taught those branches at Boston; was for two years assistant in the laboratory of Prof. Schumacher at New Haven, and for one year lecturer at the Brewster Scientific Institute at New Haven; employed on a Government commission to investigate the methods of sugar-culture and manufacture in the Southern States 1832-33; lecturer on Natural History at Yale College 1830-47; associate of Dr. James G. Percival in the geological survey of Connecticut 1835; Professor of Chemistry and Natural History at Amherst 1845-52, and in the Medical College at Charleston, S. C., 1854-61; afterward became again Professor of Natural History at Amherst; was author of a *Treatise on Mineralogy* (1832; 3d ed. enlarged, 1855), and of a *Report on the Geology of Connecticut* (1837). D. May 1, 1886.—His son, CHARLES UPHAM SHEPARD, JR., M. D., born at New Haven, Oct. 4, 1842, graduated at Yale College 1863, and in medicine at Göttingen, Germany, 1867; became Professor of Chemistry at the Medical College of Charleston, S. C., in 1867. He wrote many papers on mineralogy, and has been active in the development of the phosphate industries of South Carolina and Florida. Revised by G. K. GILBERT.

Shepard, ELLIOTT FITCH, LL. D.: lawyer; b. at Jamestown, Chautauqua co., N. Y., July 25, 1833; was educated at the University of the City of New York; was admitted to the bar in 1858. During the civil war he raised the 51st New York Volunteer Regiment, which was called in his honor the Shepard Rifles. In 1876 he was prominent among the founders of the New York State Bar Association; and shortly before his death founded the American Sabbath Union. He was owner and editor of the *New York Mail and Express*. D. in New York, Mar. 24, 1893.

Shepard, THOMAS: clergyman; b. at Towcester, Northamptonshire, England, Nov. 5, 1605; graduated at Cambridge, 1627; became a preacher at Earle's-Colne, Essex; was silenced for nonconformity in 1630. He emigrated to Massachusetts, arriving at Boston, Oct. 3, 1635; succeeded Thomas Hooker as pastor of the church at Cambridge, Feb. 1636; was influential in founding Harvard College; published *New England's Lamentation for Old England's Errors* (London, 1645); *The Sound Believer* (1645); *The Clear Sunshine of the Gospel breaking forth upon the Indians in New England* (London, 1648; reprinted New York, 1867); *Theses Sabbaticae* (1649); and other theological works. After Hooker's death he was esteemed the most learned and skillful exponent of Puritan theology in New England. D. at Cambridge, Aug. 25, 1649. He left numerous works in MS., some of which were published in England, especially *Subjection to Christ* (1652), to which was prefixed a *Life* of Shepard by Samuel Mather and William Greenhill; *The Parable of the Ten Virgins Opened and Applied* (London, folio, 1660; new eds. 1839, Aberdeen, 1838 and 1853); and various collections of *Sermons*. He left an *Autobiography*, first printed at Cambridge (1832) for the Shepard Congregational Society. A collected edition of his *Works* appeared at Boston (3 vols., 1853), with a memoir by Rev. Horatio Alger, of Cambridge. A memoir by Cotton Mather may be found in the *Magnalia Christi Americana* (best ed. Boston, 1855, 2 vols.). Revised by S. M. JACKSON.

Shepardson College: See DENISON UNIVERSITY.

Shepherd-dog: any one of the breeds of domestic dogs which are trained to assist in attending the flocks of sheep. Of all strains of shepherd-dogs the Scotch collie is the most celebrated. It is one of the most sagacious and docile of dogs. A good Scotch collie should have a long, narrow

head; small, semicircular eyes, set high on the head; long, straight fore legs, placed well under the body; long and dark, but not woolly, hair. The color is extremely varied, but is more usually black and tan, or black, tan, and white, or yellow and white. P. A. LACAS.

Shepherd Kings: certain rulers of Egypt, known also as *Pharaohs* (q. v.).

Shepherdstown: town, Jefferson co., W. Va.; on the Kanawha river, the Chesapeake and Ohio Canal, and the National Western Railroad; 8 miles W. of Harper's Ferry, 30 miles W. of Washington, D. C. (for location, see map of West Virginia, ref. A. N.). It contains Shepherd College (one of the finest normal schools), large sawmills and flour-mills, bookshops, a savings-bank, and a weekly newspaper. Pop. (1900) 1,633; (1900) 1,613.

D. L. SEYMOUR, publisher of "Herald."

Shepley, Erskine, LL.D.: jurist; b. at Andover, Mass., Dec. 2, 1799; graduated at Dartmouth College 1821, in the same class with Ames, Kendall, Joel Parker, and Daniel Foster; became a lawyer at Andover and subsequently at Portland; sat in the Massachusetts Legislature 1819, and in the same constitutional convention 1820; was U. S. district attorney for Maine 1821-33; U. S. Senator 1833-37; became a justice of the Supreme Court of the State Sept. 23, 1838; served justice 1848-55. He was a man of great constructive ability, and was appointed sole commissioner to prepare the Revised Statutes of Maine (1850-57). D. Jan. 10, 1877. —*Long Successor:* his brother (b. 1787; d. 1857), reported and published *Maine Reports*, the decisions of the Supreme Court of Maine 1830-40. Revised by F. SEYMOUR ALLEN.

Shepley, George Fourier: soldier and lawyer; b. at Andover, Mass., Jan. 1, 1819; graduated at Dartmouth College in 1840, and at Johns Law School, Cambridge, 1829; admitted to the bar of the supreme judicial court, Bangor, Me., 1840; in 1841 removed to Portland; was appointed U. S. attorney for Maine district in 1848, and reappointed in 1853 and 1857; subsequently devoting himself exclusively to a very successful and general practice of his profession, in the course of which he was called upon to argue several cases of great importance in the U. S. Supreme Court, until Sept. 11, 1857, when he was commissioned colonel of the Twelfth Maine Volunteers; commanded a brigade in Gen. Butler's expedition against New Orleans, and on the occupation of that city was appointed military commandant and acting mayor, charged with the administration of civil affairs in the city, and was also assigned to the command of the defense of New Orleans. On July 18, 1862, he was commissioned brigadier-general of volunteers by President Lincoln, and appointed him military governor of Louisiana Jan. 2, 1862. In 1864 he commanded the military district of Arkansas and North Carolina; served with the Army of the James 1864-65; entered Richmond with the Twenty-fifth Army corps Apr. 3, 1865, and was appointed military governor of that city. Resuming his profession at the close of the war he declined the appointment of judge of the Supreme Court of Maine, but in 1869 accepted that of U. S. circuit judge for the first judicial circuit. His decisions are reported in *Shepley's Circuit Court Reports*. D. at Portland, July 20, 1879. Revised by JAMES MANCZ.

Sherbrooke: *chef-lieu* of Sherbrooke County, Quebec, Canada, and by courtesy called The Capital of the Eastern Townships (see map of Quebec, ref. 6-U). It is a flourishing town situated on both sides of the river Magog at its confluence with the St. Francis, one of the large tributaries of the St. Lawrence. It is a station on the Grand Trunk railway, which has its terminus in Portland, Me., being 94 miles from Montreal. The Canadian Pacific Railway also runs through it on the line between Montreal and New Brunswick. The Quebec Central Railway has its head office here, and with the Boston and Maine Railroad connects Quebec with the railway systems of the U. S. Sherbrooke has a small water power, and on both sides of the Magog are several large and important factories, the largest being the *Boisbrun* and *Wright* mills. The town possesses several fine buildings, including the post-office, the Eastern Townships Hotel, and several churches. The Magog and the St. Francis are spanned by bridges. There are three weekly newspapers, one of which is printed in the French language. Pop. (1901) 7,227; (1891) 10,110, mostly French-Canadian. J. M. HARRIS.

Sherbrooke: a seaport of Guxborough County, Nova Scotia, at the head of navigation of the beautiful St. Mary's

river, 12 miles from its mouth (see map of Quebec, etc., ref. 2-U). Shipbuilding, the lumber-trade, gold-mining, and quartermilling are carried on. Pop. 1890, mostly Scotch.

Sherbrooke, Vancouver: see Lower, Roman.

Shere Ali, sheet-*al* 160: Amir of Afghanistan; b. in 1823; succeeded his father in 1863, and seemed at first to be open to British influence, introducing numerous reforms after British models, but was subsequently compelled by a revolt of the conservative party, headed by his own son, Yakub Khan, to change his policy completely and submit to the Russian influence. As he declined to receive a British embassy, though a Russian embassy lived in Kabul in great state, the British invaded the country in the last months of 1878. Shere Ali fled across the frontier, and died suddenly at Mazarisheh, a place under Russian authority, Feb. 21, 1879.

Sheridan: See *Gerrymen*.

Sheridan, Frances (Chamberlain): novelist and dramatist; b. in Ireland in 1794; wrote at the age of fifteen a romance, *Regina and Adelaide*, which was dramatized by her daughter long afterward, and successfully acted at Dublin; made the acquaintance of Sheridan, the theatrical manager, during the controversy in which he was involved, by the publication of a pamphlet in his favor; married him about 1743; wrote two popular novels, *Sidney Baskin* (3 vols., 1761) and *Nemoralis* (1769), and two comedies, *The Discovery* (1763) and *The Duke* (1764), and left an unpublished play, *The Triple Hulk*. D. at Bath, France, Sept., 1766. Revised by HAYDEN MYRRORS.

Sheridan, Philip Henry, LL.D.: soldier; b. at Albany, N. Y., Mar. 6, 1831; graduated from the U. S. Military Academy, and assigned to the First Infantry as lieutenent second lieutenant July 1, 1853. After a brief term in barracks he was ordered to Texas; transferred to the Pacific coast in 1855, serving in Washington and Oregon Territories until the fall of 1861, at which date he was captain in the Thirtieth Infantry. In December he was assigned to the army of Southwest Missouri as chief quartermaster. After the battle of Pea Ridge (Mar., 1862) he was relieved, and in the Corinth campaign accompanied Gen. Halleck as quartermaster until May 25. On this date he was appointed colonel of the Second Michigan Cavalry; three days later was off on a raid to Booneville, and May 30 in pursuit of the Confederates retreating from Corinth. On July 1, in command of a cavalry brigade, he defeated a superior cavalry force at Booneville, and was commissioned brigadier-general of volunteers from that date. Transferred to the Army of the Ohio, he commanded a division at the battle of Perryville (Oct. 8), where "he held the key of our position, and used the point to its utmost advantage." At the battle of Murfreesboro (Dec. 31) Sheridan's division held the left of the right wing. An attack on his front had been met and the enemy driven back, when by the giving way of the two divisions on his right his flank became exposed to the advancing foe. Hastily forming a new line under cover of a charge, he made a brave resistance for an hour, when he was again compelled to take up a new line, this time connecting with Negley of the center. The two divisions repulsed three desperate assaults by four divisions of the enemy, when, Sheridan's ammunition giving out, he ordered a bayonet charge and withdrew his line from the field; but by his obstinate resistance priceless time had been gained for Rosecrans to make his new dispositions. Sheridan's commission as major-general of volunteers followed, dating from this battle. With the exception of skirmishes with Forest and Van Dora, little of interest occurred until late in June, 1863, when Rosecrans advanced against Bragg, who fell back into Georgia. The battle of Chickamauga took place Sept. 19-20, where Sheridan fought with great gallantry, rescuing his division from a perilous position. Grant superseded Rosecrans in October, and on Nov. 24-25 was fought the battle of Chattanooga, where, on the 25th, Sheridan, by his fearless assault at the head of his division upon the center of the enemy's line on Missionary Ridge, gained additional renown. The march to Knoxville, where Burnside was besieged, next followed. Upon Grant's promotion to lieutenant-general (Mar., 1864) he applied for the transfer of Sheridan to the East, and appointed him chief of cavalry of the Army of the Potomac. In the campaign of 1864 the cavalry covered the front and flanks of the infantry through the battles of the Wilderness until May 8, when the greater part of it was withdrawn, and next morning Sheridan started on a raid against the enemy's lines of communication with

Richmond. On the 25th he rejoined the army, having destroyed the dépôts, trains, and track at Beaver Dam and Ashland stations, liberated 400 Union men, and defeated the enemy's cavalry at Yellow Tavern, where their cavalry leader, J. E. B. Stuart, was mortally wounded. The outer line of works around Richmond was taken, but the second line was too strong to be carried. Resuming the advance, the battle of Hawes's Shop was fought May 28; Cold Harbor was occupied on the 31st, and held until the arrival of the infantry. On June 7 Sheridan, with two divisions, started around the left of Lee's army and destroyed the Virginia Central Railroad in the rear. The Richmond and Fredericksburg railroad was struck at Chesterfield, and the Virginia Central was again cut at Trevilian's, where he routed Wade Hampton (June 11); next day he tore up the railway nearly to Louisa Court-house, when, on the advance toward Gordonsville, an indecisive engagement took place; not hearing from Hunter, who was to meet him here, he withdrew, rejoining the army June 19. On Aug. 7 the Middle Department and departments of West Virginia, Washington, and Susquehanna were constituted "the Middle military division," and Sheridan assigned to command of the same. Numerous severe cavalry skirmishes occurred during August and early in September, but no general engagement, although the two armies lay in such position—the Confederates under Gen. Early on the west bank of Opequan Creek, covering Winchester, and Sheridan in front of Berryville—that either could bring on a battle at will. The imperative necessity of having the unobstructed use of the Baltimore and Ohio Railroad and the Chesapeake and Ohio Canal led Grant to take the initiative, although Sheridan's defeat would have exposed Maryland and Pennsylvania to invasion; but before giving orders to attack he visited Sheridan (Sept. 16), the latter expressing such confidence of success that Grant gave him but two words of instruction: "Go in!" Three days later, at the crossing of the Opequan, he attacked Early, whom he routed after a vigorous battle, and captured 3,000 prisoners and 5 guns. Early rallied his army at the strong position of Fisher's Hill, where, on the 22d, he was again defeated, with heavy loss, and pursued to the mountains. Sheridan devastated the valley on his return, rendering it untenable for an enemy's army. He was then (Sept. 20) appointed a brigadier-general in the regular army. On Oct. 19 Early, after surprising the Union army in the morning, was disastrously defeated, owing to the arrival of Sheridan from Winchester. (See CEDAR CREEK.) The thanks of Congress were bestowed upon Sheridan and his army, and Nov. 8 he was appointed major-general in the regular army. On Feb. 27, 1865, starting out with 10,000 cavalry, he destroyed the Virginia Central Railroad, the James River Canal, and immense quantities of supplies, and defeated Early again at Waynesboro, rejoining Grant before Petersburg Mar. 27. Sheridan had now a force of about 9,000, and in subsequent operations was under the immediate orders of Gen. Grant. He commanded at the battle of FIVE FORKS (q. v.) with his customary vigor. The loss of this battle compelled Lee to evacuate Petersburg. Sheridan pursued the flying army to Sailor's Creek, where he captured 16 guns and 400 wagons. When the Sixth Corps came up a combined attack resulted in the capture of upward of 6,000 prisoners. On Apr. 8 four supply-trains were captured at Appomattox Station, and at Appomattox Court-house the advance of Lee's army was resisted until dark. On the morning of the 9th the enemy endeavored to break through his dismounted command, but abandoned the attempt when Sheridan, moving aside, disclosed the infantry behind. Mounting his men, Sheridan was about to charge when the white flag betokening surrender was displayed in his front. In June, 1865, he was placed in command of the military division of the Southwest, of that of the Gulf in July, of the department of the Gulf, Aug., 1866, and of the fifth military district (Louisiana and Texas) Mar., 1867. In Sept., 1867, he was transferred to the department of the Missouri, continuing in command until Mar. 4, 1869, when he was promoted to be lieutenant-general, and assigned to command of the division of the Missouri, headquarters at Chicago, assuming command Mar. 16. In 1870 he visited Europe and witnessed the Franco-German war. During the political disturbances in Louisiana in 1875, Gen. Sheridan was sent to New Orleans, returning to Chicago on quiet being restored. He assumed command of the army Nov. 1, 1883; was appointed general June 1, 1888. Author of *Personal Memoirs of P. H. Sheridan* (1888). D. at Nonquitt, Mass., Aug. 5, 1888.

Revised by JAMES MERCUR.

Sheridan, RICHARD BRINSLEY BUTLER: dramatist; son of Thomas Sheridan, actor and author, and Frances Chamberlaine, author; b. in Dublin, Ireland, Sept., 1751; educated in Dublin and at Harrow School; published a rhymed translation of Aristænetus, Aug., 1771; married Miss Linley, a beautiful oratorio singer, of Bath, in 1773; brought out his first comedy, *The Rivals*, at Covent Garden, Jan., 1775; followed it in November with an opera, *The Duenna*, for which his father-in-law composed the music, and which was acted seventy-five nights the first season; became part-purchaser of Garrick's half of Drury Lane theater in June, 1776; produced *A Trip to Scarborough* Feb., 1777, altered from Vanbrugh's *Relapse*; and in May followed it with *The School for Scandal*, the most successful comedy of manners in the English language; became owner of one-half of Drury Lane 1778; wrote *Monody on Death of Garrick* 1779; brought out the farce of *The Critic, or a Tragedy Rehearsed*, Oct., 1779. Elected a member of The Club, he became a friend of the leading wits and statesmen of the time; was elected to Parliament from Stafford 1780; was Secretary of the Treasury 1782; cultivated oratory with great success; crowned his fame as a public speaker by two great speeches against Warren Hastings, one in bringing charges in Parliament, Feb., 1787, and one on the trial at Westminster Hall, in June of same year; held his own in debate even against Pitt; revised Thomson's adaptation from Kotzebue, *The Stranger*; rebuilt Drury Lane 1784; produced in 1799 his patriotic play, *Pizarro*, also an adaptation from Kotzebue; became treasurer of the navy and a privy counselor in 1806; was ruined by the burning of Drury Lane 1809; made his last speech in Parliament 1812. Having fallen into habits of dissipation and carelessness in money matters, his last years were harassed by the importunities of creditors, pursuing him even to his death-bed. D. July 7, 1816, and was buried in Westminster Abbey. His *Life* was written by Thomas Moore (1825), who also edited his plays, admitting one piece, *The Camp*, which he did not write. His *Speeches* have been collected in five volumes (1816). *The Rivals* and *The School for Scandal* were published in 1884, with biography, introductions, and notes, by the present writer. BRANDER MATTHEWS.

Sheridan, THOMAS: actor and author; b. in 1721 at Quilca, near Dublin, Ireland (the residence of Dean Swift); educated at Trinity College, Dublin; became an actor 1743; played tragedy at Covent Garden theater 1744 and at Drury Lane 1745; was by some considered a rival of Garrick; was manager of the Dublin theater 1746-55; was ruined by a wanton riot; withdrew temporarily from the stage; became a successful teacher of elocution at London, Oxford, and Cambridge, and in Scotland and Ireland; returned to the stage 1760; was pensioned by George III.; was acting manager of Drury Lane 1776-79, after his son obtained control of that theater; published several works on elocution; edited the works of Swift (1784); wrote his *Life*, and was author of a *General Dictionary of the English Language* (1780) of considerable phonetic value. D. at Margate, England, Aug. 14, 1788. Revised by BRANDER MATTHEWS.

Sherif, she-reef [Arab. *sherif*, noble]: a title; applied by Mussulmans to descendants of Fatima, the daughter of the prophet Mohammed. The Sherif of Mecca is the guardian of the KAABA (q. v.), and chief dignitary of the city. E. A. G.

Sheriff [M. Eng. *shereve* < O. Eng. *scir-gerefa*: *scir*, shire + *gerefa*, reeve, officer]: a county officer with administrative and generally also judicial functions.

In England, Ireland, and Wales the sheriff is the chief officer of the crown, in every county or shire, who does all the sovereign's business in the county, the custody of the county being committed to him alone by letters patent of the crown. The office of sheriff is one of the most ancient and honorable known to the English law. The custody of the county is said to have formerly been committed to the earl or (Lat.) *comes*, and anciently the sheriff, whose Latin title is *vicecomes*, was his deputy. The earls in time became unable to transact the business of the county, and the burden was laid on the sheriff, who is now entirely independent of the earl.

Sheriffs were formerly chosen by the inhabitants of the several counties, but now by statute they are annually appointed by the crown (on nomination by the judges and the great officers of the crown) on Nov. 12, and the person appointed must have sufficient land within his county or bailiwick to answer the crown or the people. The discharge of the office is compulsory, and within one month after a

sheriff's appointment suggested he must nominate a fit person for his undersheriff. Until 1899 the citizens of London had the right to elect the sheriffs for Middlesex and London, but now the custom appoints the sheriffs for the county of Middlesex and the (recently created) county of London, and the city sheriffs for the city of London only.

The sheriff was formerly a judicial officer before whom might be held the trial of disputed facts in certain cases; but now he is relieved of this burden, except that he is charged with the assessment of damages (by the aid of a jury) and of compensation in certain cases, and that he is bound to hold a county court whenever the holding of such court is required for the purpose of election or any other lawful purpose only. He is charged also with certain other duties, as a returning officer, etc., in regard to parliamentary elections.

As the keeper of the king's peace he is the first man in the county, and superior in rank to any soldierman therein during his term of office. He may apprehend and commit any one who breaks the peace, or attempts to break the peace; and may bind any one in a recognizance to keep the peace. He is bound to pursue all traitors, murderers, and other offenders, and commit them to jail. He is also to defend the county against any of the king's enemies, and for this purpose, as well as for the purpose of keeping the peace, in apprehending offenders, he may command all the people of the county to attend him. See *Poore's COMPANION*.

The sheriff, as an officer of court, is also bound to execute process issuing from the high court of justice, and to attend on the judges when they come into the county at the assizes. In civil cases he may serve all processes by which persons are begun, unless he is a party (when service is to be made by the coroner); he must, upon a proper order, arrest and take security from the defendant (where the defendant is liable to arrest); he executes mesne process by serving attachments, etc.; and in any action or cause he must, when the case comes to trial, summon and return the jury; and when the case is determined he must see the judgment or sentence of the court carried into execution. In some matters he is liable, like other ministerial officers, to some action for the negligent or improper discharge of his duties. To protect himself against liability for mistake he must, in cases of doubt, require from the proper party a bond of indemnity.

In executing criminal process the sheriff may break open the outer door of any dwelling-house or other building, but in executing civil process he can not force an entrance into a dwelling-house, although when once admitted he may break open inner doors; and he may break the outer doors of buildings which are not dwellings. It is also the sheriff's business as the officer to preserve the rights of the crown within his county, as, as it is often called in his writs, his bailiwick. He must seize neglected lands, levy fines and forfeitures, and seize waifs, wrecks, estrays, etc.

Although the sheriff's authority extends in general over the whole county, there are many liberties exempt from his jurisdiction, in which, by ancient crown grants, the execution of legal process, etc., is bestowed upon other persons. These liberties, though still recognized, are now partly subjected to the surveillance and control of the sheriff.

The sheriff, for the better execution of the duties imposed upon him, has under him many inferior officers—an undersheriff, a deputy, and bailiffs; and these under-officers may sue, levy, and sue farm their offices on forfeiture of £500; and the sheriff himself is forbidden to "let to farm" his county or any part of it. The undersheriff, deputies, and bailiffs of the sheriff are in all respects his agents, and may perform in his name only acts which are purely administrative in their nature, and not any which are judicial. Their acts are his acts; he is responsible for all their defaults done under color of office, even when willful and intentional offenses or violations of law. To protect himself he can sue from them bonds with sureties for their good behavior.

The sheriff is the chief local judge of the county. His jurisdiction in civil matters extends to all personal actions on contract, bond, or obligation, to the greatest extent; by actions for rent; to possessory actions; and generally to all civil matters not especially committed to other courts. His criminal jurisdiction in general extends to the trial of all crimes which do not involve a punishment of death or banishment from Scotland; and he may fine, imprison, banish from the county, and generally even inflict corporal punishment without a jury.

In the several States of the U. S. the sheriff is the chief ad-

ministrative officer of each county, and his general duties and powers are essentially the same as in England in matters pertaining to the execution and enforcement of the law, whether civil or criminal. He is as often the administrative organ of all the superior courts sitting within his county, charged with the duty of carrying into effect their judgments and orders. He is wholly a State official, and has never been incorporated into the executive branch of the U. S. Government. He is generally elected by popular vote for a fixed term (usually three years); but in a few States the ancient practice of appointment by the Governor is still retained. Of his common-law judicial functions the only one retained is the assessment of damages, by the aid of a jury, in certain classes of cases in which defendants have made default.

For a full treatment of the subject, see the statutes of the jurisdiction in question and Stephen's *Commentaries on the Laws of England*; Churchill and Brown's *Law of the Office and Duties of Sheriffs* (London, 1879); Erskine's *Principles of the Law of Scotland*; Tyller's *History of Scotland*; Bell's *History of the Law of Scotland*; Whimore's *Institutions for Sheriffs, Coroners, and Constables* (Chicago, 1894); and Crocker's *Duties of Sheriffs, Coroners, and Constables* (3d ed. New York, 1896). F. BRIDGES ALLEN.

Sherlock, THOMAS, D. D.: bishop and author; son of Dean William Sherlock; b. in London, England, in 1676; educated at Eton; graduated at Cambridge 1697; was master of the Temple forty-nine years (1704-53); was made a prebendary of London 1713, vice-chancellor of Cambridge 1714, dean of Chichester Nov. 1715, prebendary of Norwich 1719, Bishop of Bangor Feb. 4, 1728, of Salisbury 1734, and of London 1748, having declined in 1747 the Archbishopric of Canterbury. He took an active part in the Bangorian controversy in opposition to Dr. Hoadly (1730), wrote several controversial works on Christian theology, of which the most celebrated were *The Use and Intent of Prophecy* (1725) and *Trial of the Witnesses of the Resurrection of Jesus* (1729), and published four volumes of his *Dissertations at the Temple Church* (1754-58), which gained him a high reputation as a pulpit orator. D. in London, July 18, 1761. His Works were edited by T. S. Hughes, D. D. (London, 5 vols., 1800). Revised by S. M. JACKSON.

Sherlock, WILLIAM, D. D.: clergyman and author; b. in Southwark, London, England, 1641; educated at Eton; graduated at Cambridge 1660; took orders in the Church of England; became rector of St. George's, Botolph Lane, London, 1669, prebendary of St. Paul's 1681, master of the Temple 1684, and dean of St. Paul's 1691, in which year he at first refused to take the oaths of allegiance to William and Mary, but subsequently took them; published a pamphlet in justification of his course, *The Case of Allegiance Due to Sovereign Powers Stated* (London, 1691), which caused a great sensation and elicited many replies. D. at Hampton, June 19, 1707. Author of over sixty publications, chiefly theological and controversial, of which the *Validation of the Doctrines of the Trinity* (1690), directed against Dr. South, and the *Practical Discourse concerning Death* (1689; n. ed. 1853) made a great impression at the time, but are now little read. Other works are *The Judgment* (1692) and on *The Divine Providence* (1694; edited by T. O. Summers, Nashville, Tenn., 1853; 3d ed. 1875).

Sherman: city; capital of Grayson co., Tex.; on the Ross, and Tex. Cent., the Mo., Kan., and Tex., the St. L. & W., and the Tex. and Pac. railways; 13 miles S. of the Red river, and 87 miles N. of Dallas (for location, see map of Texas, ref. 2-1). It is in a wheat, corn, cotton, and fruit region, and within 50 miles of the great Ardmore coal-fields, and has large manufacturing and shipping interests. It contains one of the largest cottonseed-oil mills in the South, a cotton-gin (cost about \$250,000, and said to be the largest in the world), several flour, saw, and planing mills, foundries and machine-shops, marble-works, cigar, furniture, carriage, broom, and mattress factories, and brick-yards. There are 7 churches, Austin College for boys (Presbyterian), St. Joseph's Academy (Roman Catholic), Sherman Institute, the North Texas Female College, a commercial college, improved water-works, electric street lights and railway, a national bank with capital of \$600,000, a State bank with capital of \$300,000, and 2 daily and 2 weekly newspapers. The city has an altitude of about 1,000 feet above sea-level. Pop. (1880) 6,063; (1890) 7,325.

Sherman, FRANK DEMPSTER: poet; b. at Peekskill, N. Y., May 6, 1860. He was educated at Columbia College and

Harvard University; became a fellow of Columbia in 1887, and afterward instructor in the Columbia School of Architecture. He has published *Madrigals and Catches* (1887); *Lyrics for a Lute* (1890); and, with John K. Bangs, *New Waggings of Old Tales* (1888).

Sherman, JOHN: clergyman; grandson of Roger Sherman; b. at New Haven, Conn., in 1772; graduated at Yale College 1792; was pastor of the First Congregational church at Mansfield, Conn., from Nov., 1797, to Oct., 1805, when he left that post on account of having adopted Unitarian principles; was for a short time pastor of a Unitarian church at Trenton Falls, N. Y., where he established and conducted an academy. D. at that place Aug. 2, 1828. He was the author of *One God in One Person Only* (1805), the first elaborate defense of Unitarianism that appeared in New England; and *Philosophy of Language Illustrated* (1826).

Revised by G. P. FISHER.

Sherman, JOHN: statesman; b. at Lancaster, O., May 10, 1823; brother of Gen. W. T. Sherman; was admitted to the bar 1844; was a delegate to the Whig conventions of 1844 and 1848; sat in Congress 1855-61; was Republican candidate for the Speakership 1859, but was defeated after a prolonged contest; became chairman of the House committee of ways and means; was re-elected to Congress 1860, but before taking his seat was chosen U. S. Senator; re-elected 1866 and 1872; was long the chairman of the Senate committees on finance and on agriculture; took a prominent part in debates upon finance and the conduct of the war, was one of the authors of the reconstruction measures adopted 1866-67, and was appointed Secretary of Treasury Mar. 7, 1877. He was elected U. S. Senator from Ohio Jan. 18, 1881; elected president *pro tem.* of U. S. Senate Dec. 7, 1885; re-elected U. S. Senator Jan. 13, 1886, continuing president *pro tem.* of the Senate, but he resigned the latter office Feb., 1887. In 1888 he was a prominent candidate for the presidential nomination, which was finally awarded to Harrison. He was re-elected to the Senate in 1893.

Sherman, ROGER, M. A.: signer of the Declaration of Independence; b. at Newton, Mass., Apr. 19, 1721; was in childhood apprenticed to a shoemaker, and followed that occupation until 1743, when he settled at New Milford, Conn., and joined an elder brother in keeping a small store; studied privately law, politics, and mathematics; was chosen county surveyor 1745; made for several years the astronomical calculations for an almanac issued in New York; studied law; was admitted to the bar 1754; sat for several years in the colonial assembly; removed to New Haven in 1761; was assistant governor nineteen years (1766-85); judge of common pleas and of the superior court twenty-three years; treasurer of Yale College 1766-76; sat in Congress from 1774 until his death; was one of the five members of the committee to draft the Declaration of Independence 1776; served on many important committees on the board of war and ordinance and on the treasury board; assisted in codifying the laws of Connecticut 1783; was one of the framers of the original Articles of Confederation 1777, and an active member of the Federal constitutional convention 1787; U. S. Senator 1791-93; and mayor of New Haven from 1784 till his death in that city July 23, 1793.

Sherman, THOMAS WEST: soldier; b. at Newport, R. I., Mar. 26, 1813; graduated at the U. S. Military Academy July, 1836, when he was assigned to the artillery as second lieutenant and sent to Florida, where he served against the Indians until 1842; was subsequently employed in recruiting and in garrison until 1846; was promoted captain in May, 1846. In the war with Mexico he commanded his battery at Buena Vista, and was breveted major; again in garrison and on frontier duty 1848-61, in April of which latter year he attained a majority in his corps, and was assigned to guard the Philadelphia and Baltimore Railroad and to restore communications with Washington. On May 14 he was promoted to be lieutenant-colonel, and three days later appointed brigadier-general of volunteers. In the Port Royal expedition (Oct., 1861) he commanded the land-forces, which he had organized, continuing in command in South Carolina until the end of Mar., 1862, when he was assigned to the Army of the Tennessee as division commander, participating in the Corinth campaign (April to June). Transferred to the department of the Gulf, he commanded a division in the vicinity of New Orleans until May, 1863, when he joined the expedition to Port Hudson, and in the investment of the place commanded the second division Nineteenth Corps, forming the left wing of the besieging army.

In the assault of May 27 he lost a leg while leading the assaulting column. Colonel of artillery June 1, 1863. Returning to duty in Feb., 1864, he held various commands in Louisiana until 1866, when he was mustered out of the volunteer service. He was breveted brigadier-general and major-general for gallantry, and Dec. 31, 1870, was retired from active service with the full rank of major-general. D. at Newport, R. I., Mar. 16, 1879. Revised by JAMES MERCER.

Sherman, WILLIAM TECUMSEH, LL. D.: soldier; b. at Lancaster, O., Feb. 8, 1820; son of Judge Charles R. Sherman. From 1829, when his father died, he was reared in the family of the Hon. Thomas Ewing; in July, 1836, he was appointed a cadet at the U. S. Military Academy, and in July, 1840, he graduated and was appointed a second lieutenant in the Third Artillery; first lieutenant Nov., 1841. He served in Florida until 1842; was in garrison at Fort Mifflin, S. C.; in 1846 he was ordered to California, serving as acting assistant adjutant-general of the department of California until Feb., 1849, when he was transferred to San Francisco on similar duty on the staff of Gen. Persifort F. Smith, commanding the division of the Pacific. Ordered to New York in Jan., 1850, as bearer of dispatches, he was married on May 1 to Ellen, daughter of Thomas Ewing, then Secretary of the Interior. In September of that year he was transferred to the commissary department, with the rank of captain, and stationed at St. Louis and New Orleans until Mar., 1853, when, after a six months' leave of absence, he resigned from the army Sept. 6, 1853, to engage in the banking business in San Francisco; removed to New York in 1857, in which year the affairs of his firm were closed. In 1858 he removed to Leavenworth, Kan., where he practiced law until July, 1859, when he was elected superintendent of the proposed military academy in Louisiana. The institution was opened Jan. 1, 1860, as the Louisiana State Seminary of Learning and Military Academy, and Sherman remained at its head until Jan. 18, 1861, when he addressed a letter to the Governor asking to be relieved "the moment the State determined to secede." His request was soon after granted, and in the latter part of February he left for St. Louis, where for a short period he held the presidency of a street-railway. On May 14, 1861, he was appointed colonel of the Thirteenth Regular Infantry, and soon after his arrival in Washington was placed in command of a brigade in Tyler's division, which he led at the battle of Bull Run, July 21. On Aug. 3 his commission of brigadier-general of volunteers was issued, to date from May 17, and Aug. 24 he was ordered to duty in the department of the Cumberland under Gen. Anderson, succeeding to the command of that department Oct. 8, 1861, but was relieved in November and sent to Missouri. After a brief service on inspection duty he was (Dec. 23) placed in command of the camp of instruction and post of Benton Barracks, whence in Feb., 1862, he was transferred to Paducah, Ky., to aid in the operations then in progress on the Tennessee river. Here he organized the division which he subsequently commanded at the battle of Shiloh (Apr. 6-7), where his conduct did much to check disorder and overcome the shock of the unexpected onset. Gen. Halleck reported that Sherman's firmness at the 6th saved the day. Grant officially announced that he was indebted to Gen. Sherman for the success of the battle. The advance upon and siege of Corinth next followed, resulting in the evacuation of that place May 29. In the meanwhile (May 1) he had been promoted to be major-general of volunteers. In July, having been assigned to command the district of Memphis, he occupied that place until the 21st, where he remained until called upon in December by Gen. Grant to take command of the expedition for the capture of Vicksburg. As this movement was intended to be a surprise, the preparations were hastily executed. Embarking his troops Dec. 21, a landing was effected on the 26th at Johnston's Landing, some 12 miles up the Yazoo. On the 29th the attempt to carry the position by assault was bravely made, but without success, and, owing to the surrender of Holly Springs, which overthrew Gen. Grant's plan of co-operation, re-enforcements were arriving to the aid. Sherman returned to Milliken's Bend, where Gen. McPherson took command Jan. 4, 1863. Sherman was assigned to the Fifteenth Corps, which took a leading part in the assault and capture of Arkansas Post (Fort Hindman) on the 11th.

In the Vicksburg campaign which succeeded, Sherman bore a prominent part with his command—in the expedition to Steele's Bayou to the Yazoo (March); the feint upon Haines-

May 29–May 31), movement to Grand Gulf (May 1–3), capture of Jackson (May 14), the occupation of Walnut Hills and subsequent assaults upon the fortifications at Vicksburg (May 18 and 22), in each attempt the capture of the position planned on the enemy's works; and in the siege of the city ended in the surrender of the city July 4, 1864. Sherman with a detached command was at once ordered to follow Johnston, who with a relieving force had been trying to force the Black, but retreated hastily on the news of the approach, being eventually driven behind the intrenchments of Jackson. On the night of the 18th Johnston succeeded in escaping. After destroying the railways in all directions Sherman fell back to the W. of the Big Black, along which he lay when summoned (Sept. 27) to the relief of Johnson's beleaguered army at Chattanooga. Meanwhile he had been appointed lieutenant general in the regular army, his term from July 4. On Sept. 27 the last of his command was evacuated at Vicksburg, reaching Memphis Oct. 4, where he marched onward, repairing the railway as he moved, and the 20th, when orders reached him at Tennessee from Gen. Grant, who had superseded Rosecrans, to resume all work and leave on to Chattanooga. On Nov. 1 Sherman arrived at that place, and, after viewing the position, marched back to his command, which he found in a position on the 23d, and at 3 p. m. the next day he ordered the north end of Missionary Ridge, which seemed to strongly fortified during the night. At sunrise on the 25th, by orders Sherman attacked Bragg's right as it seemed to be weak in the Confederate order, on which then Bragg was thrown at 3 p. m., and by midnight Bragg's army was in full retreat. Sherman and Hooker pursued at daylight the retreating army, the former turning back on the 28th to take command of the force for the relief of Burnside at Knoxville and reported to be unable to hold beyond that day. He moved rapidly, making the last 84 miles in two days, and Laumet was compelled to leave the city and retreat to Virginia, whereupon Sherman returned to Chattanooga and ordered his command into winter quarters. Since Oct. 27 Sherman had commanded the department of the Tennessee, though retaining command of troops in the field.

The following year (1864), on Feb. 2, Sherman moved out from Vicksburg with two divisions, and, making his way to Meridian, the great railway center of the Southwest, he cut the source of supplies for the Confederate army in the region, destroyed the railways in every direction, burnt gunpowder, etc.; but, owing to the failure of the winter division of health to perform its part, the expedition was obliged to return (Feb. 29). Gen. Grant having been promoted to be lieutenant general, he named Sherman as lieutenant general in command of the military division of the Tennessee, composed of the departments of the Ohio, the Cumberland, the Tennessee and the Arkansas. Assuming command about the middle of Mar., 1864, Sherman at once turned upon the task of organizing his army and ordering his communications preparatory to the spring campaign, which was to be directed against Atlanta, Ga., and to the Southwestern with the opening of the Richmond campaign by Grant. Accordingly, on May 6, Sherman set out with his army from the winter quarters about Chattanooga. To oppose him was the army of Johnston, lying about Dalton and numbering not far from 45,000. Sherman's force numbered 38,707 men of all arms, with 254 guns. Johnston was compelled, by Sherman's flank movement, to abandon Dalton May 13, and fall back upon Resaca, where he was evacuated after a severe battle (May 15), and retreated to Allatoona Pass. Without attempting to take any strong position in front, Sherman, on the 23d, by a flank to the right, marched on Dallas, Johnston took a strong position about New Hope Church, where severe fighting occurred May 25–26. On June 1 Allatoona was taken by Sherman and made a secondary base of supplies, as the 4th Johnston retreated to the strong position of Peachtree, Pine, and Look Mountain. From June 10 to 27 a most constant fighting occurred, when, after two unsuccessful assaults on Kennesaw (June 27), Sherman began the decisive flank movement by the right. That night the position was abandoned by Johnston, and by July 10 the army had fallen back across the Chattahoochee and taken up a new covering Atlanta. Here he was superseded in command July 13 by Hood. On this day Sherman commenced crossing of the Chattahoochee, and on the 19th and 20th the battle of Peachtree Creek was fought, resulting in the evacuation of the enemy to the intrenchments of Atlanta.

On the 22d Hood, by a night march, had gained the left of Sherman's line, which he attacked frontally, a severe battle ensuing, the enemy finally retreating to their defenses. A movement to flank Hood out of Atlanta by cutting the railways, in his rear was in progress when (July 28) Hood made a vigorous attack, but was repulsed with great loss. On Aug. 12 Sherman was made a major general in the regular army. Sending Kilpatrick out to destroy the railways in the rear, he swung around to the S. W., and by Aug. 26 his entire army, excepting the Twentieth Corps, was behind Atlanta, busily engaged in destroying the only railways by which that city was supplied. During the night of Sept. 1 Hood evacuated Atlanta, after destroying everything that could be used, and on the 2d Sherman with the Twentieth Corps entered the city. Sherman's losses from Chattanooga amounted to 21,337; the Confederate loss was about 25,000. Hood had been reinforced from time to time, and had yet an effective force of 40,000. Sherman received in June Blair's Seventeenth Corps, with 14,000. Hood then drew off to about Lawrence's, fighting with Hardee, while Sherman gave his army a much-needed rest. On Sept. 28 Hood resumed operations by crossing the Chattahoochee and operating against Sherman's communications, spending before Atlanta Oct. 3, and by a garrison of 1,944 men. The reported strength of the Confederates were of no avail, and were finally abandoned, but not until 707 of the little band had fallen, while the loss of the enemy was not less. Hood then moved S. W., Sherman following as far as Milledgeville, Ala., when, becoming convinced that Hood's only design was to draw him out of Georgia, he abandoned further pursuit, and despatching the Fourth and Twenty-third Corps to reinforce Thomas at Nashville, and leaving the latter to defend Tennessee against Hood, he took back all the surplus property and supplies to Chattanooga, broke up the railway, destroyed Atlanta, and, cutting the telegraph behind him Nov. 15, started on the 15th upon his famous "march to the sea." The history of this march is well known. On Dec. 10 Sherman was before Savannah, Fort McAllister was carried on the 13th, and on the night of the 20th Savannah was evacuated while Sherman was on his way to Hilton Head to arrange for making this very step impossible. Returning to Savannah, he entered the city on the 23d. His loss from Atlanta was 800, including 100 killed, 428 wounded, and 278 missing. By resolution of Jan. 10, 1865, the thanks of the people and of the Congress of the U. S. were tendered to Gen. Sherman and his command. After resting at Savannah and settling his army he moved northward Feb. 1. Columbia was occupied on the 13th; Cheraw, Mar. 3; Fayetteville, Mar. 11; the battle of Averysboro was fought Mar. 16; that of Bushyville, Mar. 19–20; Goldsboro was occupied Mar. 23; Raleigh, Apr. 13; and Apr. 18, at Durham Station, Sherman accepted the surrender of Johnston's army on a basis of agreement which was rejected by the Government, but on the 26th received the surrender on the terms accorded to Lee by Grant. Resuming his march, Washington was reached May 24, 1865, where, after the grand review, his army was dissolved. On June 27, 1865, he was appointed to command the military division of the Mississippi; was promoted to be lieutenant general July 25, 1866, and Aug. 11 assigned to command the military division of the Missouri. On the accession of Gen. Grant to the presidency he became general (Mar. 4, 1869). In 1871–72 he made an extended tour in Europe and the East. In Oct., 1874, the headquarters of the army were removed from Washington to St. Louis, but in Apr., 1878, were re-established at Washington. He published in 1875 *Memoirs of General W. T. Sherman, by himself* (revised edition, 1886). Retired Feb. 8, 1884. D. in New York, Feb. 14, 1891.

Revised by JAMES MERCUR.

Sherry-wine: See WINE and WINE-MAKING.

Sherwood. MART MARTHA (*Belle*; author) b. at Stamford, Wiltshire, England, May 6, 1775; married Capt. Sherwood of the army 1801, with whom she resided in India 1804–18, and settled on her return at Wickwar, Gloucestershire, where they lived many years. Her husband died in 1849; she died at Twickenham, Sept. 22, 1861. She was the author of 20 vols. of widely circulated works, chiefly written with a moral object, and many of them for juvenile readers. The best-known are *Little Henry and his Brother, Henry Milner, Erwin, Rosabel, and The Lady of the Manor*. A *Memoir*, including an autobiography, was published by her daughter, Mrs. Sophia Kelly (London, 1854), and a collected edition of her works in 16 vols. appeared in New York about 1852.

Revised by H. A. BEANS.

Sherwood Forest: a hilly region in the west of Nottinghamshire, England, between Nottingham and Worksop, about 25 miles in length by 8 in breadth. It was once a royal hunting-forest, and known to legend as the scene of Robin Hood's exploits. It is divided into farms, and it includes the town of Mansfield, several villages, and many parks and gentlemen's country-seats. The soil is gravelly and usually unproductive.

Shetland (or Zetland) Islands: a group of about 100 islands, of which 23 are inhabited, in the Atlantic Ocean between lat. 59° 50' and 60° 52' N., and belonging to Scotland. Area, 551 sq. miles. Pop. (1891) 28,711. The largest island is Mainland, with the town of Lerwick; among the others are Yell, Unst, Barra, and Foula. They are all treeless, high, and rocky, presenting steep, abrupt, and bold coasts, with fine natural harbors, and a rugged, wild surface in the interior. In the valleys some oats, barley, and potatoes are cultivated. The climate is mild and damp. Many cattle and sheep are reared, but the principal occupation of the inhabitants is fishing, especially for cod and herrings, giving employment to 7,500 men and 300 boats. Eggs form an important article of export. See Hibbert, *A Description of the Shetland Islands* (new ed. 1892).

Shevchen'ko, TARAS GRIGOROVICH: the greatest of Little Russian writers; b. Feb. 25, 1814. He was the son of the serf of a German landed proprietor in the government of Kiev, and from his childhood was exposed to brutal treatment, but picked up the rudiments of an education, early showing a talent for song and also for painting, which caused him to be apprenticed to a house-decorator in order to learn that business. In 1832, with his master, he moved to St. Petersburg, where he attracted the interest of the poet Zhukovskii and others, who bought his freedom. At first all went well with him, but in 1847, owing to some of his writings and to his participation with KOSTOMAROV (*q. v.*) in a society of which the Government disapproved, he was banished as a common soldier to the Asiatic frontier of the empire. In this vicinity he passed the next ten years, part of the time in prison and forbidden to write or paint. After the accession of Alexander II., the intercession of powerful friends procured his pardon, but although he began to compose again his health was broken and he died in St. Petersburg, Feb. 26, 1861. Shevchenko's *Kobzar*, a volume of lyrics in the Little Russian dialect, appeared in 1840 (new ed. 1860), and achieved great popularity. The deep poetic sympathy for the life of the people in these pieces made their author the idol of his countrymen, while the hopeless sadness and pessimism of his tone were the natural result of his own experiences. In 1841 he brought out *Haidamaki*, a Cossack epic, also the only Russian one with claims to greatness, and this was followed by *Hamalia, Maiak*, and other pieces. See article in the *Revue des Deux Mondes* (1874), and *The Peasant Poets of Russia*, by W. K. Morfill, in *The Westminster Review* (July, 1880). A. C. COOLIDGE.

Shibboleth [from Heb. *shibboleth*, ear of corn, stream, deriv. of **shābhal*, increase, flow]: a test or password by which one's rank in society is indicated. It is recorded in Judges xii. that after Jephthah's victory over the Ephraimites the men of Gilead detected their fugitive enemies by requiring them to pronounce the word *shibboleth*, which the Ephraimites called *sibboleth*, and thus betrayed their origin; whereupon they were put to death.

Shield [O. Eng. *scield*: O. H. Germ. *scilt* (> Mod. Germ. *schild*): Icel. *skjöldr*: Goth. *skildus*]: a buckler, a broad defensive weapon carried upon the arm to protect the body from blows and missiles. Most savage nations employ shields of some form, and all the nations of antiquity used them, as in mediæval Europe, down to the general introduction of gunpowder in warfare. The shield is of great importance in heraldry. For practical use, shields were of leather, wood, basketwork, etc. See HERALDRY.

Shieldrake: See SHELDRAKE.

Shields: the name of two towns of England, about 8 miles from Newcastle, opposite to each other on the Tyne, near its entrance into the North Sea—North Shields on the northern bank, in the county of Northumberland; South Shields on the southern, in the county of Durham (see map of England, ref. 4-1). North Shields has two docks—the Northumberland, of 55 acres, opened 1857, and the Albert Edward, of 24 acres, opened 1884. There are large exports of coal and coke and imports of timber, grain and esparto-grass. North Shields forms part of the borough of TYNE-

MOUTH (*q. v.*). The total tonnage entered and cleared at both ports, exclusive of that coastwise, was, in 1893, 3,540,860. South Shields is an old town, but is well built in its modern part. It has a town-hall, public library and museum, marine school, etc., and a park of 45 acres. The south pier, a breakwater nearly a mile in length, was begun in 1854, and is not yet completed (1895). The Tyne docks of the North Eastern Railway, covering 50 acres, are chiefly used for shipping coal and coke. The harbor is lined with ship and boat yards, and alkali, glass, and iron works. On an eminence overlooking the harbor are the remains of a Roman station where coins, portions of an altar, etc., have been dug up. South Shields sends one member to Parliament. Pop. (1891) 78,431. R. A. ROBERTS.

Shields, CHARLES WOODRUFF, D. D., LL. D.: educator; b. at New Albany, Ind., Apr. 4, 1825; graduated at Princeton College (1844) and Theological Seminary (1847); was pastor of Presbyterian churches at Hempstead, Long Island, 1849-50, Philadelphia, 1850-65; and since 1865 has been Professor of the Harmony of Science and Revealed Religion in Princeton College. He has published *The Presbyterian Book of Common Prayer according to the Revision of the Westminster Divines* (New York, 1864; 4th ed. 1886), *Liturgia Expurgata* (Philadelphia, 1864; 3d ed. New York, 1884); *Philosophia Ultima, or Science of the Sciences* (vol. i., New York, 1877; 3d ed. 1889; vol. ii. 1889); *Order of the Sciences* (1884); *Religion and Science in their Relations to Philosophy*; *Essays on Church Unity* (1891); *The Historical Episcopate* (1894); and *The Question of Unity* (1894). C. K. HOYT.

Shi-Hwang-Ti: See CHI-HWANG-TI.

Shi'ites [Arab. *shiah*, sect]: the most numerous of Muslim heretical sects. Their main characteristics are rejection of the Sunna (see SUNNITES) and extravagant devotion to Ali, the son-in-law of the prophet Mohammed and the fourth caliph. The most advanced maintain that the revelation of the Koran was intended by God for Ali, but given to Mohammed through an error of the archangel Gabriel. The majority, however, are content with denouncing the first three caliphs, Abubekir, Omar, and Othman, as usurpers, and asserting that Ali was the rightful successor of Mohammed. The memory of the tragic death of Ali by murder, and of his two sons, Hassan and Houssein, by poison and murder, inflames the Shi'ites to this day beyond conception and is annually commemorated with bloody rites. The bitterness of hatred between the Sunnites and Shi'ites has never been equaled even in the most envenomed wars of Christendom. To kill one Shi'ite is declared by the Sunnites more acceptable in the sight of God than the slaughter of seventy Christians. In the treaties imposed by the Ottomans on Persia the first clause has commonly stipulated that the Persians, who are Shi'ites, should not hereafter curse the memories of the first three caliphs. The Shi'ites are found mainly in Persia, India, and among the Tartars. They number probably not more than 18,000,000, and are divided into many minor and hostile sects. E. A. GROSVENOR.

Shikarpur: town; in the Presidency of Bombay, British India; in a low, level, regularly inundated, but fertile and not unhealthful plain; in lat. 27° 57' N., lon. 68° 45' E.; 15 miles W. of the Indus, with which it communicates by a canal (see map of N. India, ref. 5-A). It is an entrepôt for transit trade between the Bolan Pass and Karachi. Pop. (1891) 42,004.

Shiko'ku: the third in importance of the islands forming the empire of Japan; between lon. 132° and 135° E. and lat. 32½° and 34½° N.; area, 6,855 sq. miles. The mean temperature is about 59° F. The island comprises the provinces of Tosa, Awa, Sanuki, and Iyo. The surface is hilly, and there is no mountain over 4,600 feet high. The chief towns are Kochi, Matsuyama, Takamatsu, and Tokushima. Pop. (1891) 2,827,397. J. M. P.

Shill'aber, BENJAMIN PENHALLOW: humorist; b. in Portsmouth, N. H., July 12, 1814; entered a printing-office at Dover 1830; was a compositor at Demerara, Guiana, 1835-37, and in the office of *The Boston Post* 1840-47; was editorially connected with the latter paper 1847-50, acquiring celebrity by his "sayings of Mrs. Partington"; was printer and editor of *The Pathfinder* 1850-52; proprietor and editor with Charles G. Halpine ("Miles O'Reilly") of *The Centinel* 1850-52; returned to the *Post* 1853-56, and was one of the editors of *The Saturday Evening Gazette* 1856-66; retired to his home at Chelsea, Mass., and devoted himself to

which are regarded as of great value. He was elected president of the American Institute of Mining Engineers in 1880, and president of the American Society of Civil Engineers in 1890. D. at Homewood, Pa., May 5, 1892.

Shinshu, or True Doctrine (known also as *Ikko-* or *Monjo-shu*): a powerful sect of Japanese Buddhists, having their headquarters at Kioto, in the great *Nishi* (West) *Hongwanji* temple. Its founder was a man of good family, Shinran Shonin (1173-1262 A. D.), who studied as a lad at Hiyeizan. (See Kioto.) The Shinshu sect finds salvation in the "extinction of passion," a doctrine at once the cause and effect of salvation, which salvation is called Nirvana. The doctrine of "help from another" is also taught, and Amita, or "the boundless" Buddha, is relied upon for the completion of merits and a rebirth into paradise. In this sect there is less difference than in any other between laymen and priests, the latter being allowed to marry and to eat flesh and fish.

J. M. DIXON.

Shinto (liter., Way of the Gods): the ancient cult of the Japanese, which has scarcely a title to be classed among religions, having no moral system and no eschatology. It has passed through three phases: the early stage, when it was part and parcel of the national life, and was as much political as religious; the second stage, when it had to struggle with the powerful and profound system of Buddhism, which almost swallowed it entire; and the modern stage, when a brilliant band of literary men sought to rescue it from the obscure condition into which it had fallen. These strove to identify it with a reformed patriotism and a restored imperialism, and their views finally triumphed in the restoration of 1868. The first period may be considered to have lasted until about A. D. 550, and its history is told in the *Kojiki* and the *Nihongi*, written a century and a half later—books which may be called the Japanese scriptures, in so far as they are concerned with the creation of the race and its early history from a religious standpoint.

Probably about the year 400 A. D. the ancestral worship out of which Shinto developed was so far organized that the home was no longer deemed sufficient, and a separate temple was erected. Over it was placed as custodian, or chief priestess, a daughter of the Mikado. When Buddhism arrived from the West in the sixth century it seems to have adopted wholesale the Shinto pantheon, and all that remained distinctive of the old ritual was the *gohei*. From this era is to be dated the term *Shinto*, way of the gods, in contrast with *Butsudo*, or way of Buddha, both Chinese terms. The *gohei* (liter., august cloth or present) was originally a piece of hempen cloth hung on the sacred *sakaki* (*Cleyera Japonica*) in honor of the gods. The material was changed successively to cotton, silk, and finally to paper. In modern temples all that is visible to the eye of the worshiper is a mirror and a bundle of these zigzag paper-cuttings attached to a rod. The paper is usually white, but on occasion a succession of *gohei* may be seen—yellow, red, black, white, blue—in honor of the gods of wood, fire, earth, water, and metal respectively. The wand plays a considerable part in the divination with which Shinto became associated during the thousand and odd years of its eclipse. The god was supposed to come in answer to the worshiper's call and to possess the wand, and through it the *gohei*, the whole rite resembling closely the Shamanism of Northern Asia. The priests of Shinto seem to have made clever use of the phenomena of water boiling on mountain heights at a low temperature, and of the heat-absorbing qualities of salt, in their ordeals of water and fire. See *Esoteric Shinto*, by Percival Lowell, in vols. xxi.-xxii. of the *Transactions of the Asiatic Society of Japan*.

The Tokugawa shogunate strongly favored Buddhism, with its gorgeous ritual and magnificent temples; but a reaction toward the simplicity of early Japanese life and customs set in among native scholars, Mabuchi (1697-1769), Motoori (1730-1801), Hirata (1776-1843) being the most prominent. This movement is known as the revival of pure Shinto, and was directly hostile to the dual rule under the shogunate. Satsuma, always less Buddhist than the rest of Japan, led the restoration movement in 1868, and the result was altogether favorable to Shinto, which became the only state religion. Buddhist temples were stripped, "purified," and handed over to Shinto keeping. The revived religion, however, proved entirely too feeble to supplant Buddhism and quickly lost ground. "Pure Shinto," indeed, was largely the fad of scholars, for Buddhism had appropriated and assimilated almost everything that was dear to the people in their old religion.

The Shinto temple proper (*yashiro* or *jinja*) differs from the Buddhist *tera* (monastery or temple) in being that is, destitute of furniture, smaller, and usually double. The inner shrine (*honsha*) at the back contains, carefully inclosed in a succession of boxes, the sword (if a male deity), or mirror (if a female), which is jealously guarded as the sacred treasure of the place. With this mirror the mirror exposed to view in the outer shrine or oratory (*haiden*) has nothing whatever to do, being a loan from Buddhism. Worshippers ascend the steps in front, strike the temple-gong with a mallet provided for the purpose, smite or rub their hands together, and then depart after throwing some coins on the floor. The entrance to the temple is a torii, or sacred arch. Shinto morality is practically a Rousseau-like following of natural impulses, and proclaims neither heaven nor hell; its priesthood is not a caste, nor wholly devoted to a religious life; it is largely a form of hero-worship, and intensely national; and its chief deity is Amaterasu, goddess of the sun, from whom the Mikado traces his descent.

Other deities are Susano, a kind of Mars, presiding over the moon; and his daughter Uga-no-mitama, popularly worshipped as Inari, the goddess of rice. Most of the deities appear to be deified human beings. See article on Inari for Japanese mythology, the *Introduction to the Kojiki*, and *Transactions of the Asiatic Society of Japan* (vol. x.), and various articles in these *Transactions* by Ernest Satomura. J. M. DIXON.

Ship-building: naval architecture, or the art of designing and constructing vessels for navigation, and more particularly the larger vessels, or those which carry naval forces, whether intended for war or for commercial purposes. It is impossible to state with any degree of accuracy the origin of the art, or the portion of the globe in which ship-building originated. Among razor-knives found in Denmark, belonging to the "bronze age" in Europe, are several with representations of the hulls of galleys which compare favorably with those of ancient Rome. The Phœnicians were the greatest commercial people of ancient history, and, instructed by the Egyptians, seem to have been the first to make material progress in the construction of vessels. Among the paintings in the tomb of Rameses the Great is a representation of a naval combat between the Egyptians and a people supposed to be Phœnicians, whose ships are propelled by sails. A biblical reference to the power of Tyre, capital of Phœnicia, describes its vessels and their construction: "The planking being made of the fir-trees of Senir (Hermon), the masts of cedars of Lebanon, the oars of the oaks of Bashan, the rowing-benches of ivory, and the sails of fine linen of Egypt. Reference is also made to mariners, pilots, captains, and men of war, showing the progress made in the art of ship-building and navigation. A peculiar feature in the construction of the ships of the Egyptians was the planking, which was about 3 feet square, and was laid overlapping, like shingles upon a roof, being fastened to the ribs or frames by wooden tree-nails. According to Herodotus the Nile vessels were fitted with rudders at the stern, thus antedating the application of that invention to sailing vessels by several centuries. The vessels of the Phœnicians served as models to the Greeks, whose ships of the height of their civilization, show a marked resemblance to those of the dwellers in Tyre.

Ship-building in Europe.—The nations of the north of Europe developed a class of vessels which, from specimens found buried in mounds in Scandinavia and Denmark, show a remarkable knowledge of the forms of least resistance, together with the strength of materials and their proper distribution, and suggest that the influence of the Phœnician ship-builders had in some way penetrated to the north of Europe.

Cæsar, in his history of the campaign against the Veneti in the year 54 B. C., states that their ships were built of tire of oak, and designed to endure the force and violence of the tempests; the rowers' benches were fastened by iron spikes; instead of cables, they secured their anchors with chains of iron. A Roman ship of the time of Trajan, sunk in Lake Ricciola, was raised after more than 1,300 years. The planking was of pine and cypress, covered on the outer side with sheets of lead fastened with copper nails.

The Greeks and Romans had a peculiar method of girding their vessels with long hempen cables, which, passing through holes at the stern-post, continued all around the vessel fore and aft immediately under the wales; as the hulls were undergirded transversely in the same manner

the buoyancy of the water acting in an opposite direction through a point which is the center of gravity of the volume of displacement, called the center of buoyancy. When the vessel is at rest in an upright position the two points lie in the same vertical plane. The position of the center of buoyancy is calculated about two axes—one taken at the load-line and the other at the mid-length of the vessel. In order that the vessel may float at a given draught at the bow and stern, the center of gravity of the vessel in a fore-and-aft direction must lie in the same vertical line with the center of buoyancy of the immersed body. When these points are thus located the vessel is said to be in trim and proves the correctness of the designer's calculations, for in order to ascertain with accuracy the position of the center of gravity of the vessel the weight of each particle that goes to make up the entire vessel must not only be calculated, but also its moment about some point in the length taken as an axis. In a similar manner, the vertical center of gravity must be determined in order to ascertain its distance, called the metacentric height, below the metacenter of the vessel. The metacenter is a point above the vertical center of buoyancy at a distance equal to the moment of inertia of the load-water plane divided by the volume of water displaced. The metacentric height is a measure of the initial stability of the vessel, but not of the range of stability. (See *HYDROSTATICS, Stability of Floating Bodies*.) For good easy behavior the metacentric height should not exceed 3 feet, and for safety not be less than 18 inches, provided that the vessel has a reasonable amount of free-board or height out of water. There are many other calculations that can be made in regard to the stability of the vessel in various conditions of load or when some of the compartments are filled with water.

The plans necessary to give a clear idea of the design are given below, but these must be supplemented by detail plans of the principal parts of the vessel: 1. Plan of lines, or half-breadth and body plan. 2. Midship section. 3. Profile in-board. 4. Deck plans. 5. Cross-sections. 6. Sail plan.

The plan of lines shows the form of the vessel, and is in reality the "traces" of planes taken at right angles to each other throughout the ship. From these the shape of the vessel is laid down full size upon the mould-loft floor. The midship section is taken at the mid-length of the vessel and shows the character of the framing, the disposition and thickness of the plating of sides and bottom, decks, bulkheads, stringers, etc., in fact, all the parts upon which the strength of the vessel depends. If the vessel is not built according to the rules of one of the insurance companies, plans and calculations showing the strength of the structure must accompany the application, and this involves considerable mathematical investigation, for the ship must be taken as a girder, and the maximum stresses the material is subject to calculated for the top and bottom flanges of the girder. The inboard profile gives the location of the principal weights in a fore-and-aft direction, the spacing of the frames, the location of bulkheads, the distances between the decks, the position of cargo hatches, and the portions devoted to cargo, coal, passengers, crew, etc. The deck plans and cross-sections show the general arrangement of the deck framing and plating, and the arrangement of the cabins and passenger accommodations. The sail plan gives the general outside appearance of the vessel, with the amount of sail carried, the height of masts, etc. The many questions of handling cargo quickly and effectively, of steering-gear for controlling the vessel, providing sufficient sail-power to prevent the vessel falling off in the trough of the sea when the machinery is disabled, the working and stowing of lifeboats, give the designer occasion for the careful application of scientific and experimental data. The work involved in the preparation of the design for a war-vessel is of a much more complex nature. The features of speed, armament, protection, accommodation, and endurance are so thoroughly interwoven and depend so much one upon the other that the emphasizing of any one feature must be at the expense of some of the others. Thus the most thorough and scientific investigation must be made of the vessel in all its features to enable the maximum of efficiency to be attained in the ship as a whole.

Laying Down.—The form of the vessel or the lines having been determined in the draughting-room, the frames or ribs are next drawn full size upon the floor of a building known as the mould-loft, in order that moulds or scurve-boards may be made, to which each frame is shaped or bent. To facilitate the work in the loft, the ship is divided into two parts called the fore and after bodies, being divided by

an imaginary line amidships, or a point near which the curvature of the lines is reversed. On the bodies are laid off the edges of the plating, the line of the stringers and keelsons, the undersides of the decks, the outline of the floors, etc. For the wooden vessels the moulds represent the shape and taper of the frame timbers. Pieces of timber are then selected and worked exactly to the moulds, their edges beveled to conform to the curvature of the vessel taken from the mould-loft floor, and the joints or butts carefully doweled together. For metal vessels the moulds are made to show the shape of the outer edge of the frame and the line of the floors; the object in thus moulding, shaping, and bending the frames is to have them their true shape, so that when put together they shall form the outlines of a vessel, agreeing with the plan of the naval architect, and giving, when the planking or plating is fastened to them, the complete outline of the hull. While this part of the work is going on, the shipwrights are preparing the foundation and laying the keel-blocks upon which the vessel is to be built.

Ordering Material.—For convenience in ordering the material of an iron or steel vessel an exact model of it is made in wood on a scale $\frac{1}{4}$ th or $\frac{1}{8}$ th of full size; on this model are marked off the stations or the frames, the deck-lines, the edges of the plating and stringers, and the plates laid off in their proper lengths so as to have a proper shift of the butts or joints. The dimensions of the frames and plates are then measured from the model, and after verification as to width in the loft are sent to the mills. An allowance is made for machining the plates, or such of them as form the outer strakes, for the inner strakes are often placed on the ship without planing the edges, the ends only being machined in order to have close joints for calking metal to metal.

Keel-blocks.—As the entire weight of the vessel must come upon the keel-blocks, it is essential that they shall have a very firm foundation, such as piling or concrete; they generally slope lengthwise toward the water, and are placed about 4 feet apart from center to center. Each block is built up of several pieces of timber, the bottom pieces often of sufficient length to serve as a foundation upon which to build up the supports of the launching ways; the upper pieces are in some yards so put together as to permit of being removed from under the keel without splitting, while in others the removal of the blocks is effected by splitting out the cap pieces. The blocks are generally given an inclination to the foot of from five-eighths of an inch in heavy vessels to three-quarters of an inch in light ones, to facilitate launching.

Keel.—The first operation, be the ship of wood or metal, is to place the keel upon the blocks; if the vessel is of metal the keel may be constructed after one of several methods. The bar-keel consists of a plain bar in suitable lengths with scarfed butts, the plating of the garboard strakes being flanged or turned down against the bars, and riveted through and through. Another variety is the side bar-keel, which is built up of three parts, the middle piece extending above the keel proper to a depth equal at least to the floors, and the garboard strakes being riveted through in a manner similar to that employed with the ordinary bar-keel; this is one of the strongest of keels, and also one of the most costly. Another variety, and one that, in these days of cellular or double-bottom construction, finds general acceptance, is the flat keel; this consists merely of flat plates bent to shape. If the keel laid is a bar-keel of either type, the garboard strakes are at once put in place to afford a landing for the frames. The stem and stern post are set up, and, if the vessel is of wood, the deadwood and other pieces in the center line are bolted in place.

Stem and Stern Post.—The stem of a metal vessel is usually a simple forging rabbeted to receive the ends of the plating—that is, a recess is cut in it on each side so that the plates may end in it and form a fair and flush surface. The stern-post, if of a single-screw vessel, is quite an elaborate forging, although of late years castings of steel have been substituted for forgings with great success. The post is made up of two parts in one, first the post proper on which the plating ends, and through which the screw-shaft passes, forming incidentally a part of the stern bearing, and second the rudder-post or the support of the rudder; the two connected form a continuous frame about the propeller. In twin-screw vessels the stern frame is scarcely less elaborate, for provision is usually made for heeling thereon the shaft brackets or struts which support the screws. The frame must also receive the ends of the hull-plates and support the rudder.

Frames Forward.—In wooden ships the frames are raised up, and usually fastened to the keel, and are set at right angles to the keel, except that at the ends they are placed across on the outside planking. These end timbers are called "ends," and are adjusted at their heels to mortises cut in the deadwood. In iron vessels of the plating class the frames and floors are often riveted up entire upon the keel, and each raised to their place upon the keel or garboard plates, but first the frames and floors must be bent to shape, and this is done as follows: The frames are usually in three or four parts in one length, either of single box, single sole, channel, or Z bars. The long bars are placed in a furnace especially arranged for this purpose, and heated until they can be readily bent to the shape of the mould, which has been worked off upon the landing slide; the ends are of cast iron, from 3 to 4 inches thick, perforated with square holes already set, and arranged so as to form a smooth floor of sufficient size to accommodate the largest frames, and give room to the workman. In the square holes, iron stops are placed, agreeing in contour with the shape of the mould; the bars after being heated are forced back against the stops and at the same time bent to conform to the levels taken from the moulded-off floor. After cooling, holes are punched by the rivets used in connecting the frames with the floors, side plating, beams, etc.

The upper ends of the frames are held by crosspieces of plank, called spalls. Each frame is adjusted so as to be exactly perpendicular to the keel, and is held in place at the top by strips of timber called rib-bands, which have been prepared from measurements taken from the loft, and the proper positions of the frames marked thereon. The rib-bands and frames are shored up to keep them in position until the inner strakes of plating are on.

Main Keelson.—The main keelson is then placed upon the beams directly over the keel, if of wood, it is fastened through floors and keel, but if of metal it is riveted to the beams, they in turn being riveted to the outside plating. This keelson serves to keep the floors from tripping and enforce the stress-resisting element of the vessel.

Double-bottom Plating.—A much better disposition of the material, on the same weight, is known as the cellular construction, or double-bottom system; on this system are constructed nearly all of the large and magnificent vessels engaged in the transatlantic trade, and nearly all war-vessels. The frames in the double bottom, or the space between the inner and outer skins, are made up of short frames and braced plates somewhat like the latticework of bridge girders, between the keelsons or longitudinal, so that the reaction of the longitudinal and transverse framing must be carried on together; outside of and above the double bottom the raising of the frames is substantially the same as described above.

Setting on Planking or Nailing.—Before the planking is put on the vessel the sheer lines at side and the normal lines or spilloings of the bottoms are marked on the outside surface of the frames; the spilloings are found by fastening a board, square, and straight-edged battens to the frames in such a manner as to cross the midship frame at right angles; the battens will then assume a line at all points normal or square to the frames of the ship. These lines are laid off at intervals of from six to eight inches or wider of planking. The boards are worked either in parallel strakes or in combination of two strakes with the alternate edges straight. This is sometimes called the "anchor-stroke method," the object being to have the narrowest portion of one strake always opposite the widest portion of the other. The battens of the plank are shifted so as to have at least three strakes between centers in the same frame space. The strakes next the keel, called the garboard strakes, and those at the heads of the beams are made thicker than the balance of the plank, in order to have the greater amount of material at the parts of the vessel where the greatest strains are experienced. Before the planks are placed in position the frames are often bound together inside and strapped diagonally by iron bands 2½ to 3 inches wider than the frames are bound longitudinally by the planking and ceiling and diagonally by the beams. In metal vessels the plates forming the outside skin are worked to lengths from 12 to 20 feet, and in widths varying from 24 to 30 inches. Templates are constructed from the loft, giving the exact size of the plates with the position of the rivet holes marked thereon; the plates are then planed to the required sizes and the rivet-holes punched and countersunk, and are then ready to be put in place. The bulkhead strakes are placed in position first and bolted up. Tem-

plates of the rivet-holes in the edges are taken off for the outer strakes in order that the holes in the inside and outside strakes may exactly coincide for riveting. The necessary holes for the stringers and keelsons are also punched at the same time. As the finished surface of the vessel beneath the water must be smooth and free from all projections, the rivets that pass through the plates are bent down to a conical head to fit counterbores in the outer surfaces of the plates.

Deck Beams.—The beams not only serve to carry the deck and its load, but are also struts and ties which prevent in a certain measure the ship's sides from collapsing; it is very necessary therefore that they shall have great connection with the frames and the outer skin. In wooden vessels the beams are made in one length, if possible, but are sometimes built up, that is composed of several pieces of timber securely worked and bolted together. The beams rest at their outer ends upon clamps, which are thick plates of plank running fore and aft on the inner side of the frames, and are securely fastened by means of vertical knees to the framing and planking. They are also braced in a longitudinal direction by smaller knees placed horizontally. The whole structure—beams, knees, clamps, frames, and planking—is thoroughly bolted and clamped together.

In order to give the beams strength to resist deck loads, and at the same time throw the water in the sides, where the waterways are loaded, they are slightly arched; the arch is called spring or round.

The beams of metal vessels are usually formed of iron or steel rolled to shapes known as T or angle bars. They vary in weight and in depth from 4 to 15 inches. The lengths are taken from the plans and ordered in one piece for each beam, with the proper round or spring. The beam so ordered is slightly longer than the distance from side to side of the ship, to allow for turning down the lower half at the ends to form knees through which they are fastened to the frames. The method of forming the knees is to split the beam for a slight distance at each end, midway of its depth, and turn down the lower half upon a former; a piece of metal is then welded in to connect the upper and lower parts. After the beams are in position the spalls can be removed from the frames, leaving the space between decks free for the workman. In framing the decks the beams are arranged to allow of the boilers and machinery being lowered to their beds without disarrangement of the deck-plating; provision is also made for the cargo-hatches, mast-partners, and other openings.

Inner Skin or Ceiling.—In wooden vessels the ceiling and the thick strakes and keelsons form a complete lining to the vessel, worked on the inner side of the frames. In metal vessels the inner skin is more often called the inner bottom, and is worked only when the vessel is constructed on the cellular system. It is usually placed from 8 to 24 feet from the outer skin, to allow ready access for thorough inspection, cleaning, and painting. It is worked on the upper side of the bracket frames very much in the same manner as the outside plating is put on. For structural purposes the inner bottom enters largely as a factor of strength. Many freight-vessels, oil-steamers, and colliers are provided with inner bottoms, the space between the inner and outer bottoms being used as tanks for water ballast.

Bulkheads.—At certain positions throughout the ship are located water-tight partitions or bulkheads; those in the middle portion of the vessel are necessarily determined by the arrangement of the boilers and machinery, but every effort is, or should be, made to allow at least any two of the compartments bounded by the bulkheads to be filled with water without endangering the stability of the vessel. The foremost bulkhead of all is called the collision bulkhead, and is located half the maximum breadth of the vessel from the bow. This bulkhead is especially stiffened and braced to withstand the pressure of the water against it in case of injury to the ship forward of it. In metal vessels bulkheads have two functions to perform: one to serve as a structural tie uniting the sides of the vessel, the other, by far the more important, to confine the inflow of water in case of damage to the compartment injured. The pressure per square inch due to a head of water of 25 feet is about 11 lb. Very efficient stiffening must be provided to enable the plating to withstand such pressure. The best method of construction is to have the plating worked horizontally, with heavy vertical stiffeners bracketed at the heads and heels. The stiffeners may be of rolled shapes or built up of plates and angles, as the depth and width of the bulkhead may

require. In addition to the vertical stiffening, horizontal webs are sometimes worked on the opposite side of the bulkhead, with their ends securely bracketed to the ship's side.

Decks.—The upper deck, to which is carried the full scantling of the vessel, plays a very important part in the structural strength. The arrangement of the material subject to longitudinal stress may be compared to a beam of which the upper deck is the top and the keel the bottom flange, the outside plating forming the web of the beam; therefore in vessels of large size this deck is plated completely over in order to secure for the top flange of the girder the proper sectional area. On the ends of the beams are worked stringers of heavier plating than the balance of the deck-plating, making good connection with the sheer strake by means of heavy angle bars; the space between the stringers is filled in with plating as required. In wooden vessels the strength at the deck is made up through the waterways, thick strakes, and clamps, which are strong pieces of timber or plank running longitudinally.

The remaining decks of an iron vessel are worked in a manner similar to the upper deck. Where the frames pierce the plating staple-angles are sometimes worked about the frames to make them water-tight. Deck beams should be supported by stanchions; so far as possible these should be in the midship line, but for convenience of staterooms and deck arrangements they are sometimes worked two to a beam, and placed beside the joiner-work bulkheads.

Fastenings.—The fastenings of a wooden vessel are composed of copper and iron bolts, iron spikes, and treenails of wood. The plank is fastened generally by spikes or treenails, except at the butts, which are bolted. For additional security the frames, outside and inside planking, are often fastened together by through-bolts, driven from the outside and riveted on washers against the inside of ceiling. The deck plank is usually fastened by spikes. The fastenings of a metal vessel consist almost entirely of rivets, which are hammered into place while hot.

Calking.—When the planking is fastened the seams or slight spaces between the edges of the plank are filled with oakum, and this is driven in with great care until it is as hard as the plank. To hold the oakum the planks are laid with a slight bevel outward, about $\frac{1}{16}$ th of an inch for each inch of thickness of plank; otherwise the oakum would be easily forced through the seam. An improved method is to cut a recess in the edges of the plank about midway of the depth, so that the oakum will spread into the recess and render it impossible to be driven through. After the calking the seams are paid with hot pitch or marine glue. In metal vessels all water-tight work must be calked metal to metal, that is, a slight layer of metal must be driven over against the adjacent metal until the joint is absolutely tight. This work was formerly done entirely by hand; now a calking-tool operated by compressed air or electricity is used, the blows being given with great rapidity.

Launching.—The vessel has been built resting upon the keel-blocks and shores; while here the shafting and propellers have been put in place, the rudder hung, the bottom painted, and all work below the water-line on the outside surface finished. Now the vessel is to be transferred from the fixed keel-blocks to a movable platform which shall allow the vessel to move easily and without damage into the water. This is done by building on each side of the vessel, about one-fourth of the breadth of beam from the keel, a platform or foundation to which the weight of the vessel shall be transferred. In laying the keel-blocks the bottom pieces were made of sufficient length to allow of their forming the foundation for this platform. On these are built up the groundways, which are shored to prevent spreading and are capped with strong pieces of timber, 3½ to 4 feet wide, with smooth upper surfaces; on these are laid the bilgeways, which are also large smooth pieces of timber, free to slide with the vessel; on the bilgeways are constructed the cradles, which are fitted to the ship's bottom; between the cradles and the bilgeways are fitted rows of long wedges of such thickness that when driven up the vessel will be lifted from the keel-blocks, and the weight brought to bear on the groundways. The upper surface of the groundways and the bottom surface of the bilgeways are coated with tallow, and the bilgeways secured to the groundways by pieces of plank at the bow so that they can not move until they are sawn asunder. Then the wedges are set up until the keel-blocks can be removed and all clear for launching; when all is clear, the planks at the bow

are sawn off, and the vessel, resting only on the greaser surfaces, begins slowly to slide down the inclined plane. She soon gains headway, and in a few seconds is in the water. After launching, the fitting of the joiner work and cabins, the putting together of the machinery, stepping and securing the masts and rigging of the ship, are proceeded with until the vessel is complete in all respects.

PHILIP HICHBORN.

Ship-canals: canals intended for the passage of ships proper; hence, therefore, canals to connect sea with sea, and thus by a short cut to obviate a long ocean navigation. Such canals are usually laid across an isthmus or peninsula. The Suez Canal is an apt instance; so also are the projected canals across the Central American isthmus and the isthmus of Florida. The CALEDONIAN CANAL (q. v.) of Scotland is an instance of a class of minor ship-canals. In another sense ship-canals are those proposed to connect routes of natural navigation (rivers or lakes), by allowing a passage of the vessels, whatever they may be, used in such navigation. To this class belong many of the works described in the cyclopædia under separate heads—e. g. the ILLINOIS AND MICHIGAN CANAL (q. v.); see also the article CANALS.

The importance of a navigable connection between the Atlantic and Pacific Oceans through the isthmus which connects North and South America calls for a condensed view of the chief plans proposed at different dates, and of the natural obstacles baffling them all up to the present. From the era of the Spanish conquest of America the search for the secret of the supposed natural strait was carried on along the whole coast-line of the two continents; and when this ceased, the possibility of the construction of an artificial route began to be discussed. Governments, companies, and individuals have devoted much time and money to the search for a practical route for a ship-canal. Tehuantepec, Honduras, Nicaragua, Chiriqui, the Isthmus of Panama (or Darien), and the Atrato river, have all figured in connection with this question, and a full statement of the various surveys and projects made prior to 1866 will be found in the report of the superintendent of the U. S. Naval Observatory (Admiral C. H. Davis), made in compliance with a resolution of the U. S. Senate (*Ex. Doc.* 624th). See also *Engineering* (London), in a series of articles entitled *The Nicaragua Canal* (Feb. 24, 1893, *et seq.*).

The results of the surveys since 1875 of the American isthmus for ship-canals and their substitute, the ship-railway, will be found under *Nicaragua Canal* and *Panama Canal*, below, and in the article SHIP-RAILWAYS. Since 1875 important results at both Nicaragua and Panama have proceeded from efforts to construct the canals. The remaining projects have ended either in surveys and estimates, or in lapsed concessions from the governments on whose territory the canals were to have been constructed.

Panama Canal.—Across the Isthmus of Panama occurs, next to Nicaragua, the greatest depression yet found on the isthmus, the summit-level of the railway being 287 feet above sea-level. The route from Porto Bello or Chagres to Old or New Panama has been the established line of communication since 1658, nearly coeval with the first settlement in America. A survey was made in 1843 by the French engineer, M. Garella (*ingénieur-en-chef des mines*), of which the report was printed in the *Journal of the Franklin Institute*, and in the French *Journal des Ponts et Chaussées* (1844). George M. Totten, chief engineer of the Panama Railroad, subsequently made an estimate for a canal with locks, to cost from \$60,000,000 to \$115,000,000, according to the summit-level adopted. The survey was renewed by the U. S. Government, by Commander E. P. Lull, U. S. navy, resulting in the location of a practicable line for an interoceanic ship-canal, 26 feet deep, from the Bay of Aspinwall on the Caribbean Sea to Panama on the Pacific.

In 1879 Count Ferdinand de Lesseps made an appeal to the several nations to send delegates to a proposed congress to meet in Paris, to decide upon the route and the plan for an interoceanic canal between the Atlantic and Pacific Oceans through the American isthmus. On May 15 of that year the congress met in Paris. Twenty-four countries were represented. Count de Lesseps was elected president. The congress decided that a canal with a constant level was desirable, and that this canal should be by way of Limón Bay to Panama.

Immediately after the adjournment of the congress the Universal Interoceanic Canal Company was organized under

the French law for building the canal under a commission previously granted to Louis X. B. Wyse by the Government of Venezuela, and sold by him to Count de Lesseps.

The total length of the canal as projected is 46 miles; the lowest carrying float in the Colaba is 440 feet. The route is a goodly follow-up of the Panama Railroad. The dimensions of the canal are as follows: The breadth at the bottom is 22 to 24 meters (72 to 78 feet); the breadth at the surface of the water, 25 to 60 meters (82 to 195 feet); depth, 8 to 9 meters (26 to 294 feet). The curves on the canal are to have a minimum radius of 2,000 meters (6,560 feet). The greatest obstacle to be overcome on the Atlantic side, was in construction, maintenance, and operation, is the Chagres river. It was the original intention to dam back the river and carry the floods to the sea by an artificial channel along the slopes of the mountains, but the great cost and doubtful practicability of the plan led to its abandonment.

The canal, if built according to the original design, would require a tide-lock at Panama, where the ordinary range of tide is 19 feet. During storm-tides the range is much greater. The materials in general to be excavated are, on the mountain and valley of the Chagres river, a very fine alluvium in which is but little mineral soil; elsewhere, solid rock, clay mixed with magnesian, with tufa (or compressed volcanic ash) in the Cerro Chagres. From Colaba to Panama the route is through pyroclastic rock, sandstone, tuff, and conglomerate. The total amount of materials to be excavated in the canal proper, according to the original design, is 140,000,000 yards, and, with the last cut for the Chagres river, not including those required for the Chagres dam at Gamboa, is 150,000,000 cubic yards, or a total of 150,000,000 cubic yards.

The original estimate made by the Panama Canal Congress was \$600,000,000 francs = \$120,000,000. At the close of the year 1888 the amount expended, not all on the actual work, however, was 1,000,000,000 francs, equal to \$200,000,000. It was necessary to raise much more money, as there was at that time not more than one-third of the whole work completed. It was found impracticable to raise this money except by a lottery loan, but this scheme failed, and work ceased on the isthmus in 1893. A commission sent out by the French Government reported that it would cost \$242,000,000 to complete the canal. The canal was thrown into the hands of a receiver, M. Montheilant being appointed by the Government as liquidator. In 1896 he estimated that it would require to complete the canal at sea level three milliards of francs, or about \$600,000,000.

Nicaragua Canal.—The Nicaragua route follows the most direct marked depression of the American isthmus, and has the natural advantage of the great lake of the same name as a waterway. It would perhaps be more directly in the water's highway than the Panama route. A route for a proposed canal was in 1850 surveyed by Orville Childs, C. E. This report will be found in the *Journal of the Franklin Institute*, June, 1870. A Government survey was also made by Lieutenant Edward P. Lull, U. S. navy.

In 1870 a commission was appointed by President Grant to examine the reports of the various isthmian surveys. After an examination of all the routes they reported and estimated the cost of construction, including the harbor improvements, at at least \$100,000,000. Other estimates were made by Maj. Walter McFarland, U. S. A., \$140,000,000, and of A. G. McLeod, C. E., U. S. N., \$40,919,839. A congressional committee which investigated the subject and the estimate of Mr. McLeod placed the total cost at \$162,981,124.

Commissions have been given to various companies by the Nicaraguan Government. The first given to a U. S. company was that called "The Vanderbilt concession of 1840." This was abandoned in 1850 on account of the non-fulfillment of the company of the conditions of the concession, but in 1870, by another administration, the concession was renewed, to be abandoned only upon the decision of arbitrators who have yet not been appointed. The concession of 1849 and the complications that existed, particularly on account of Britain's formal Britain to the territory at the northern terminus of the canal, led to a treaty (still in force) between the governments of the U. S. and Great Britain, called the Clayton-Bulwer Treaty of April 19, 1850, which in Article I. says: "The governments of the U. S. and Great Britain have declared that neither the one nor the other will obtain or maintain for itself any exclusive control over the said canal." On Jan. 19, 1899, a bill was introduced in the U. S. Congress to incorporate the Maritime Canal Company of

Nicaragua under a commission granted by that Government. This bill became a law on Feb. 20, 1899. In the meantime the Nicaragua Canal Construction Company was incorporated under the laws of the State of Colorado. This latter company contracted with the canal company to complete the surveys and construct the canal. In June, 1899, the preliminary work on the construction was begun. Before Oct. 1, 1899, over \$2,000,000 had been expended, as certified by the Nicaraguan Government commissioners, the concession requiring this expenditure within three years after the acceptance of the work.

The route which was finally located and on which work has been begun is from Greytown, on the Atlantic to Brito, on the Pacific, 169½ miles apart. In detail, the line of the canal extends from Greytown in a southeasterly direction 67 miles through the low grounds of the heavily wooded plains and swamps. The cross-section of the canal here is to be 190 feet wide at bottom, 288 feet at surface, and 29 feet deep. Lock No. 1 will have a lift of 31 feet; dimensions of lock, 650 feet by 80 feet. Lock No. 2, 14 miles from No. 1; lift, 30 feet. Lock No. 3, about 2 miles from No. 2; lift, 40 feet. About 3 miles from No. 3 is the "Eastern divide" cut, 20 miles long; summit depth of cut, 238 feet; average depth entire length of cut, 141 feet; material mostly rock; dimensions of the cut, 80 feet at bottom, 80 feet at surface, with 2 to 1 slopes above water; depth of water, 30 feet. The route from the divide cut is through the basin of the San Francisco river. It is a tributary of the San Juan and flows across the axis of the isthmus. It and all other openings are dammed up to make an impounded reservoir, or lake, extending from the divide cut 12½ miles to the main San Juan at Ochoa, where the river is to be dammed by an immense work of loose rock, to be raised from the divide cut. This dam is to be 70 feet high, 1,900 feet long, and it will raise the water above it to a level of 104 feet above the sea, and this will raise the level of Lake Nicaragua from 103 feet, its present level, to 110 feet above the sea.

The San Carlos river now discharges into the San Juan above the dam site, and the lower reach of this river must be dammed also. From 6 to 8 miles of embankments are required, some of them 60 feet high, to impound and hold the waters.

Several waste weirs, or sluices, to relieve the basin of excessive flood waters, are provided for in the plans. These dams and embankments will make slack-water navigation from lock No. 3 to the lake.

Considerable dredging is required in the river channel, especially near the lake, for about 30 miles. It is then necessary to dredge 20 miles out into the lake, as the shore has a very flat slope. On the opposite side of the lake submarine rock dredging is required for 9 miles. The depth from shore to shore of the lake is to be 39 feet. From the Ochoa dam to the west shore of the lake the distance is 121.04 miles, the lake being 564 miles wide. From the lake to the Pacific the distance is 17.04 miles.

There are three locks, Nos. 4, 5, and 6, located near each other. Their lifts are each 42½ feet, No. 6 having a variable lift on account of the fluctuations of the tides of the Pacific.

The harbor of Greytown before 1855 was a good and capacious port. Drifting sands have closed up its connection with the sea and only a shallow lagoon exists, with its entrance practically closed to navigation. The work of restoration has been attempted by building a jetty out from the shore about 1,000 feet and dredging a channel under its protection, which (1895) has about 12 feet depth. The work thus far executed is some dredging on the axis of the canal by the great Panama dredges, which were purchased and taken to Nicaragua, and the construction of several miles of the ordinary railway, to be used as an auxiliary to the canal work; also some clearing in advance of the work and a telegraph line for some distance.

At Brito, on the Pacific, is an open roadstead which must be inclosed by heavy stone dikes, or breakwaters. The cost of the entire work, estimated in May, 1889, by the commission of civil engineers employed for the purpose by the construction company, is \$87,799,570. On account of financial difficulties the work was suspended in 1894.

Florida Ship-canal.—The U. S. Congress has made a number of appropriations for surveys for a Florida ship-canal. Four routes have been surveyed under the direction of the Secretary of War; these surveys were made in 1824, 1855, 1856, and 1878-79. A survey was made by the city of Mobile in 1872, but with the exception of dimensions on the subject nothing has been done for some time to pre-

note the undertaking. For a full history and complete statement of facts see the *Florida, Atlantic, and Gulf Ship-canal Company*, published in New York (1881); also report of Gen. Quincy A. Gillmore, in the annual report of the chief of engineers U. S. army (1880).

Cape Cod Ship-canal.—To shorten the distance and avoid the dangers of navigating around Cape Cod a proposition for a ship-canal between Barnstable Bay on the north and Buzzard's Bay on the south has been brought forward. Probably the best route follows a natural depression between Sandwich on the north coast and Monument, at Buzzard's Bay, on the south, a distance of about 8 miles. At an earlier geological period this depression was a sea-channel separating Cape Cod from the mainland, and it is so low even now that within the nineteenth century the storm-tides have met each other.

Many examinations, surveys, and reports were made from 1776 to 1878, when Clemens Herschel, C. E., made an exhaustive report on the subject, and estimated the cost of a canal and jetties with a depth of 18 feet at mean low water, and a width of 111 feet, at \$2,000,000 in cash.

Although the State Legislature has granted many charters to different companies, yet very little actual work has been done on the construction of the canal. There are (1895) several bills for charters before the present session of the Legislature.

Suez Canal.—According to Diodorus Siculus (B. C. 60) there was a canal from the Gulf of Pelusium (not far from the present terminus of the canal) to the Red Sea. It was begun by Necos, continued by Darius, and finished by Ptolemy II. The canal was said to be wide enough for two galleys to pass abreast.

For the modern canal nothing was done except to make careful surveys until 1849, when the project of a ship-canal was finally taken up, to be carried through by Count Ferdinand de Lesseps. After the route had been carefully surveyed and favorably reported on, the Viceroy of Egypt granted the first concession to M. de Lesseps in Nov., 1854. At Constantinople, where de Lesseps had an interview with the prime minister, the project was favorably received; but through the interest of the representative of Great Britain, Lord Stratford de Redcliffe, the sanction was not given. In order to place the subject prominently before commercial nations de Lesseps wrote to the principal foreign ministers, asking that they would name engineers of high rank, and would secure their uniting in a commission to examine the routes for a ship-canal. The commission met and appointed a sub-commission to prosecute the study of the proposed route on the ground, which they did, and presented to Said Pasha a preliminary report dated Alexandria, Jan. 2, 1856. The commission rejected the plan for an indirect canal from Alexandria as "inadmissible from a technical and an economical point of view," and reported in favor of a direct route, making an estimate of 200,000,000 francs as the cost of the work. A second concession was given on Jan. 15, 1856, the terms of which were designed to satisfy the opposition which had already begun in Great Britain, and to guarantee fair returns to the stockholders who might invest. The viceroy made an official declaration for himself and his successors, subject to the ratification of the sultan, that the canal and all its ports should be open at all times as a neutral highway to every merchant ship passing from one sea to another, without any exclusive distinction or preference to persons or nationalities. The statutes which were to govern the company fixed its capital stock at 200,000,000 francs.

The Egyptian Government engaged to furnish a contingent of the fellaheen, and the work was at once begun. The location of the northern terminus of the canal was changed from Pelusium to Port Said. The first work on the canal was at this terminus, and was begun on Aug. 25, 1859, by de Lesseps in the presence of about 150 persons. For a description and illustration of the artificial harbor at Port Said, see HARBORS.

From Port Said the distance across the isthmus in a direct line is about 70 miles. The length of the canal is 100 miles, of which over 60 per cent. is through shallow lakes. The material excavated was usually sand, but in places it was necessary to blast through strata, 2 or 3 feet in thickness, of solid rock. The total excavation was 80,000,000 cubic yards.

On account of the complications with Great Britain and its opposition to the construction of a canal, obstructions were placed in the way of the work from time to time which greatly delayed its completion and increased its cost. The

most important result was the withdrawing of the fellaheen from the work by peremptory orders from the British Government to the viceroy. Although the work was delayed by this, it served to bring into use a much more extensive plant of machinery, specially constructed to perform work hitherto done by men. The appliances thus used were various and very efficient. With them the contractors excavated 50,000,000 cubic meters, with the assistance of less than 4,000 men and in the space of less than five years. The work was all performed in daylight.

The canal was formally opened by vessels from nearly all the maritime nations of Europe on Nov. 17, 1869. The canal at that time was in a very imperfect state, not being fully completed in width and depth, but the company has since finished the work and maintained the depth needed. The canal has a sufficient depth and width to permit the safe passage of ships drawing 25 feet of water. The following table shows the increase in the number of ships, tonnage, and receipts:

YEAR.	Number of vessels.	Net tonnage.	Receipts from tolls and passengers.
1870.....	486	435,911	* \$569,152
1875.....	1,494	1,887,578	5,296,137
1880.....	2,026	3,057,421	7,501,627
1885.....	3,624	6,335,753	12,423,254
1890.....	3,389	6,890,094	12,482,542
1891.....	4,207	8,698,777	16,789,113
1892.....	3,559	7,149,175	14,899,175
1893.....	3,841	7,710,000	14,133,722
1894.....	3,852	8,089,108	14,770,081

* Computed at 5 francs to the dollar.

In the concession it was laid down that the maximum charge was to be 10 francs per ton "of capacity." The business of the canal became so great that it was necessary to widen and deepen it. This work is (1895) nearly completed. The new dimensions are 31-2 feet depth; bottom width, 108-2 feet; surface width, 420 feet; area of prism, 8,240 sq. feet. There are sidings—called *gares*—excavated for the passage of vessels at several points; the radius of the curves is 2,000 feet. The cost of the canal as originally completed was \$95,000,000.

The Corinth Canal.—This canal extends from the Bay of Corinth to the Gulf of Athens. It was across this isthmus that the Athenians, 300 years before Christ, hauled their triremes, which are thought to have been of about 150 tons burden. The canal saves 185 miles (342 km.) from Adriatic ports and 95 miles (178 km.) from Mediterranean ports. The average tolls are 18 cents per ton and 20 cents per passenger. The length of the canal is 3-9 miles (6,290 meters), part of which is excavated in alluvial soil and part in calcareous and granitic soft rock. There is no lock or tunnel, it being a sea-level canal. There are generally quiet harbors at each end, but jetties are (1895) being constructed for further protection. The width of the canal is 22 meters (72 feet) at bottom, and 24-20 meters to 28 meters (79½ to 92 feet) at the low-water level. The depth of the canal below low-water level is 8 meters (26½ feet). The heaviest cutting is about 79 meters (259 feet); the average cutting is 45 meters (147½ feet). The amount of material excavated was 11,500,000 cubic meters (14,453,400 cubic yards). The total cost was nearly \$5,000,000. The work was begun in 1884, but suspended at various times by financial embarrassments. It was completed so as to permit its inauguration by the King of Greece on Aug. 6, 1893, but it was not opened to navigation until Nov. 9, 1893. Owing to the slips of the canal sides, developed in the original excavation, it was found necessary to construct retaining walls for rather more than half of its length. The total amount of masonry in these walls and used in protecting the slopes of the cuttings was 165,000 cubic meters (216,000 cubic yards).

Cronstadt and St. Petersburg Canal.—This is a work of great strategical and commercial importance to Russia. The plans were matured in 1874, and work was begun in 1877. The canal and sailing course in the Bay of Cronstadt are about 16 miles long together, the canal proper being 6 and the bay channel 10 miles, and extend from Cronstadt, on the Gulf of Finland, to St. Petersburg. The available depth prior to its construction was 9 feet in the river. The canal, opened in 1890, is navigable for vessels drawing 20½ feet; its greatest width is 350 feet and its least width 220 feet; the total cost was \$9,000,000. For a descriptive and historical sketch, see London *Times*, Oct. 17, 1884.

The *Brussels Canal* in Belgium is (1895) approaching realization. This has been contemplated and argued for over 400 years. The distance by water from Brussels to Antwerp is about 32 miles, of which 17½ are on the Willemshaven Canal, now 10½ feet deep; 4½ miles on the canalized river Rupel, and 8 miles on the Scheldt. Vessels of 100 to 400 tons can now sail to Brussels, but the narrowness of the canal and locks excludes larger vessels. It is intended to deepen the canal to 24½ feet. The cost is estimated at \$5,000,000.

Manchester Ship-canal.—The city of Manchester, England, is situated on the Irwell, about 30 miles from the Liverpool bay. The canal avoids cost and delay in transshipment at Liverpool. In 1852 a plan was proposed by E. Leader Williams as engineer, and James Abernethy as consulting engineer. The terminus in the estuary of the Mersey was to be a point opposite Garston. The canal in the estuary was to consist of five training-walls. Several modifications were made in the route and plans of the canal during the various discussions that took place in Parliament. The final total estimate on the plan before that body in the spring of 1864 was £6,994,168 15s. 6d. The plan was opposed in Parliament by the Mersey docks and harbor board on the ground that it would reduce the depth on the Liverpool side at the mouth of the estuary, and as this case was sustained by James B. Esdaile, the engineers of the ship-canal changed the route so as to reach the estuary at Eastham, about 9 miles from Liverpool, on the south bank of the estuary. The necessary parliamentary approval was then obtained.

The locks for admitting vessels at Eastham (three in number) are, respectively 600 feet long by 80 feet wide, 550 feet long by 50 feet wide, and 550 feet long by 30 feet wide. The four other sets of locks between there and Manchester are of similar dimensions. The total length of the canal is 65½ miles. The total rise from the ordinary water-level of the canal at Eastham to the docks at Manchester is 80 ft. 6 in. Dividing this between the four sets of locks gives an average rise of about 15 ft. 1½ in. All the lock-gates are worked by hydraulic power. Sluices are provided on Flacey's patent. The railways and highways crossing the route of the canal have been raised by expensive constructions, so as to give a clear height of 75 feet for the vessels traversing the canal. An ordinary canal was carried across for a swinging aqueduct composed of a long iron caisson resting on a pivot pier.

The canal is excavated throughout its whole length to a minimum width of 120 feet at the bottom, and it averages 125 feet wide at water-level. The upper portion, from Flacey to Manchester, is 170 feet wide at the bottom and 220 feet at water-level. At the various locks the canal is widened considerably, and vessels can be turned there if necessary. The width adopted permits large steamers to pass each other at any part of the canal. The minimum depth of the canal is 26 feet. The sills for all the locks are placed 28 feet below water-level to allow future deepening of the canal by dredging. Extensive docks have been constructed at Manchester, and at Warrington there is one of 22 acres. The time required for navigating the whole length of the canal is from five to eight hours.

The masonry, both brick and stone, used in the locks, locks, piers, and retaining walls is of the best quality, both in materials and workmanship. The total amount in cubic yards of brickwork is 173,000, and 220,000 cubic yards of masonry. The lower portion of the dock and lock walls is made of concrete, the culverts being lined with masonry of brickwork. At the water-level granite or limestone fender stones, slightly projecting from the face of the wall, are inserted to protect the concrete facing. The deepest cutting is near Ramsey, where, for a short distance, it is 60 feet. The cutting with the largest prism is at Latchford, where, for a distance of 1½ miles, the depth averages 55 feet. The slope of the excavations varied with the nature of the soil from 4 to 1 to 2 to 1. In the lock excavations the sides are nearly vertical. The total amount of excavation in the canal and docks was about 46,000,000 cubic yards, 10,000,000 cubic yards of which was in softest rock. All this waste material from the canal was used in filling up the beds of the river Mersey which are cut off by the canal, and in raising the sea locks so as to make them available for shipping, building, and other purposes. The canal was opened for operation Manchester on Jan. 1, 1894. The total cost was about \$75,000,000. The excess over the estimated cost (\$46,000,000) was largely due to extraordinary cost of right of way. The engineer of the work was Sir E. Leader Williams.

The *North and East Sea Ship-canal* between the Baltic Sea and the North Sea, in Germany, opened June 19, 1895, was constructed mainly for military and naval purposes, although largely used for general mercantile traffic. The work was begun by the German Government in 1857. The canal is 61½ miles long, the terminal in the Baltic Sea being at Holtenau, at the harbor of Kiel. The route lies mainly through marshes, shallow lakes, and the valleys of two small rivers, the summit of the watershed being about 79 feet above sea-level. The normal water-level is that of the Baltic Sea, but there are protective locks at each end. The canal has a depth of 29½ feet below mean water. The width at bottom is 72 ft. 2 in. and the minimum width on the surface is 100 ft. 8 in. Six passing-places of ample length and width are provided. The total amount of earth removed was about 107,000,000 cubic yards, and the total cost of the canal was about \$50,000,000. K. L. CURRIER.

Ship-fever: See *TYPHUS FEVER*.

Shipley, Omer: clergyman and author; b. at Southampton, England, July 1, 1832; educated at Cambridge; was for twenty-three years a clergyman of the Church of England; was received into the Roman Catholic Church Oct. 26, 1878; edited many ascetic and devotional works; translated from Catholic authorities three volumes of religious poetry (*Lyra Eucharistica, Meditations, and Mystical*) and a number of volumes of essays by different authors (*The Church and the World, Tracts for the Day, Ecclesiastical Reform, Studies in Modern Problems, Curious Horrors*).

Revised by J. J. KEANE.

Ship-money: a tax formerly laid in England on the cities, ports, towns, and boroughs of the kingdom in order to provide and furnish ships for a navy. It was first imposed about 1097 to resist the invasion of the Danes. Ship-money was among the wrongs complained of in England in 1641, and was one of the causes which led to the death of Charles I. on Jan. 30, 1649. He was very much in need of money, and Parliament, which alone could vote him a subsidy, he would not give, and perhaps he dared not. He then undertook to levy a tax on his own authority, the so-called ship-money. Such a tax had been levied previously without any special vote of Parliament, but only in the seaports and coast-districts, and only in time of war; it was simply another form of the old duty resting on the port of the country of furnishing ships for the navy. In 1696 the king arbitrarily extended this tax to the inland counties and to times of peace. John Haverley (q. v.) was taxed twenty shillings, but refused to pay, and asked for a decision by the courts. The courts decided against Haverley, holding that the ship-money was not a tax, but in 1640 and 1641 the Long Parliament declared this exaction illegal, and the bill stating this principle received the assent of the king in Aug., 1641.

Shipp, ALBERT MORGAN: educator; b. in Stokes co., N. C., Jan. 15, 1819; graduated at the University of North Carolina 1840; became a Methodist preacher 1841, president of Greensboro Female College 1848, Professor of History and English Literature in the University of North Carolina 1849, president of Wofford College, South Carolina, 1859, and Professor of Evangelical Theology in Vanderbilt University, Nashville, Tenn., 1875. He was the author of *History of Methodism in South Carolina* (Nashville, 1887). D. at Cleveland Springs, N. C., June 27, 1887. ALBERT OSBORN.

Shippen, EDWARD, LL. D.: jurist; b. in Philadelphia, Pa., Feb. 16, 1729; studied law in Philadelphia and at the Temple, London, where he was admitted a barrister 1750; became prothonotary of the Supreme Court of Pennsylvania and judge of admiralty 1753; held various judicial positions, and was chief justice of Pennsylvania 1799-1806. D. in Philadelphia, Apr. 16, 1806.—His daughter MARGARET was second wife of Benedict Arnold. P. S. A.

Shippensburg: borough laid out by Edward Shippen in 1734; incorporated in 1819; Cumberland co., Pa.; on the national pike road, and the Cumberland Valley, the Phila. and Read., and the W. Md. railways; 11½ miles S. N. E. of Chambersburg, 41 miles W. of Harrisburg (for location, see map of Pennsylvania, ref. 6-P). It is in an agricultural region; has large deposits of iron ore in its vicinity; and contains water-works, gas and electric-light plants, manufacturing streets, paved sidewalks, the Cumberland Valley State Normal School, a national bank with capital of \$75,000, 2 weekly newspapers, and manufactories of clothing, furniture, hosiery, engines, flour, carriages, and flywheels. Shippensburg was the seat of the first courts of the county.

the headquarters of Gen. Braddock's army, and the site of several colonial forts built to protect the settlers from Indians. Pop. (1880) 2,213; (1890) 2,188.

JOHN C. WAGNER, EDITOR OF "NEWS."

Shippigan': post-village in Gloucester co., New Brunswick; on the Gulf of St. Lawrence, near the northeast angle of the province: 254 miles N. of St. John (see map of Quebec, etc., ref. 3-1). It has a magnificent harbor, which serves as a port of refuge, and important herring, cod, and mackerel fisheries. It occupies an important point in the scheme to shorten the transatlantic passage. It is the proposed terminus of the Continental Railway, and from this port ferry-steamers are to cross to St. George's Bay, Newfoundland. Just beyond Shippigan is the wide flat island of Miscon, said to be the best district for plover in the Dominion. Pop. 2,500, nearly all French-Canadians. M. W. H.

Shipping-articles: See SEAMAN.

Shipping, Law of: the body of rules governing the ownership and employment of vessels, as well as the relations and conduct of persons engaged in their navigation. It is a branch of MERCANTILE LAW (*q. v.*).

What is a Ship?—The term has a very broad signification in this branch of the law, unless narrowed by a statute. Whether a particular water-craft is subject to the rules of shipping depends not on its size, form, capacity, or means of propulsion, but upon the use for which it was designed and to which it is put. Hence a floating elevator, a steam-dredge, and a floating bath-house have been treated as ships, because intended and employed for navigation and transportation. A bath-house built on several boats, with a view to its transportation whenever and wherever desired, is to be deemed the permanent cargo of the boats. *Public Bath No. 13, 61 Federal Reporter, 692.*

Ownership of Vessels.—This may be acquired by capture (see *The General Usages of War* under INTERNATIONAL LAW), by operation of law, as in the case of the bankruptcy or the death of the former owner, or by contract between the former and the present owners. A contract to purchase a vessel from a ship-builder and to pay the price in installments as the work progresses does not pass the title to the purchaser until the vessel is in a deliverable state and the purchaser is notified thereof, unless the parties stipulate that it shall pass sooner. Such has been the rule always in the U. S. (*Clarkson vs. Stevens, 106 U. S. 505*), and was finally established in Great Britain by the House of Lords in *Seath vs. Moore, 11 Appeal Cases 350* (A. D. 1886).

The present sale of a chattel passes title to the purchaser at common law, although the contract is oral, and the chattel is not delivered nor the price paid, except in cases within the statute of frauds. (See FRAUDS, STATUTE OF.) This rule is believed to apply to ships in the U. S. British courts, however, declare that "a ship is not like an ordinary chattel: it does not pass by delivering, nor does the possession of it prove the title to it," and that as well by the law merchant as by the Merchant Shipping Act (17 and 18 Vict., c. 104, §§ 55-65) a bill of sale is necessary to the transfer of title from the seller to the purchaser of a ship.

Because of the costliness of ships and of the risks and repairs incident to them, it has been customary from an early period for several persons to unite in their ownership. Generally the title of such persons is that of part-owners and not of partners—a form of title much older than that of partnership (see PART-OWNERSHIP), although by agreement they may constitute themselves partners. If part-owners of a vessel can not agree as to its employment, English mercantile law permits the majority in value to "employ it upon any probable design," upon their giving a stipulation to the dissenting owners, in a sum equal to the shares of the latter, either to restore the ship or to pay the value of such shares. Such dissenting owners then bear no part of the expense and reap none of the profits of the adventure. This rule is based on the idea that ships "are built to plow the sea, and not to lie by the walls"—that their employment is a matter of public concern. If the part-owners are equally divided, the court will decide between them. In the U. S. it has gone to the extent of ending such conflicts by forcing a sale of the vessel, but in Great Britain it never exercised such power until authorized by statute. (24 Vict. c. 10, § 8).

Liability of Owners.—English maritime law determined the liability of ship-owners for the conduct of persons in charge of the vessel on their behalf by the common-law rules of agency. (See AGENT.) In case of loss occasioned by their agents, their responsibility was coextensive with the

loss. Such was not the rule of the general maritime law of Europe. By that rule innocent owners were chargeable for the acts of the master and crew to the extent of their interest in the ship only, and if the ship was lost their liability was at an end. The reason given by Grotius for this rule is that men would be deterred from owning and operating ships if they were subject to the fear of an indefinite liability for the acts of the master. This fear induced Parliament to limit the liability of ship-owners (see preamble to 7 Geo. II., c. 15), although British legislation has not adopted fully the doctrine which prevails on the Continent; it leaves innocent owners responsible, in many cases, to the value of ship and freight immediately before the injury, although the ship be destroyed or injured by the same act, or afterward on the same voyage. (See 17 and 18 Vict., c. 104, § 503, and 25 and 26 Vict., c. 63, §§ 54-56.) The U. S. Government has abolished the English rule which it inherited, and has adopted the continental rule, graduating the liability by the value of the ship after the injury as she comes back into port, and the freight actually earned; and enables the owners to avoid all responsibility for acts done without their privity or knowledge, by giving up the ship and freight, if still in existence, in whatever condition the ship may be; and without such surrender subjects them only to a responsibility equivalent to the value of the ship and freight as rescued from the disaster. U. S. Rev. Statutes, §§ 4282, 4283; *The Scotland, 105 U. S. 24.*

Master's Duties and Powers.—The master is responsible for the proper navigation of the ship, and is entitled to the obedience of all the officers and crew. He is bound to exercise due care and skill in keeping the vessel in a seaworthy condition, and in properly guarding all interests committed to him by the owners of the ship or of the cargo. Accordingly, he has authority to make contracts relative to the usual employment of the ship and to its repairs and necessities. He may even sell it when the prosecution of the voyage becomes impossible and immediate necessity to sell exists. His power to pledge the ship and crew is described in the articles on BOTTOMRY and RESPONDENTIA (*qq. v.*). When the vessel is in her home port, or subject to the supervision of the SHIP'S HUSBAND (*q. v.*), the master's implied authority is greatly limited.

Nationality and Registration.—The registration of British ships begins with the Navigation Act of 1660 (13 Car. II., c. 18, § 10), whose professed object was "the increase of shipping and encouragement of the navigation of this nation, wherein, under the good providence and protection of God, the wealth, safety, and strength of this kingdom is so much concerned"; but whose real objects, according to Blackstone, were dealing a blow to the sugar islands and "clipping the wings of those our opulent and enterprising neighbors." (1 *Commentaries* 418.) Under this act ships might be registered as a rule by English owners, whether built in England or elsewhere; but a statute of the next year required them to be of English building. (13 and 14 Car. II., c. 11, § 6.) This remained the policy of Great Britain until 1850. The subject is now governed by 17 and 18 Vict., c. 104, which provides that any ship may be registered which is owned by natural-born subjects, or by persons legally naturalized or denized, or by corporations established under the laws of, and having the principal place of business within, the British dominions. Unless registered, a ship is not to be recognized as a British ship, so as to be entitled to any of the advantages or to the protection enjoyed by such a ship, or to use the national flag or to assume the national character.

The registry laws of the U. S. are based upon an early act of Congress (ch. i. of 1792) which copied very closely the English statute then in force. (26 Geo. III., c. 60.) Only vessels built within the U. S. and belonging wholly to citizens thereof, and vessels which may be captured in war by citizens of the U. S. and lawfully condemned as prize, or which may be adjudged to be forfeited for a breach of the laws of the U. S., being wholly owned by citizens, or vessels wrecked in the U. S. and purchased and repaired by a citizen, in case the repairs cost three-fourths of the value of the vessel when repaired, can be registered (U. S. Rev. Stat., §§ 4132 and 4136), with the exception of a limited class provided for by ch. 63 of the laws of 1892 and other special statutes. The place of registration is the vessel's home port. In order to register a vessel, the owner must take and subscribe the oath required by statute, must give a bond that the certificate of registry shall be used solely for this vessel, must produce a certificate of construction from the carpenter

the ship built it, and must have it surveyed. If the ship or not is not altered in its hull, or if it is altered in form or structure, a new registry is required. If the vessel is not to be engaged in foreign commerce, but in the coasting trade or fishing, instead of being registered it must be recorded, if of 20 tons and upward, or if of less than 20 tons it must be licensed. (U. S. Nav. Stat., §§ 4311-4391.) Under this legislation U. S. ships have a virtual monopoly of the coasting trade.

Inspection of Steam-vessels.—The owners of registered or licensed steam-vessels invading the public waters of the U. S. are required to have them inspected from time to time, and to obtain a certificate that they are suitable for the service in which they are employed. U. S. Nav. Stat., §§ 4391-4397.

None of the rules relating to this branch of the law are set forth in other articles and need not be repeated here. See *LOCOMOTIVE, APPROPRIATE, BILL, or TANKER, CARRIAGE, COACH, CHALLOUPEAU, DESTROYER, FREIGHT, JETTERON, LARK, (Moosehead Lake), MARINE, LORAIN, PILGRIM, ROAD, LAW, or VESSEL, 744, 745, 746, 747, and 748, and 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.*

The literature on this subject is very extensive. Among the most important treatises are *Alford, Law of Merchant Ships*; *Byron, Law of Shipping*; *Macle and Pollock, Law of Merchant Shipping*; *Parsons, Law of Shipping*; *Bever, History of the Law of Shipping and Navigation*; *Wheeler, Vessels and Voyages*.

FRANCIS M. BURDORF.

Shipping-master; See DECKMAN.

Ship-railways.—Railways for the transportation of ships overland between sequential basins of navigable water. The connection between the water and land-transportation is effected by lowering the side of the railway tracks into the water to such a depth that the ship floats on and off a carriage or cradle. This is done by means of hydraulic lifting-jacks, inclined planes, or any of the other methods in common use for raising ships out of the water for repairs.

Method of operating a Ship-railway.—The cradle having a track, a line of supports along the center to steady and sustain the load, with other supports for the fulgura arranged on each side, is lowered on the rails into the water. The road is then brought into position and the cradle is raised in a bearing along the load, and the fulgura supports are adjusted to places where the cradle and road are lifted on of the water to the level of the tracks on shore. The action power is then applied, and the ship is taken across the railway line to the other harbor and lowered into the water by the means employed in raising it.

Early Methods of Overland Transportation.—Transportation by means of portage is the most ancient form of artificial navigation. The first ship-railway recorded is one that was used through centuries, the *Dolomieu Canal*, which existed at the time of Athenianus, 400 A. D., and which is said to have been in operation 300 years. It connected *St. Louis* to *Port Jackson*, and its remains are still to be seen here. It is thus described in the *Journal of Commodore Bouchard*: "A track on the Corinthian isthmus where ships were hauled out of the Ionian into the Aegean Sea." The ships hauled are said to have been about 150 feet long and 18 feet wide, with a draught of 84 feet. It is very probable that before the *Dolomieu* was built the practice of transporting ships overland was long in use, for the ability to handle such ships as these, merchantmen must have had a long and slow development, with the limited knowledge and power at the service of the engineers of those days. It is said that this method of ship transport was employed by the Greek admiral *Nicias* *Geryllus* in the year 851 to attack the *Argonauts* who were then devastating the coasts of the *Chalcidians*.

In 1485 the *Venetians* transported under the direction of *Nicolas Machiavelli*, a civil engineer of Venice, a fleet of thirty-five vessels overland from the river *Adige* to *Lake Garda*, a distance of 90 miles; the motive power on the plains being used and on the mountainous windlasses worked by men. The longest ship of the fleet averaged 148 feet in length, 40 feet wide, with a displacement of 300 tons, and were armed with the ponderous bombardment artillery of the period, and were with large crews of crews, bows, arrows, lances, and all the usual necessities of war in vogue.

The object of the expedition was to relieve the city of *Verona*, at the time besieged by the *Milaneses*. This was accomplished to a measure, but the *Milaneses* captured and burned the fleet. Early in the spring of 1489 a larger and

more powerful fleet was in like manner transported to *Lake Garda*, and accomplished the relief of *Verona*. Thirteen years later, at the siege of *Constantinople* in 1509, the mouth of the *Bosphorus* being closed to their ships by heavy chains the *Turks* moved a large fleet from *Two Bosphorus* into the *Golden Horn* behind the chains in a single night, over a newly constructed trackway 3 miles long, thereby almost doubling the length of line which the besiegers had to defend, and largely contributing to the city's fall and the consequent end of the *Turk* empire. In 1718 *Moscow* being covered a shallow, two galleys, and four large boats 2 leagues over mountains and valleys from *St. Petersburg*, Russia.

Application of Railways to Navigation.—The first application of railways to navigation occurred in providing substitutes for locks on canals and in one notable instance for the canal itself. The *Hule Canal* in *Cornwall*, England, between *Hule* and *Lantern*, has been in use since 1829. At *Hule* the canal draws the usual boats, which are furnished with small iron wheels, ascend to the uplands by an inclined plane 900 feet long provided with two lines of rails terminating at each end in the canal. There are seven of these inclined planes on the *Hule Canal*.

The *Morris and Essex Canal* in *New Jersey* is operated with inclined planes connecting different levels.

Before the *Peru* railway was built a portage railway 90 miles long was in operation across the *Andes* between *Johnstown* and *Holladayburg*, upon which canal-boats were carried in sections from one canal to another.

In 1860 *Sir James Brunel* and *E. G. Webb* proposed to the *Emperor Napoleon III.* a ship-railway across the Isthmus of *Suez* in lieu of the ship-canal. *Marshal Vaillant*, Minister of War, referred the matter to *M. de Lesseps*, who rejected the idea. It was proposed to make the railway level throughout, have ten rails in its track, and to use there for the first time the hydraulic lift invented by *Edwin Clark*, and since so successful at the *Victoria Docks* and elsewhere. The speed was to be 30 miles per hour; that on the ship-canal, for steam-vessels, is 5 miles per hour, a difference in favor of the ship-railway which, as soon as its practicability is demonstrated elsewhere by everyday use, may cause it to supersede its one-time successful rival. *Moore, Brunel* and *Webb* also in 1872 prepared plans for a ship-railway which the republic of *Honduras* proposed to build across its territory from *Puerto Caballo* to the *Bay of Amoy*. It was to carry vessels of 1,200 tons, and doubtless would have been successful had the republic found the money to carry out the work. Another plan of great interest for a ship-railway was that of *Sir John Fowler* for passing the catamarans of the *Nile*.

The Chignecto Railway.—In 1875 *H. G. C. Ketchum*, C. E., of *Fredericton*, *New Brunswick*, proposed a ship-railway as a substitute for the *Bellefleur Canal* across the Isthmus of *Chignecto*, to connect the navigation of the *Gulf of St. Lawrence* and that of the *Bay of Fundy*. From the report in 1783 of *Col. Robert Morse*, chief of the *Royal Engineers*, recommending the construction of the *Bellefleur Canal* as an important necessity of commerce, the question of when and how it should be built was never allowed to drop. In 1863 the first actual survey for a canal was made by the government of *New Brunswick*, and from that time until *Mr. Ketchum's* survey in 1881 of the ship-railway line there was no possible canal route that had not been gone over and reported on, as great was the interest of Government and individuals in the question. The ability and perseverance of *Mr. Ketchum*, and the superiority of a ship-railway for the purpose intended, finally carried the day. The proposal to form a company to build a ship-railway was accepted by the Dominion Government, and an annual subsidy of \$170,000 was granted for twenty years. The company was not to call on the Government for any portion of the subsidy except what might be necessary to make up the net earnings of 7 per cent. on the authorized capital of \$5,000,000, and it agreed to pay over to the Government half of the surplus profit beyond the 7 per cent. until the whole of the subsidy which might have been paid to the company should be repaid.

In 1889, under *Sir John Fowler*, *Sir Benjamin Baker*, and *H. G. C. Ketchum*, as engineers, the construction of the *Chignecto ship-railway* was begun. It is 17 miles long, and on a straight line from end to end, running through a country moderately rolling, with only one watercourse in view, and generally favorable to the rectilinear location and 75 per cent. maximum grade adopted.

Fig. 1 shows a vessel as it will look on the lifting-deck

ready for transportation. The vessel, resting on blocks along its keel and bilges, is supported on platform-cars 38 feet wide, carried on 240 wheels, arranged in four lines to run on two tracks of standard gauge, 18 feet apart between

of the gate proper is 17 feet lower, or 13 feet below high water spring tide, and retains a minimum depth of 32 feet in the basin. The lifting-dock at the inner end of the basin is 270 feet long. Vessels will be able to enter or leave during the

high stages of the tide, while the excellent anchorage off shore, and the large storage capacity of the basin, insure a continuity of traffic uninterrupted by the fluctuations of the bay. This pioneer ship-railway is (1895) more than three-fourths finished. Awaiting the completion of this great work are many others that are projected, and whose construction will doubtless quickly follow.

The Hurontario Railway.—This is to connect Georgian Bay with Lake Ontario at Toronto. It is to be 66 miles long, probably in one straight line; the maximum grades going south (the direction of heaviest traffic), 8 feet per mile; going north, 22 feet per mile; its track will consist of six rails, and the estimated cost is \$15,500,000. The available water-power along its line is over 100,000 horse-power, from which electricity for doing all the work of operating the railway will be generated. The saving in distance over the route around by way of Detroit is

about 300 miles, while the country through which it is to run favors facility and permanence of construction.

Columbia River Railway.—A boat-railway along the Dalles of the Columbia river, U. S., between Three Mile Rapids and Celila, is under way, Congress in Aug., 1894, having appropriated \$100,000 for the preliminary work. The novel feature of this work is the proposed use of one-degree curves on the railway. The track would be similar to the Chignecto ship-railway, and the general features are also alike with some variation in details to suit the flat-boat traffic for which it is designed.

The Tehuantepec Railway.—This was first proposed by Capt. James B. Eads in 1879, and with characteristic energy, in a few years, in the face of almost universal opposition, he pushed through all the stages of preliminary surveys, detailed plans, congressional inquiries, procurement of concessions from Mexico, and some actual construction at a cost of more than half a million dollars. A table of the distances the railway would save is unnecessary, for it is plain that lengths and breadths of continents are involved. With the opening of the Suez canal, one of the two great barriers to interoceanic navigation was removed. The completion of the Tehuantepec ship-railway would remove the other.

Tehuantepec was selected as the proper location because of its greater proximity to the U. S., its superior advantages

centers. The gridiron on which the ship and cradle move up and down in the lifting-dock is like the deck of a bridge with floor-beams arranged in pairs, slightly separated to admit the hydraulic presses between them, and are connected in the usual way by track-stringers under the rails. The hydraulic presses are 25 inches in diameter and twenty in number, and are designed to lift a vessel carrying 1,000 tons of cargo, together with the cradle and gridiron, a total weight in all of 2,500 tons. They are placed 21 feet apart longitudinally and 64 feet transversely, and have a maximum stroke of 40 feet. The cross-heads on the inner cylinders or rams are attached to the floor-beams with eye-bars.

When a vessel is to be lifted the gridiron, with a cradle on its tracks, is lowered, and the vessel is hauled into position with hydraulic capstans. Water is then forced into the presses until the keel-blocks are brought to a bearing; next the bilge-blocks are drawn into place and the pumps are again started, raising the gridiron in less than ten minutes to a position where its tracks are slightly above those of the railway. A connected system of heavy iron chocks, supported by the masonry, is then moved under the ends of the girders by hydraulic power, the gridiron is lowered to a bearing on them, and its tracks are connected with those of the railway. Two locomotives will haul the ship across the isthmus in less than two hours, and the lifting-dock at the other end by a reverse operation quickly replaces it in the water.

The track is composed of rails weighing 110 lb. per yard, laid on very heavy ties, some of which extend under all four rails. It is stone-ballasted, on the most solid cuttings and embankments, and is characterized by smoothness and rigidity.

A novel feature is the way in which the difficulties arising from the immense tides of the Bay of Fundy are overcome. A basin 500 feet long and 300 feet wide is constructed at the south end. The entrance-gates and seawalls are of heavy masonry, the top being at the common level of the top of the lifting-dock and railway. The top

in distance and time to the main more healthful climate, the easy gra

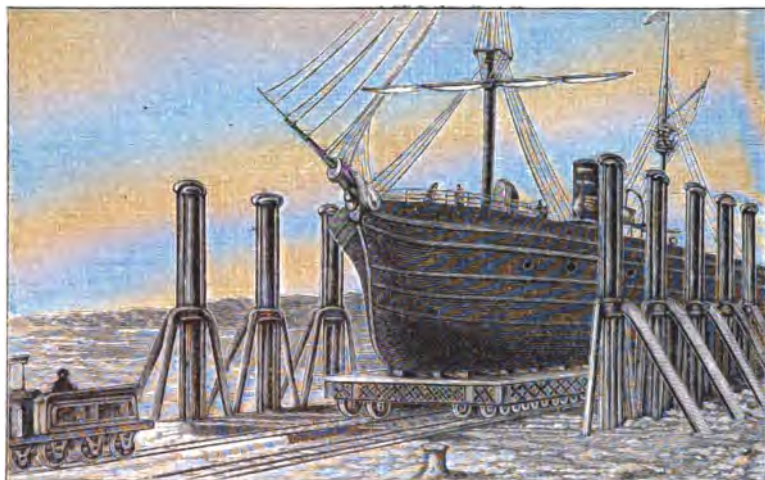


FIG. 1.

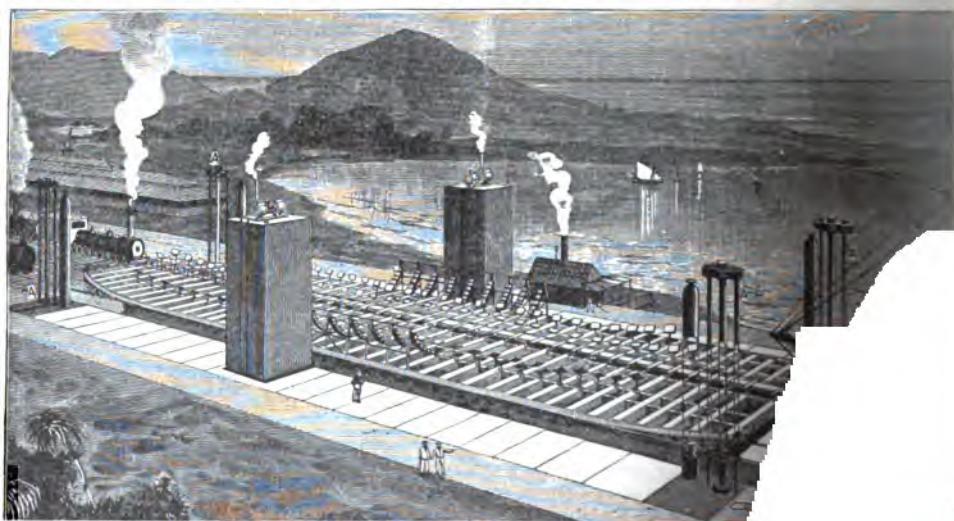


FIG. 2.

By the railway, and the expenditure of the labor (when improved in each mile). The summit between the two oceans is 700 feet above low tide; the heaviest grade on the line is 25 feet per mile, but between the summit and the Pacific plain; on the remainder of this railway the grades where they occur are from 20 to 40 feet per mile. The total weight of ships carried will not exceed 7,000 tons; there will be six rails of very large sections, built in the most substantial manner, forming the railway, which is to be 134 miles long; all of which, with the lifting devices, hoists, machinery, stations, docks, and all requirements, will cost less than \$50,000,000.

Fig. 3 shows the proposed lifting dock and cradle ready to receive a vessel as deep as submerged. The lifting dock is built of steel pontoon, 450 feet in length, 75 feet in breadth, and 15 feet in depth. The pontoon is sunk very quickly by admitting water through sluice-gates in its sides, and can be raised again by powerful pumps in about fifteen minutes. The cradle is in the first with hydraulic appliances to properly distribute the weight of the vessel over the keel and the supports.

It is quite plain that a loaded ship's cradle presents exceptional difficulties as regards curves on the ship-railway.

If a part-owner holds the position he is known generally as managing owner. (See *U. S. Rev. Stat.*, § 1144, 39 and 40 Viet., c. 50, § 304.) The ship's husband goes to the outfit for the voyage; procures provisions and stores; provides proper master and seamen; looks after her legal registration and documents, as well as her due clearance from the custom-house; engages and settles for freight, adjusts averages, salvage, etc., enters into charterparties, and keeps true and proper accounts of all contracts, payments, and receipts in the course of his employment. The master is sometimes called the ship's husband, but all that is meant in some cases is that when the ship is beyond the jurisdiction of owners and of husband, the master possesses many of the latter's powers. As the ship's husband is the agent of the owners in their capacity of joint adventurers in his employment, and not in their capacity of part-owners of the vessel, the scope of his authority is limited accordingly. He can do what is necessary to enable the ship to prosecute her voyage and earn freight, but he has no implied authority to bind the owners by a contract for altering the size of the ship, or for her insurance. Mercantile usage, however, seems to be extending the scope of this peculiar agent.

only. Has 5000

Fig. 3

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and with each curve

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the same effect.

copper. With the increased use of iron in the shape of chains, pistons, stanchions, guns, large anchors, coils, funnels, wire rigging, and its special use in ships of war, and when the ship itself could be regarded as a large magnet under the earth's inductive force, the subject of deviation of the compass assumed a vast practical and critical importance.

The disturbance of the compass is principally due to permanent magnetism of the ship's iron, and is always increased by the transient induced magnetism of masses of iron. In wood-hull ships there is little permanent magnetism, the generally small observed deviation being due to transient induced magnetism. In iron-hull ships the very large deviation is dependent on permanent magnetism, and remains indicative of the direction in which the ship is built, its magnetism as a whole, having then been fixed by the process of hammering and riveting.

The inductive effect of the earth's magnetism is greatest along the line of the magnetic dip. By means of a small com-

pass C. A. Schott was enabled to trace out with chalk on the iron gun-turret (sides 11 inches thick) of an ironclad vessel its magnetic equator, and found its plane inclined to the horizon at an angle of nearly 90° dip; after revolving the turret 180°, the line of no polarity again was traced out, when the plane, passing through the intermediate horizontal position, gradually approached its former place after a lapse of about twelve hours; it probably takes weeks before the fixed position is reached, depending on the action of the iron. Inside such turrets the magnetic intensity is very much weakened, but 12 per cent. was found to be left in the above case. The reader is referred to Sir George B. Airy's *Treatise on Magnetism* (London, 1870) and to the *Admiralty's Manual for the Deviations of the Compass*, by Capt. F. J. Evans, R. N., and Archibald Smith (London). This manual is the standard work on the subject of the deviation of the compass.

The earth's magnetic force has been represented by three component forces, to the ship's head, to the starboard side, and to the keel respectively; similarly, the components of the combined total magnetic force of earth and ship are in these directions; their respective differences or components of disturbance can be expressed by linear equations possessing each a constant and three coefficients, which are to be determined by experiment for each ship and position of compass, and must be numerically worked out by application of the method of least squares.

The general character of the deviation in wood-built sailing ships, with compass as usual on the quarter-deck and over the middle fore-and-aft line of the ship, is found as follows: No deviation when heading (magnetically) N. or S.; greatest deviation when heading (magnetically) E. or W.; deviation easterly when head in eastern semicircle, and westerly when head in western semicircle. In steam-vessels, with the compass aft, these directions of no and maximum deviation will often be found displaced by several degrees, yet preserving their general symmetrical character. In the southern (magnetic) hemisphere the deviations are reversed, though for steam-vessels they may be only partially changed. In iron-built ships an individual character has to be recognized. The points of no deviation are shifted from the N. and S. points, and lie nearly in the direction (by compass) of the ship's head and keel while building; they may not be opposite to each other, nor be removed exactly at right angles from the point of maximum deviation. In general, the deviation is easterly when the part of the ship which was S. in building is E. of the compass; westerly when W. The deviation described above is technically known as the semicircular deviation, and may be expressed by $B \sin \zeta + C \cos \zeta$. In the general deviation formula $\delta = A + B \sin \zeta + C \cos \zeta + D \sin 2\zeta + E \cos 2\zeta$, the angle ζ being the azimuth or the compass-bearing of the ship's head reckoned from the disturbed magnetic meridian positive to the eastward; it is a constant, generally small, + if easterly deviation is in excess. + B is approximately the deviation at E., and + C at N.; in the last terms of the harmonic function involving 2ζ , and which are technically known as the quadrantal deviation, + D is the mean deviation approximately at N. E. and S. W.; the coefficient E is generally small or zero; the deviation δ is reckoned + when the N. end of the needle is drawn to the E.; and the above empirical expression applies, provided the deviation on any course does not much exceed 20°, or about two points, in which latter case the formula becomes more complicated. The correct magnetic course will be $\zeta = \zeta + \delta$. The semicircular deviation rarely exceeds 10° in wood-built vessels, but in iron-built ones may reach double and treble this amount. The quadrantal deviation seldom exceeds 1° or 2° in wood-built ships, but in iron-built ones may reach three or four times this amount. The semicircular deviation is principally due to the effect of permanent or sub-permanent magnetism. The quadrantal deviation, which undergoes no change with a change in the ship's place, is mainly due to the effect of induced magnetism.

The heeling error in wood-built ships is not appreciable, but in iron-built ones it may be serious; generally, the error vanishes with the ship's head at or near E. or W., and attains a maximum value with headings at or near N. or S. The sign of the error changes with a change from the northern (magnetic) to the southern hemisphere. In the northern (magnetic) hemisphere, with the compass above the upper deck, the majority of iron ships have the N. end of their compass-needle drawn to windward, and in the southern hemisphere to the leeward. The heeling error is

due to the joint disturbing effect of the vertical components of permanent and of induced magnetism.

The values of the coefficients A, B, C, D, E , are found directly from observations, the deviation of the compass being observed with the ship heading in a number of equidistant points around the horizon, usually either 32, 16, or 8. If the deviation is observed on four cardinal compass-points, D remains indeterminate; if on four quadrantal compass-points, E remains indeterminate. These observations are made by swinging the ship (or allowing it to swing by the tide), and noting for the several headings the bearing of a distant object, or by reciprocal bearings if the locality is confined, or when at sea by azimuths of the sun, the local time and latitude being known. The deviations being determined for a number of points, they may be plotted on what is known as Napier's diagram, and graphically interpolated by drawing a curve with a free hand through the several fixed positions. The deviations for any compass course will then become known. They may also be tabulated. If we deduce numerically the coefficients A, B, C, D, E , we can compute directly the values of δ for plotting or tabulation. In either case we know the correct magnetic course corresponding to the disturbed or compass course, as well as the reverse of the compass course belonging to any correct magnetic course.

It has been remarked that inside iron turrets the magnetic intensity is greatly diminished; the same is the case with nearly all iron ships, the directive force of the needle being diminished. The relative horizontal force is found by means of the number of oscillations in a given time of a small needle, and the proportion of the disturbed to the undisturbed horizontal force, usually called λ , is determined from oscillations in four equidistant azimuths. It is usually less than 1, and is closely connected with the coefficient D , as may be surmised from the fact that λ is due to the effect of the horizontal induction of soft iron. D and λ are nearly constant. A knowledge of the value of λ is of importance; by its assistance the values of B and C may be found without swinging the ship from observations of δ and λ on one course; similarly, observing on two courses, we may determine B, C, D and λ . The value of λ is further needed in the computation of the heeling error, which is expressed— $(D + \frac{\mu}{\lambda} - 1) \tan \theta \cdot i \cdot \cos \zeta$ for

a heel of the vessel of + i degrees to the starboard. Here μ is the ratio of the disturbed vertical force at the compass to the earth's vertical force; it is found by means of oscillations of the dipping-needle in the plane of the magnetic prime vertical; μ changes with a change in the geographical position; θ is the magnetic dip. It is therefore not actually necessary to heel the ship in order to determine the heeling deviation. It should be added to the general deviation table.

The mechanical correction of the deviation of the compass is properly resorted to in case no suitable position for the standard compass can be found where the deviations are comparatively small; in ships built head S. (northern hemisphere), and intended for navigation in northern magnetic dips, the compass should be placed as far forward as practicable. It may also be elevated 3 or 4 yards above deck. The semicircular deviation may be corrected mechanically, either by means of two magnets or by one magnet; the quadrantal deviation may be corrected by a mass of soft iron placed near the level of the compass; the same may be effected by the mutual action of two compasses placed side by side; the heeling deviation may be corrected by the application of a vertical magnet. In mechanically corrected compasses there is always some danger that, with change of geographical position, loss of magnetism of magnets, and change in the sub-permanent magnetism of the hull, deviation may reappear, though the disturbing force may have been completely neutralized in one place and at one time. It is therefore never to be trusted, and, as a rule, deviation tables should be formed whether mechanical corrections have been applied or not.

An excellent collection of important memoirs, entitled *A Series of Papers from the Transactions of Foreign Societies by Poisson, G. B. Airy, A. Smith, F. J. Evans, W. W. Rindell*, with other papers and documents, has been published by the British Admiralty.

C. A. SCHOTT.

Revised by FRANK H. BIGELOW.

Ships of War: vessels built and armed for offensive or defensive purposes. Modern war-ships include the fol-

floating types; armored vessels for the line of battle and for coast service; armored monitors, rams, protected cruisers, armored cruisers and auxiliary cruisers, gunboats, gunboats, torpedo-boats, torpedo-boats, and various vessels for harbor service. It is the endeavor to give in this section a brief historical sketch of modern naval construction in Great Britain, France, and the U. S., which, until the war activity of the Italian authorities, have alone originated types of war-vessels; this is followed by descriptions of the more important typical warships of the various classes, which may serve to render more intelligible the tabular statement of the ironclad navies of the world.

Transition to the Application of Armor.—Since about the middle of the nineteenth century a revolution has been wrought about in naval construction, and new systems have been adopted through the influence of the following agents: (1) The application of steam, chiefly the screw-propeller; (2) the increasing and the increased power of artillery; (3) the use of armor; (4) the submarine torpedo. Up to the time that the advantages of the screw were established to the satisfaction of admiralty boards, steam-vessels were regarded almost as auxiliaries, owing to the vulnerability of hulls and machinery, the limited scope of the battery, the momentary consumption of their engines, and the difficulty in making paddle-wheel steamers good sailing vessels. The U. S. steamer Princeton (1842-43) was the first screw steamer. She was designed by Johnson, and her construction and success were mainly due to the efforts of Capt. Henry R. Stockton, U. S. navy. Great naval powers are reluctant to begin changes that involve costly reconstruction; thus, with the conservatism regarding any new system, was the reason of the otherwise unaccountable reluctance of the British to take up the project of a screw navy. When the French built the line-of-battle screw-ship *Napoleon* (1850), the British took alarm and began reconstruction with vigor; and the renovation of their navy by the application of the screw was well advanced in 1859, when the French launched the ironclad wooden frigate *la Gloire*. Then began the decline of unarmored hulls.

The principal incentive to the application of armor was the discovery anticipated from shell-fire. It was not until 1854 that naval batteries consisted entirely of shell-guns, the magazines being filled with loaded shells entirely fossil. Admiral Dahlgren carried the application of this missile to great perfection in the U. S. frigates of 1854. The *Merrimack*, one of them, visited Europe in 1859, starting naval admiration by the enormous shell-power of her battery. The swift destruction of the Turkish fleet at Sinope by the shells of the Russian ships during the war in the Crimea (1854) had much to do with hurrying forward the application of armor; the destruction of the Congress and the Connecticut during the civil war in the U. S., and the *Monitor* and the *Merrimack* engagement, gave it fresh stimulus.

Early Forms of Armored Ships.—The first definite proposal for building an ironclad was made in 1841 by Robert U. Stevens, of Hoboken, N. J.; armor, it is stated, was suggested by his father, John Stevens, in 1812. An act passed Apr. 12, 1842, authorized the Secretary of the Navy to enter into a contract with Stevens for the construction of a "war-steamer for harbor defense, and iron-plated, to be built principally of iron." The contract was made Feb. 10, 1844, and altered Nov. 14, 1844, increasing the dimensions as follows: Length, 75 ft.; beam, 40 ft.; depth, 33 ft. 6 in.; protection, 64 inches of iron; horse-power intended, 9,624. Work was begun in 1844, and when the vessel was about half completed, the Government refused further appropriations.

It was the initiative taken by the Emperor Napoleon III. which wrought about a complete revolution in modern naval construction of war, as the first ironclad used in battle was the French battleship *Désolation*, Lave, and Tonnerre, begun for service in the Crimea in Sept., 1854, two months after the loss of the *Niagara* battery was laid at Hoboken. They were all of the same dimensions—namely: Length, 75 ft. 6 in.; beam, 40 ft. 1 in.; draught, 8 ft. 8 in.; hulls, of wood; armor, 400 inches thick; armament, 16 guns of French 7-in., corresponding to 68-pounder, carried 2 ft. 8 in. above water-line. They were about 1,000-ton displacement, with speed about 4 knots an hour. They formed part of the fleet, carrying 1,500 guns, which destroyed Fort Komora, an inferior barbed-iron work. The ironclads engaged at about 1,000 yards, at which range they were proof against 40-pound shot with 10-pound charges. The British adopted the design and built five, but they were never in action.

In view of these successful results, the French determined to build ships which should combine with their protective armor satisfactory sailing qualities, and in Mar., 1855, the first ironclad frigate, *la Gloire*, was begun at Toulon. The construction of two other wooden armored frigates—the *Invincible* and the *Narmandie*, of the same type as the *Gloire*—and the *Couronne*, an iron vessel, was ordered. The latter ship differed from the others not only in the materials employed, but in the strength of the hull, which afforded protection against the projectiles then in use. The *Couronne* was especially constructed with a view of establishing comparison between wooden vessels and those of iron. The four frigates were completely armored above the water-line with 5-inch plates resting on a 18-inch wood backing. The armament consisted of thirty-six 5-in. guns mounted on a single battery, extending the whole length of the ship 6 ft. 8 in. above the water-line.

Great Britain at last decided to follow in building armored ships. The *Warrior* was ordered in June, 1859, a few months before the completion of the *Gloire*. The *Warrior* and her counterpart, the *Black Prince*, were one-half greater displacement than the *Gloire*, and 102 feet greater length; they were built entirely of iron and armored with 44-inch iron plates over a length of 215 feet out of a total length of 290 feet. Their speed was 14 knots, compared with 12½ for the *Gloire*. The wise choice of the material of construction leaves them serviceable vessels to-day, while the French ships were some years since stricken from the list. The *Defence* and the *Resistance*, of 6,150 tons displacement, with similar disposition of armor, were begun at the same time. In 1861, following upon the four ships just mentioned, Great Britain undertook the construction of not less than eleven ironclads, representing four different types—the *Achilles*, 5,820 tons displacement, armored along the whole length with 44-inch plates; then the *Minotaur*, the *Northumberland*, and the *Agincourt*, of 10,700 tons displacement, similar to the *Achilles*, except that the armor was 5½ inches thick amidships, tapering to 3 inches at the extremities. The vessels of the fourth type, the *Hector* and the *Valiant*, have proved more serviceable than the others, being smaller, more maneuverable, and much more economical; they were armored throughout the whole length with 44-inch plates, the protection being only above the water-line at the bow and stern. The *Magenta* and the *Solferino*, laid down two years after the *Gloire*, formed part of the first group of French ironclads. The second group consisted of ten vessels of the *Provence* or *Flandre* class. The displacement was slightly augmented, but the protection was increased to 6 inches of armor.

Up to 1855 the vessels built for the U. S. navy were the best possible specimens of their class; among the early steamers, the *Powhatan* and the *Susquehanna*, at the time they were launched, in 1850, were the most efficient naval vessels afloat. The screw frigates, built in 1855, were regarded all the world over as the model men-of-war of the period. Of these, the largest was the *Niagara*. The other five—the *Roanoke*, the *Colorado*, the *Merrimack*, the *Minnesota*, and the *Wabash*—were vessels of about 5,000 tons, and carried a powerful battery of shell-guns. The twelve screw-vessels were of two classes, built in 1853, the first, of about 3,000 tons, including the *Overette*, *Lanaster*, *Hartford*, *Richmond*, *Brooklyn*, and *Pennsylv*; the second class, small sloops. These were all admirable vessels, but they were no advance upon the type of the *Wabash* class. At the beginning of the civil war, of the ninety ships on the naval register fifty were sailing vessels, and only twenty-four of the forty others were serviceable steamers. The construction of iron or armored vessels had not been begun, and sail-power had been only partly replaced by steam-power. At the outbreak of the war a special naval board was appointed to determine upon types of ironclads to be built for immediate service. The three ships ordered on the recommendation of the board were the broadside vessels *Galena* and *New Ironsides*, and the *Monitor*. The first vessel was armored with bars, of 2½ inches total thickness, put on in a very complicated manner, which proved so deficient that the vessel failed in the first test under fire, in the James river, in an action from which the *Monitor* came out unhurt. The *New Ironsides* was a converted ironclad wooden frigate with unarmored ends, except that the water-line belt was complete all around. Her armor consisted of 44-inch solid plates backed by 21 inches of oak, the whole inclined throughout the casemate at an angle of 30° from the vertical. Her battery consisted of fourteen 11-inch

smooth-bores and two 8-inch Parrott rifles. Though her speed was only about 6 knots at the best, this vessel performed most valuable and effective service throughout the war, both before fortifications and on the blockade. In a period of about six months she was struck some 193 times, but never forced to go into a home port or to depend upon outside assistance for repairs. The *Monitor* (*g. r.*) was built of iron under the superintendence of, and from an original design by, Ericsson. The opportune appearance of the *Monitor* in Hampton Roads in Mar., 1862, and her successful combat with the *Merrimac*, gave a fictitious value to this vessel as an example of naval architecture. Nevertheless, these vessels performed invaluable services and furnished the type of modern coast-service ironclads and a system of armament which has been followed in the most powerful ironclads of recent construction. At the termination of the war it was determined to build four seagoing double-turreted monitors without overhanging armor-shell at either the end or the sides. These were the *Miantonomoh*, the *Monadnock*, the *Terror*, and the *Amphitrite*. Their hulls were of wood, and were armored with laminated plates an inch thick, with a total thickness of 6 inches at the sides and 12 inches on the turrets. The *Miantonomoh* made a voyage to England, where she attracted much attention, and was no doubt the progenitor of the *Devastation*; the *Monadnock* was sent around Cape Horn to San Francisco. In 1874 these vessels were broken up and rebuilt into the double-turreted monitors of the same names.

Improvements in the Construction of Ironclads.—During the period of the civil war in the U. S. construction of ironclads proceeded rapidly in Europe, but until a later period it was more influenced by the developments in artillery than by the results of the war. The introduction, in 1864, of the 7½ and 15½ ton guns into the French armaments made the *Flandre* class ineffective before they were completed. In 1865 the *Océan* was begun, and later the *Marengo*, the *Suffren*, and the *Friedland*, after the same type, only the latter being completely of iron. They were protected at the water-line by 8-inch armor. The armament consisted of four 23-ton guns mounted in a central battery protected by 6½-inch armor, and four 15½-ton guns in barbette turrets at each of the four corners, projecting beyond the sides of the ship, and armored with 6½-inch plates. The *Friedland* differs from the other ships in having only two barbettes, each armed with a 23-ton gun. In 1868–69 a fourth group of ships was begun, the *Richelieu*, the *Colbert*, and the *Trident*, plated with 9-inch armor and very similar to the preceding group, the excess of 1,200 tons displacement being devoted mainly to armor and armament. The hulls of these ships were constructed of wood, except the extremities forward and abaft of the central battery, which were of iron. Such was the construction of the French ironclad navy up to the time of the Franco-German war.

E. J. Reed, appointed in 1862 to the office of chief constructor of the British navy, undertook the building of the *Bellerophon*, in which the cellular system of construction was first fully introduced, realizing a considerable saving in weight with great increase in the strength of the structure, and obtaining a system of water-tight subdivision which is the only protection against rams and torpedoes. Designs for the best mode of defense combined with the most powerful means of attack sprang up with the rivalry between guns and armor. For masted ships Capt. Coles advocated the turret system and Mr. Reed the broadside system, each striving to give the utmost protection armor could afford to the battery and other vital parts, while enabling the largest guns to be worked safely under these defenses. The broadside system armored the battery and the water-line, while the sides and the upper portions of the ships remained much as in the older frigates. The turret aimed at lower sides, as offering less target to the enemy, while affording an all-round protected fire. In 1862 the *Enterprise*, the *Favorite*, and the *Research* were adapted to Mr. Reed's principle—the belt and the battery—upon which, also, with the addition of indented ports at the corners of the battery, to give wider range of fire, were built the *Pallas*, the *Penelope*, the *Bellerophon*, and the *Hercules*. In the *Sultan* an upper-deck battery with four guns was added. On the *Sultan* pattern the *Audacious* and several other vessels were built. As the guns increased in size the batteries decreased and the guns became fewer, but the belt remained.

The *Monarch*, ordered in 1865, was designed as a seagoing rigged turret-ship having 7-inch armor, a free-board of 14 feet, and an armament of four 25-ton guns in two turrets

plated with 8-inch and 10-inch armor. Then came the *Captain*, a ship designed by Capt. Coles and Messrs. Laird in rivalry of the *Monarch*. She was intended to combine a low free-board with the qualities of a seagoing frigate, and the result of her first cruise seemed to indicate the value of the combination; but an investigation of the calamity of her capsizing in the Bay of Biscay, on the night of Sept. 6, 1870, with 500 men, only eighteen of whom were saved, showed that, in comparison with the other qualities, the small stability due to lack of free-board was a fatal error in her design. This disaster led to more complete and exact investigations of the stability of ships than had ever before been customary. A seagoing mastless turret-ship, or improved and enlarged monitor, was then devised, and three such ships were built—the *Devastation*, the *Thunderer*, and the *Fury*.

The *Devastation* is a mastless, twin-screw, sea-going turret-ship, 285 feet long, 62 ft. 3 in. beam; mean draught, 26 ft. 8 in.; displacement, 9,300 tons. Her sides, which rise 4 ft. 6 in. above the water-line right aft, are protected along the whole length by armor 12 inches thick; right forward this belt drops to 6 inches above the water-line, and is covered by an armored deck, 8 inches thick, arranged so as to give great support to the bow in ramming. Armor of the same thickness covers the deck aft. On the middle of the upper deck there is a raised breastwork about 150 feet in length, protected by 10-inch and 12-inch armor, covered by a deck 2 inches thick and 11 feet above the water, forming a glacis for two turrets, each containing a pair of 35-ton guns, protected by armor 12 and 14 inches

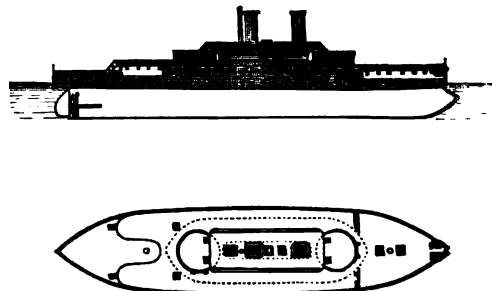


FIG. 1.—*Devastation*.

thick. All the necessary hatches, openings, smoke-pipes, etc., are led up by iron trunks to a light flying-deck which extends between the two turrets, slightly overlapping each. The sides of the vessel above the armor-belt are continued, forming an unarmored superstructure extending 9 ft. 3 in. above the water-line forward, and to the height of the breastwork throughout its length and slightly abaft it, the open deck aft having 4½ feet free-board. The trial at load-draught showed a speed of 13·84 knots, the engines developing 6,650 indicated horse-power. She carries 1,350 tons of coal, which enables her to steam 4,700 knots at 10 knots an hour.

In 1894 the *Devastation* was refitted throughout, supplied with new machinery and armament, and extensive internal rearrangement. The tables at the end of this article give the present outfit.

In the construction of the third ship, the *Dreadnought*—first named *Fury*—a new design was followed, making the breastwork of the same width as the ship itself—in other words, raising the armored side of the ship to a level with the upper deck of the breastwork. The *Dreadnought* was 35 feet longer and of over 1,500 tons greater displacement than the *Devastation*, and the armored belt was carried for the whole length of the ship at the same height above the water-line, increased to 14 inches thickness amidships. In 1885 this vessel, whose design was then sixteen years old, was commissioned as the flagship of the British Channel Squadron.

In 1872–73 the Italian first-class battle-ships *Duilio* and *Dandolo* were begun. They were the first vessels of the central-citadel type with revolving turrets *en échelon*. For their general design the naval authorities accepted the view of the British committee on designs, trusting for both buoyancy and stability to their unarmored raft. The principal dimensions are as follows: Length between perpendiculars, 340 ft. 11 in.; beam, 64 ft. 9 in.; mean draught, 26 ft. 7 in.; displacement at deep load-line, 11,200 tons.

There is a central citadel or compartment, 197 feet in length and 28 feet in breadth, which descends to 5 ft. 11 in. below the water-line, protecting the machinery and boilers, the magazines and shell-rooms and a portion of the



FIG. 2.—Duilio and Duodecim.

machinery for working the turrets and guns. Forward and aft of this citadel, the decks, which are 4 ft. 8 in. under water, are defended by horizontal armor. Over this citadel is built a second central armored compartment, including the bases of the turrets and the remaining portion of the mechanism employed in working and working the guns; namely, above this second compartment the two turrets, placed at diagonally opposite corners of the citadel, the effect of which arrangement is to render possible the discharge of three guns simultaneously in a direction parallel with the keel. Each turret is armed with two 100-ton Armstrong muzzle-loading guns. The armor of the central portion of the vessel is 21.67 inches thick, and that of the turrets is 17.72 inches. The decks are protected by horizontal armor of steel and iron, the latter being under the former. The Duilio has twin screws, driven by a pair of Pamb's trunk-engines. On the trial, in 1860, with all weights on board, at a mean draught of 20 ft. 9 in., the vessel showed on the measured mile, with 7,710 indicated horsepower, a speed of 15 knots per hour.

The *Indefatigable*.—Upon the construction of these ships, Mr. Barclay, director of naval construction in Great Britain, brought forward the design of the *Indefatigable*, of similar type, until 1886 the largest vessel in the British navy. The *Indefatigable*, begun in 1874 and launched in 1876, is a



FIG. 3.—Indefatigable.

twin-screw double-turret ship with a central armored citadel. Her length is 330 feet and she has the extraordinary breadth of 78 feet. The displacement at the mean load-draught of 25 ft. 3 in. is 11,880 tons. The general design is similar to that of the Duilio. The protected portion of the ship is confined to the citadel or battery, within whose walls are inclosed the engines and the boilers, the turrets, the hydraulic loading-gear, the magazines, and, in fact, all the vital parts of the vessel. It measures 110 feet in length, 78 feet in breadth, and is armored to the depth of 6 ft. 9 in. below the water-line and 9 ft. 7 in. above it. The sides of the citadel consist of two thicknesses of 12-inch armor, each backed by iron girders and oak backing. Inside of this are two thicknesses of skin-plate, in which the horizontal girders are secured, the ends of the armor-backing and plating being supported by and bolted to transverse frames 2 feet apart, composed of plates and angle-irons. It will thus be seen that the total thickness of armor at the water-line is not less than 24 inches. The armor-belt, however, is not of uniform strength throughout, but varies in accordance with the importance of the protection required and the exposure to attack. Consequently, while the armor at the water-level is 24 inches, in two thicknesses of 12 inches each, above the water-line it is 20 inches, in two thicknesses of 12 inches and 8 inches,

and below the water-line it is reduced to 10 inches, in two thicknesses of 12 inches and 8 inches. Outside the citadel a 4-inch armor-belt, 9 ft. 6 in. below the water-line at the sides, extends to the extremities of the vessel, disposed at the bow and to meet the spar of the main. Over this shot-proof deck, at a level a little above the water-line, comes the middle deck; and the entire space between the two decks is divided into compartments arranged partly to carry coal and partly stores packed in water-tight tanks, forming further subdivisions of the space. At the sides of the ship the compartments, about 4 feet wide, are filled with cork, inside which, again, are compartments 2 feet wide, filled with layers of canvas and oakum. The cork and canvas compartments are carried above the main deck, 4 feet and 3 feet respectively, and 30 feet forward of the citadel and 37 feet aft of it. Thus if a shot hit the unarmored ends of the vessel at right angles to the water-line, it would travel through, first, 4 feet of cork, then 2 feet of canvas and oakum, then such coal and stores as were encountered, and would finally pass through oakum and cork to the sea on the opposite side from which it entered. The cork is, of course, intended as a life-belt to the ship, to give her additional buoyancy and stability when the unarmored ends are riddled and filled with water. The turrets are set on *decks*, or diagonally in opposite corners of the citadel, so that all the guns can be fired together, either forward or aft, without either turret obstructing the fire of the other. They are protected by armor-plates 18 inches thick. The internal diameter of the turrets is 38 feet; in each are two 24-ton muzzle-loading rifled guns mounted on Armstrong's hydraulic system. The guns themselves are 26 ft. 8 in. in length, the bore is 24 feet long and 16 inches in diameter. The weight of each projectile is 1,500 lb., and the powder-charge weighs 450 lb. The guns are loaded by depressing the muzzle beneath the level of the armor-deck covering the citadel, where a hydraulic hoist lifts the charge to the muzzle, whence it is put home by a hydraulic rammer. The *Indefatigable* is propelled by twin screws—an arrangement adopted in all ironclads and most recent unarmored vessels. Each screw is driven by an independent three-cylinder inverted compound engine. On trial, when in commission and complete in every respect, the engines developed an indicated power of 8,010, giving a speed of 12.81 knots per hour. The ship carries 1,200 tons of coal, enabling her to steam 4,000 knots at 10 knots per hour. Two years after the construction of this vessel was begun, Mr. Reed stated in Parliament and in the public prints that his investigations showed that in action the cork and stores might be shot away and the unprotected ends riddled and waterlogged, and that in such an event, though the citadel were still intact, the ship would capsize. The reply was that the supposed case was too remote a possibility to be considered, and that without any unprotected ends the ship would still float, and under the most unfavorable circumstances would have a margin of stability. A technical committee, appointed to investigate the matter, after most elaborate calculations of great value to naval architecture, completely sustained the views of the admiralty.

The *Italia* and the *Lepanto*.—In these great vessels of the Italian navy, launched in 1880 and 1883, of 15,000 tons displacement, side-armor is not used as a means of preserving stability when the ship is pierced at the water-line. Their buoyancy is preserved in such an emergency by the cellular subdivisions of the space just above an arched armored deck extending the whole length of the ship beneath the water-line. Armor is used only at the openings to the engine and boiler rooms, and to protect the heavy guns mounted on *barbette* and the communications leading to them from the magazines. The *Lepanto* was tried at sea in 1885 at a displacement of 14,800 tons, and made a maximum speed of 18.38 knots over a course of 80 miles, with the engines developing 16,150 I. H. P. The trial is notable from the facts that the power and speed surpassed those of any ironclad afloat, and also because a large number of locomotive-boilers were used with complete success in connection with boilers of the usual type.

In 1883-84 Italy began the construction of the *Andrea Doria*, *Ruggiero di Lauria*, and the *Francesco Morosini*, first-class battle-ships of some 11,000 tons displacement; these ships were completed in 1892, and are similar in design to the Duilio. They were followed in 1893-96 by the *Re Umberto* and *Sicilia*, sister ships, similar to the *Lepanto*; and the *Sardegna*, a still more formidable ship of the same class, was begun in 1897.

The "Admiral Class" of British Vessels.—Following the *Inflexible*, the British built the *Ajax* and the *Agamemnon*, reduced copies of the first vessel, and then the *Colossus* and the *Edinburgh* of the same type, with 18 inches side-armor and armed with 43-ton breech-loading guns. A great gain was made in the speed of the latter two vessels over their predecessors, partly by a better form and partly by improved propelling machinery, by which much greater power has been obtained from the same weight of material. The "Ad-

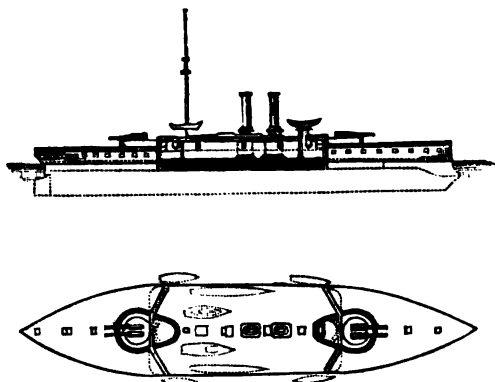


FIG. 4.—Collingwood.

miral" class, of which the *Collingwood* was the first, begun in 1880, followed by the *Rodney*, the *Howe*, the *Anson*, the *Camperdown*, and the *Benbow*, in 1883-84, while following the same system of construction, have their battery mounted *en barbette*. This modifies the distribution of the armor by dispensing with the upper part of the citadel—necessary with turrets to protect their training, loading-gear, etc.—and allows the maximum thickness of the armor to be concentrated on the water-line where required to protect the machinery and the boilers. A part of the weight thus saved, and that due to the less weight of barbettes over turrets, is devoted to ordnance; for the *Howe*, the *Camperdown*, and the *Anson* carry four 66-ton guns each, the *Rodney* four 68-ton guns, and the *Benbow* has two 111-ton guns. In addition to the heavy guns they all carry six 6-inch guns in a machine-gun proof battery on the upper deck, between the barbettes.

British Turreted Ships.—The steady progress of France and Italy in the building of armored vessels of the first class had in 1884-85 aroused the attention of the British to the probability that if their rate of construction were to continue the French fleet would soon be superior to theirs, and eminent authorities contended that upon certain methods of comparison the French fleet was then the more powerful. The relative merits of the central-citadel type of British battle-ship and the completely armor-belted battle-ships of the type of the *Amiral Duperré* received careful attention, and though most serious allegations were made by Sir E. J. Reed, popularly considered an authority, against the safety of the citadel-ships when their ends were riddled by shot, the balance of favor seems to remain with the British type. As the result of this discussion Great Britain laid down in 1885 two turreted battle-ships, the *Victoria* (afterward sunk by collision with the *Camperdown*) and *Sans Pareil*, of 10,470 tons displacement each, the armament consisting of two 110-ton 13½-inch guns in a single turret forward, protected by 18-inch compound armor, and twelve 6-inch guns in broadside on the upper deck, protected by a 3-inch steel side and steel traverses. The citadel is 170 feet long and the armor 18 inches thick at the sides. Also were then begun the *Nile* and *Trafalgar*, two double-turreted battle-ships of type similar to the *Inflexible*, of 11,940 tons displacement. Their armor-belt is of unusual length and 20 inches thick. The two turrets, each mounting two 66-ton guns, are situated, like the *Dreadnought's*, on the middle line, but, unlike this ship, the *Nile* and *Trafalgar* have a broadside battery of eight 5-inch guns between the turrets. These vessels attained on trial in 1890 a speed of 17 knots.

These vessels were regarded when designed as the maximum displacement and power to be hereafter required, and indeed it was predicted by some authorities who favored the building of protected cruisers that these vessels might be the last ironclad battleships. They were hardly launched when the British authorities formulated in 1889 the most

extensive programme ever adopted by them. Under the title of the Navy Defense Act \$105,000,000 was appropriated for building and completing by Apr., 1894, 70 vessels to carry 566 guns, having an aggregate of 336,000 tons displacement and of 594,000 horse-power. These vessels comprise 10 armored battle-ships, 8 of the first and 2 of the second class; 40 protected cruisers, 9 of the first and 31 of the second class; and 18 torpedo-vessels. The distinguishing features of the programme were the rapidity with which the vessels were to be built, the great increase of engine-power and speed, and the increase in size and power of the armored vessels. Nine out of ten of these are barbette-vessels, in contrast to the recent turret-ships, and are of greater free-board and superior sea-keeping qualities to the earlier vessels. The *Royal Sovereign*, the first of these battle-ships, was completed in Apr., 1892. The rapidity of construction surpasses all previous records in the building of great war-ships, as the *Royal Sovereign* was laid down in Sept., 1889. This vessel is the largest battle-ship hitherto constructed for the British navy, and has six counterparts, named the *Renown*, *Repulse*, *Ramillies*, *Resolution*, *Revenge*, and *Royal Oak*. The eighth vessel of this class is a turret-ship, the *Hood*. The armament of the *Royal Sovereign* comprises four 13½-inch 67-ton guns, mounted in barbette in pairs, and firing a projectile weighing 1,250 lb. with a powder-charge of 630 lb.; ten 6-inch 100-pounder quick-firing guns, double-banked, the four on the main deck being mounted in casemates protected by 6-inch armor, while the six on the upper deck are mounted in sponsons; sixteen 6-pounder and twelve 3-pounder quick-firers, 8 small machine-guns, and two 9-pounder field-guns. The auxiliary armament is distributed all over the ship and extends from bow to stern. The ship is also fitted with seven torpedo-tubes, of which two are submerged. The following table gives the principal dimensions of the *Royal Sovereign* and her predecessor in design, the *Trafalgar*, and includes the results of actual trials for speed and power as obtained in smooth-water trials:

DIMENSIONS, ETC.	Royal Sovereign.	Trafalgar.
Length.....	380 ft.	345 ft.
Breadth.....	75 ft.	73 ft.
Draught, mean.....	27 ft. 6 in.	27 ft. 6 in.
Displacement, tons.....	14,150	12,240
Free-board { forward.....	19 ft. 6 in.	11 ft. 3 in.
aft.....	18 ft.	11 ft. 3 in.
I. H.-P. { natural draught.....	9,700	8,440
forced draught.....	13,300	12,940
Speed { natural, knots.....	16.77	16.22
forced, knots.....	18.0	17.28
Coal carried at the designed load-draught, tons.....	900	900
Coal endurance at 10 knots.....	5,000	5,000
Total weight of armament, tons.....	1,410	1,065
Weight of auxiliary armament, tons.....	500	135
Height of heavy guns above water-line.....	23 ft.	15 ft.
Length of belt.....	250 ft.	230 ft.
Greatest thickness { side armor.....	18 in.	20 in.
protective deck.....	3 in.	3 in.
Total weight of armor and backing, including protective deck, tons.....	4,350	4,400

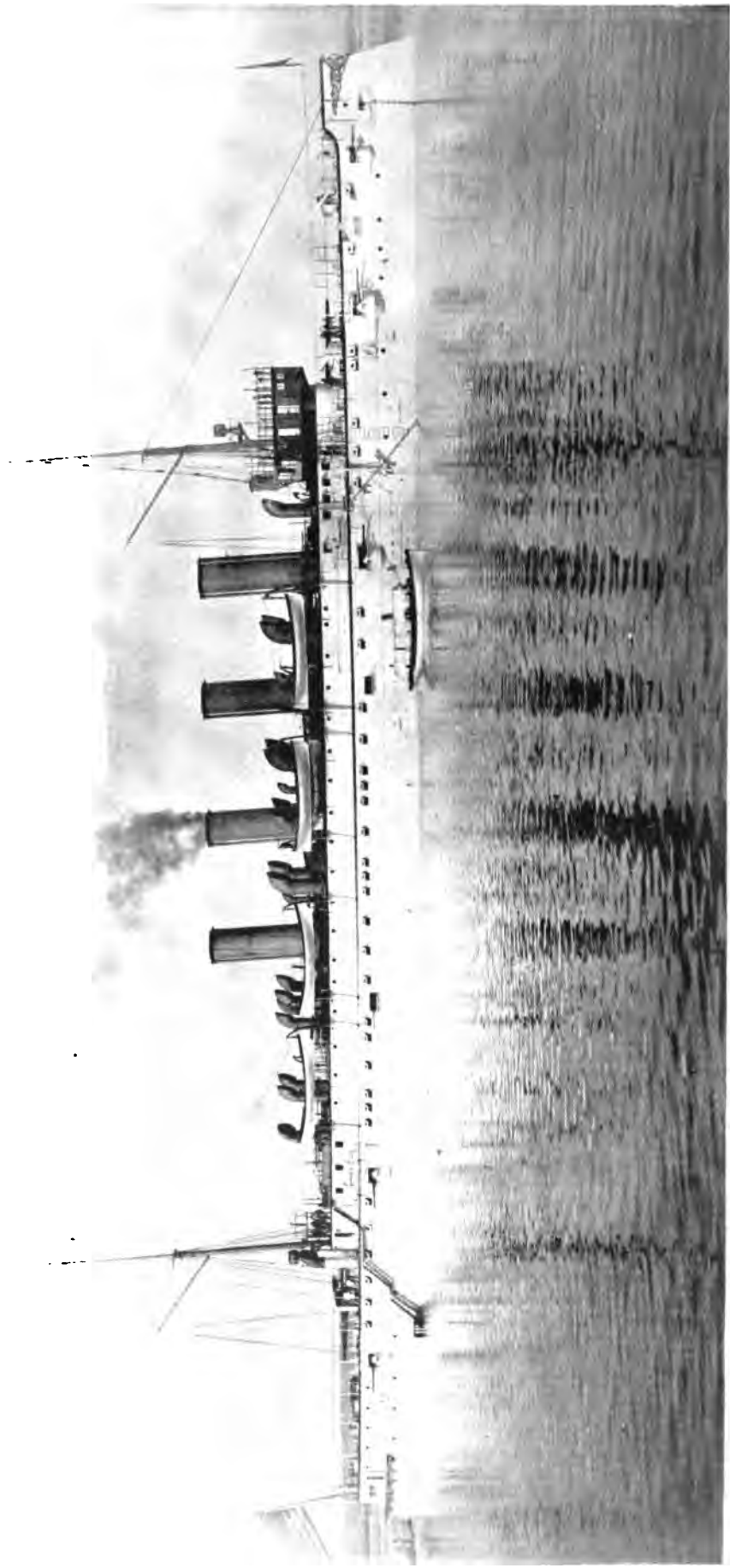
Growth of the French Navy.—The modern navy of France dates from the close of the Franco-German war, when a programme was elaborated, according to which the armored fleet was to consist of 16 first-class ironclads, 12 second class, and 20 coast-service vessels of two classes. It was then definitely decided to use only iron or steel in future construction, a conclusion which was arrived at very tardily considering the progress upon the opposite side of the Channel.

The *Redoutable*, 8,800 tons, the first vessel built in accordance with the new programme, was begun in 1872 upon designs of M. de Bussy, and was then classed as a first-class ironclad. The *Dévastation* and *Poudroyant* (since named *Courbet*), ships of nearly 10,000 tons displacement, were begun in 1876 upon the same general plans as the *Redoutable*, masted, high free-board, central battery.

The *Amiral Duperré*, begun in 1876, has proved the type upon which the later French ships have been designed without substantial variation, excepting only that the later vessels have been fitted with military masts instead of the full ship-rig of spars and sails. The designers, believing that mastless low free-board turret-ships would not make good seagoing battle-ships, and in order to reduce the armored area and increase its thickness, discarded the central battery of the preceding first rates, which was also no longer suitable to the heavy guns required, and mounted on the *Amiral Duperré* four 13½-inch 48-ton guns, each in an armored bar-



British battleship Royal Sovereign.



United States Protected Cruiser Columbia.

bottom of the upper deck, 21½ feet above the water. There are located by each gun in an unprotected gun-deck-battery. The armor consists of a complete water-line belt 8 feet long and 21½ inches maximum thickness. The top



FIG. 2.—Amiral Duperré.

batteries have 15½-inch armor-plates and armored ammunition-tanks leading to the armor-belt, 2½ inches thick at the level of the top of the belt. The Amiral Duperré has in a marked degree the distinguishing peculiarity of all the French vessels, a great "tumble-home," or decrease in breadth from the water-line up. This serves the double purpose of decreasing the weight of upper works and giving better command to the battery. The Formidable and Amiral Dautouche, sister ships, begun in 1872 and 1873 respectively, were practically upon the same design as the Amiral Duperré, the modifications consisting in mounting three French 75-ton guns in batteries on the middle line of the upper deck and having two auxiliary masts, and consequently no sail-power. These two vessels were long years in building, and were completed and successfully tried in 1882, the Formidable making under command a speed of 16½ knots with 9,000 I. H. P. In 1887 two more battle-ships of 10,000 tons, from the same design by M. Moue, the Massena, Hoche, Neptune, and Napoleon, were begun. Each was to carry four 19½-inch guns in batteries placed one forward and one aft on the middle line and one on each side in spigons, obtaining a fore-and-aft fire. Subsequent changes were made by which the Hoche under the forward and after guns in turrets with a comparatively low free board at the extremities, similar to the British

system 34-inch, as in the earlier designs, the armor being confined to the complete water-line belt and the barbette.

After these vessels some years elapsed before new designs for first-class battle-ships for the French navy were decided upon, and of these the Brennus, begun in 1880, was the first to show the marked influence of the great development during that time of quick-firing guns and high-explosive shells. The Brennus is nearly 11,000 tons displacement. The armor consists of a complete water-line belt 13½ inches thick, covered by an armor-deck of 4 inches of steel. Above this the side is protected by a belt of thin armor, 4½ inches thickness, 5 feet in height forward and 4 feet aft. Two 18½-inch guns are mounted in a post-shouldered turret forward with 17½-inch armor, and one in a similar turret aft, each protected by 10½-inch armor. The secondary armament consists of ten 44-inch quick-firing guns, six mounted in a central belt of 4-inch armor which rises from the armor-belt to the upper deck, and four mounted in independent revolving turrets of 4-inch armor located upon the top of the central fore. The speed is 17½ knots.

In 1891 the Jauréguiberry, Carnot, and Charles Martel, of 10,000 tons displacement, were begun. The heavy guns are mounted in turrets, one 12-inch gun forward and one aft, and one 10½-inch gun on each side in turrets at a lower level. On the central superstructure above all these turrets are eight 54-inch guns, mounted in turrets of 4-inch armor, those of the Jauréguiberry in pairs and the others singly. The armor-belt at the water-line is 18 inches thick amidships and 11 inches at the ends, surrounded by an armor-deck 2½ inches thick, and a cushioning stranding around the whole side, covered with 4-inch armor.

It will be seen that in these later ships the barbette has been abandoned for the turret, individual protected stations are provided for the smaller guns, and the side in the vicinity of the water-line is protected for the whole length by thin armor and minute water-tight subdivision.

The Massena and a sister-ship, of very similar design to the preceding vessels were begun in 1892. These are to have triple screws and a speed of 15 knots.

Of armored vessels for coast-defense of more modern type than the Tonnerre class the French have four ships from the same design, the Indomptable, Terrible, Calman, and Requin, begun in 1877 and completed in 1884-87. Four ships of about the same class were begun in 1891, namely,

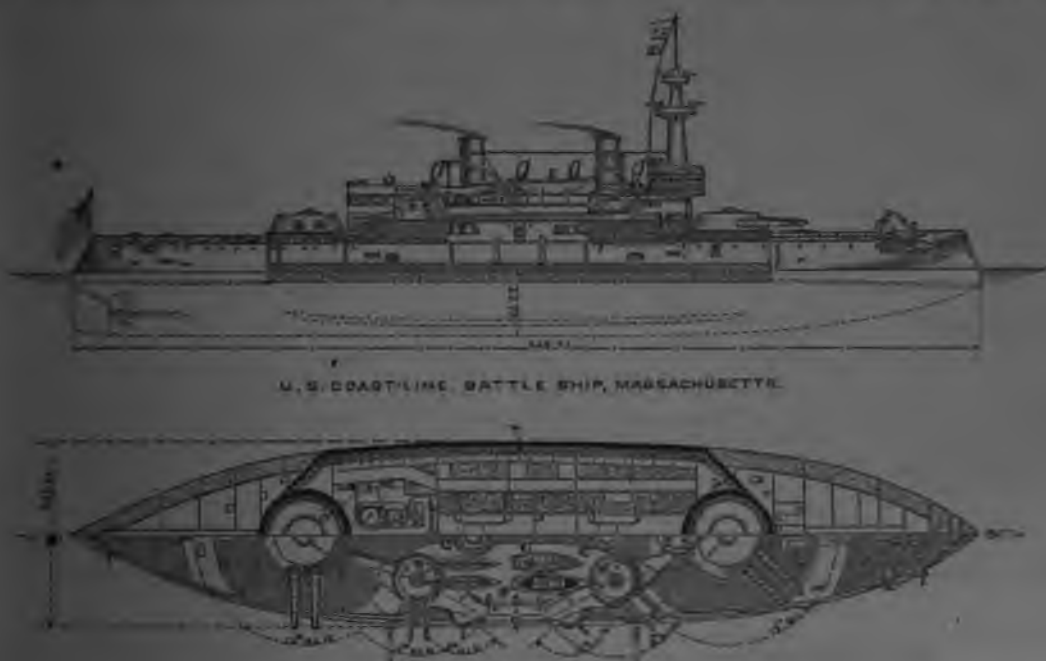


FIG. 3.

Albatross class. This, with the great height of the central superstructure carrying the masts, gives the vessel the appearance of a floating castle. The Hoche and Massena were completed in 1885 and the remaining two in 1892. These vessels carried the unprotected gun-deck-battery of small guns,

the Tréhouart, Douvres, Valmy, and Jemmapes. The first two of these vessels will be undergoing second-class ironclads.

First-class Battle-ships of the U. S. Navy.—These are represented by the Massachusetts, Oregon, and Indiana, begun in 1891 and designated for coast-line defense. The prin-

cial dimensions are: Length, 348 feet; beam, 69½ feet; mean draught, 24 feet; free-board, 11½ feet; displacement, 10,300 tons. There is a belt of 18-inch armor extending over slightly more than half the length, rising 3 feet above the water-line, and extending 4½ feet below it. The under-water protective decks at the ends of the belt are 3 inches thick, and the armor-deck over the belt 2½ inches thick. Above the 18-inch belt and for the same length the side is covered with 5-inch armor to the upper deck.

The armament consists of four 13-inch guns mounted, two in a turret, one forward on the central line of the ship and one aft, each turret protected by 17-inch armor. At a higher level than these turrets are four others of 8½-inch armor, each containing two 8-inch guns. The battery is thus so arranged that four 8-inch guns fire straight ahead and four right astern, in addition to the 13-inch guns. There are also four 6-inch guns protected by 5-inch armor, two on each broadside on the main deck at the same level as the 13-inch guns. There are twenty-eight rapid-firing and machine guns and six torpedo-tubes. The battery of these vessels far exceeds that of any vessel in the world of their size, and equals that of any ship. The engines are of 9,000 I. H. P., and a maximum speed of 16½ knots is expected, with a sustained sea-speed of 15 knots. The normal coal-supply is 1,400 tons, and the bunker capacity 1,800 tons.

The seagoing battle-ship *Iowa* was authorized in 1892 and begun in 1893. This vessel will exceed her predecessors in size by about 1,000 tons and in speed by a knot, but will be of about the same general design, although greatly improved by considerable increase of free-board forward and better security against interference of the lines of fire of the guns of the battery.

In 1895 Congress authorized two additional battle-ships and six composite gunboats of 1,000 tons displacement.

The *Texas* and *Maine*, begun in 1889, should be, according to the latest classification adopted in the British navy, rated as third-class battle-ships. The *Maine* has been officially called an armored cruiser in the U. S.

CRUISERS.

There no longer exists in the classification of war-vessels a definite size or class which may actually be distinguished as armored or unarmored, as was the case so recently as 1880. Then began the extensive introduction of armored decks in all classes of cruisers, and since then the rapid improvement in rapid-firing and machine guns, and also the improvement in machinery with greater possibilities of speed, have tended to a rapid increase in the size of cruisers, and an increased amount of armored protection by the use of thin armor-plating on the sides in addition to protective decks, armored protection for individual guns, and cofferdams of water-excluding material. The use of sails in the larger cruisers has practically disappeared, and the greater dependence upon fuel has also tended to increase the size of these ships in order to increase the supply of coal carried, and thus increase the endurance at sea under steam.

The following tabulated particulars relate to eight of the most important cruisers in the world:

DIMENSIONS, ETC.	United States.			Spain,	Russia,	Great Britain.		
	New York.	Brooklyn.	Minneapolis.	Infanta Maria Teresa.	Rurik.	Edgar.	Blenheim.	Powerful.
Length.....	380 ft. 6½ in.	400 ft. 6 in.	412 ft.	340 ft.	396 ft. 6 in.	380 ft.	375 ft.	500 ft.
Breadth.....	64 ft. 10 in.	64 ft. 8½ in.	58 ft. 2½ in.	65 ft. 2 in.	67 ft.	60 ft.	65 ft.	71 ft.
Draught.....	23 ft. 3½ in.	24 ft.	22 ft. 6½ in.	21 ft. 6 in.	26 ft.	23 ft. 9 in.	25 ft. 9 in.	27 ft.
Displacement.....	8,300 tons.	9,271 tons.	7,375 tons.	6,890 tons.	10,923 tons.	7,390 tons.	9,100 tons.	14,200 tons.
Coal capacity, maximum.....	1,290 tons.	1,753 tons.	1,670 tons.	1,100 tons.	2,000 tons.	850 tons.	1,500 tons.	3,000 tons.
Armor, thickness of belt.....	4 in.	8 in.	.....	12 in.	10 in.	.....	.....	.....
Armor, thickness of battery.....	5½ to 10 in.	5½ to 8 in.	.....	10 in.	.....	2 in.	.....	.....
Armor, thickness of deck.....	6 to 3 in.	6 to 3 in.	4 to 2½ in.	3 to 2 in.	2½ in.	5 in.	6 to 3 in.	6 in.
I. H. P.....	17,401	16,000	20,493.	13,722	13,250	12,550	21,411	25,000
Speed.....	21 knots.	20 knots.	23-073 knots.	20-24 knots.	18-5 knots.	20-97 knots.	21-6 knots.	22 knots.
Armament.....	six 8-in.	eight 8-in.	one 8-in.	two 11-in.	four 8-in.	two 10-6 in.	two 10-6 in.	two 9-2 in.
	twelve 4-in.	twelve 5-in.	two 6-in.	ten 5-5 in.	sixteen 6-in.	ten 6-in.	ten 6-in.	twelve 6-in.
	eight 6-pdrs.	12 6-pdrs.	eight 4-in.	two 2-75 in.	six 4-7 in.	twelve 6-pdrs.	16 3-pdrs.	28 R-F.
	four 1-pdrs.	four 1-pdrs.	12 6-pdrs.	sixteen R-F.	18 R-F.	five 3-pdrs.	.....	.....
Cost, totals.....	2 Gatling.	4 Gatling.	4 Gatling.	\$3,000,000	\$3,400,000	\$2,000,000	\$2,125,000	\$3,500,000

* This table consists of actual trial data, excepting the *Rurik* and *Powerful*, given as designed.

Cruisers of the U. S. Navy.—The armored cruiser *New York*, begun in 1890 and completed in 1893, is of the same type as the *Blake* and *Blenheim* of the British navy, but slightly inferior in size and battery-power. She has an armored protective deck the whole length of the ship, extending 4 ft. 9 in. below the water at the side to a foot above the

water amidships; it is 6 inches thick on the slopes, 3 inches at the flats, reduced to 2½ inches at the ends of the vessel. In addition to this there is a belt of 5-inch armor in wake of the machinery spaces between the protective and main decks. Behind this belt is a cofferdam or cellular space 3 ft. 6 in. deep, extending all around the ship, filled with cellulose, a very light and water-excluding material. The armament consists of six 8-inch guns, two mounted in a barbettes forward plated with 10-inch armor, two similarly mounted aft, and one on each broadside amidships on the spar-deck. Twelve 4-inch rapid-firing guns are mounted in sponsons of 4-inch armor on the main deck, and eight 6-pounder guns in 2-inch armored sponsons on the same deck. The 8-inch guns are 25 feet and the 4-inch guns 16½ feet above the designed load-line. There are six torpedo-tubes for ejecting Whitehead torpedoes above the water-line, one forward and one aft and two on each broadside. There are twin-screws, and each screw has two sets of three cylinder triple-expansion engines, making four sets of engines, each in a separate water-tight compartment. It is estimated that the vessel can maintain at sea a speed of 18-5 knots.

The first-class cruiser *Brooklyn*, authorized in 1892 and begun in 1893, is similar in design to the *New York*, but of greater size and armament.

The *Columbia* was built for the express purpose of preying upon commerce, and when begun in 1890 it was stated by the Secretary of the Navy that "no merchant vessel that she meets, armored or unarmored, can escape from her." She and her sister ship, the *Minneapolis*, are of 7,375 tons displacement, 412 feet long, 58 ft. 2½ in. beam, and 22 ft. 6½ in. draught. The *Columbia* is expected to maintain at sea a speed of 21 knots an hour. There are three screw propellers, one placed amidships as in ordinary single-screw ships, and one on each side, slightly forward of the middle screw. Each screw has a separate triple-expansion engine in an independent water-tight compartment. All the motive machinery and boilers are below the armored deck, which is 4 ft. 6 in. below the water-line at the sides and 1 foot above amidships; the slopes are 4 inches thick, and the flat 2½ inches. There is a cellular structure 5 feet wide extending the whole length of the ship at the outer edge of the protective deck. The coal carried at the designed draught is 750 tons, and the total capacity of the bunkers is 2,000 tons. The battery of this vessel is a light one, being only intended to cope with small cruisers and armed merchantmen; it consists of two 40-caliber 6-inch guns mounted in the open on the spar deck forward, one 8-inch gun aft, eight 4-inch rapid-firing guns in 4-inch steel sponsons on the main deck, and eighteen machine-guns of various sizes.

Growth of the U. S. Navy.—The navy of the U. S. began modern construction in 1883 by the building of the cruisers *Chicago*, *Boston*, and *Atlanta*, and the dispatch-boat *Dolphin*. During the period of the building and completion of these ships it became necessary also to establish in the U. S. the manufacture of the class of steel of which such vessels were built, and the construction of modern ordnance and ammunition. At this time twenty-five years had elapsed since the construction of powerful modern iron-

clads was begun abroad, and during the greater part of that period, since the close of the civil war, none of the new types of war-vessels had been built in the U. S., and the republic was absolutely without rank as a naval power. In effective force the navy was in 1888 rated as nineteenth among the nations. Thus the U. S. followed Japan, Turkey,

Greece, Brazil, Chili, and Portugal. In 1895, counting as *active* the vessels built and building, the U. S. takes rank as a naval power fifth among the nations, in the following order: Great Britain, France, Russia, Italy, U. S. This classification is probably an unduly favorable comparison which does not actually represent the rank for active service, on account of the large proportion of vessels incomplete.

Evolution of development of Warships.—The gradual increase in the working-pressure of steam, with the single engine, the consequent introduction of the compound engine, which has come into practical use since 1870—largely developed into the triple-expansion engine—and the continued rise in the steam-pressure since, have produced two very important effects: (1) A reduction in the expenditure of coal, making longer voyages possible, or increasing the endurance under steam and decreasing the necessity of sail-power, which is destructive to speed and hampers and obscures the battery; (2) a reduction in the weight and space occupied by the machinery, both of which are most important elements in the efficiency of a man-of-war. The type of engine most in use at present for ironclads is the three-cylinder vertical inverted-cylinder engine, and the triple-expansion principle is almost universal. The piston speeds employed vary from 500 to 900 feet per minute, and are continually increasing with improvement in machinery and the increased use of steel; the faster the engines run the smaller and lighter the parts. The French type of boiler is generally employed, carrying 180 to 190 lb. per square inch of steam-pressure and burning 16 to 20 lb. of soft coal per square foot of grate per hour with natural draught. Such engines usually develop as much from 6 to 10 indicated horse-power per square foot of grate surface of the boilers, and the usual weight of the above types of machinery, engines, and boilers, including water, is from 250 to 290 lb. per indicated horse-power under natural draught. The French have adopted in several new vessels a type of multitubular boiler which effects a great reduction in weight of boilers and contained water. The type of boiler moves with increasing favor, and is being fitted in the latest and more powerful cruisers building.

The use of forced draught, by making the boiler communicate directly and forcing large volumes of air into them, has recently been revived, and is now an element in the design of all modern war-vessels, enabling them, by a largely increased consumption of fuel, to develop about from 30 to 50 per cent. more than the ordinary maximum power of the machinery for a few hours in cases of emergency when the greatest available speed is required. This method of forcing the fire was used so long ago as 1859 in U. S. river-vessels, but was first used by the French in war-vessels. It was the subject of considerable experiment in the British navy in 1865, on the *Unconquer*, the *Satellite*, and other vessels, in which the indicated horse-power per square foot of grate was increased from 6 to 10, under natural draught, to 16 with an atmosphere in the fire-rooms equivalent to a column of 14 inches of water. These experiments once led to the introduction of the system in all new war-vessels built, owing to the rapid deterioration of boilers subject to great forcing, its use has been carefully restricted.

In unarmored vessels horizontal engines are used only where necessary to get the machinery below the water-line and beneath the protective deck. Short-stroke vertical internal engines are more generally employed on account of their greater simplicity and endurance, and because of their less weight and bulk for corresponding power. Warships of over 1,500 tons displacement are now almost invariably provided with twin-screws and have two complete sets of propelling machinery, in separate, water-tight com-

partments, by which arrangement the danger of total disablement is reduced to a minimum. Twin-screws offer the additional advantage that they admit of adequate protection to the rudder and the steering gear, which is impossible in an unarmored single-screw ship and difficult to accomplish in an armored vessel. They also furnish a valuable auxiliary steering-power, and are equally efficient as propellers in comparison with the single screw. The system of trials of steamships initiated in the U. S. by Chief Engineer B. F. Isherwood, U. S. navy, but never developed, although for years in vogue in Europe, has done much toward economy in the expenditure of the power of marine engines and the determination of the power necessary for certain speeds of ships. In 1874 the system of obtaining the resistance of ships by towing models, established by William Froude in Great Britain, was confirmed by towing a full-sized ship, the *Greyhound*, and is now regarded as a means of immense advantage in design of ships. It forms the basis of the progressive speed-trials of the ship over a measured distance in smooth water, at which all data can be obtained under uniform conditions, and in a systematic manner.

Materials of Construction.—Since 1876 rapid progress has been made in the use of mild steel or ingot iron. This metal is chiefly produced by the open-hearth process, cast into large ingots, and then rolled into plates or shapes. It has not the distinctive property of tempering peculiar to steel, and contains from 12 to 20 of 1 per cent. of carbon. It is very ductile and malleable, and can be produced in large quantities of uniform quality; it has 55 to 80 per cent. greater tenacity than the best iron ship-plates, and is only 2 to 24 per cent. heavier for equal volume. The cruizers began in 1880 for the U. S. navy were the first in the U. S. built throughout of mild steel. The elaborate tests made by the Government have shown an average ultimate tensile strength of about 60,000 lb. per square inch, and an elongation under tension of 25 per cent. in a length of 8 inches. The use of this material, while adding considerably to the strength of a vessel, from its great ductility and uniform strength in all directions, enables a reduction in the weight of the structure of from 10 to 14 per cent. over that of iron. This fact led to its use even when the steel cost much more than iron. The cost of manufacture is so much less that it has practically replaced iron as a structural material.

The remarkable developments in ocean steamships and in ironclad and unarmored war-ships could never have been attained if wood had continued to be the material of construction. In wooden ships the limits of size and of proportion were practically fixed by the capabilities of the material of which they were built, but in iron ships the designer is left free to adapt such dimensions as will conduce to efficiency, safety, and economy. The greater strength of iron and steel, and increasing skill in the fashioning and disposition of the material in the structure of vessels have led to a continuous increase in the size of ships, which, combined with the corresponding decrease in the proportion of weight of hull to weight carried or in the load-displacement, has largely increased the efficiencies of ships—that is, it has increased their speed, both from absolute size and greater available weight for machinery, and their war-power by increased proportion of weight of armor and batteries. The decreased weight of hull, with, also, a gain in structural strength, has had equally remarkable effects in small as in large vessels, for through no other means could a torpedo-boat 63 feet long, weighing but 12½ tons, capable of a speed of 18 knots an hour, stand the strain of the machinery and be sufficiently strong to be lifted from the water to rest on crutches on board an ironclad.

ARMORED VESSELS.*

* In the table names of ships building or being rebuilt April, 1895, are put in italics; h. p. = between perpendiculars; B. L., broad beam; G. S., gun deck; S. L., steam-turbine; M. L., machine-loading; * length on water-line; † with forced draught; ‡, minimum.

Argentine Republic.

NAME	Date of launch	Length ft. l.	Breadth ft. l.	Beam ft. l.	Mean draught ft. l.	Engine nom.	Indicated horse-power	Speed	Armor	Armament
<i>Formosa</i>	1893	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.
<i>Formosa</i>	1895	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.
<i>Formosa</i>	1895	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.
<i>Formosa</i>	1895	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.
<i>Formosa</i>	1895	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.
<i>Formosa</i>	1895	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.
<i>Formosa</i>	1895	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.
<i>Formosa</i>	1895	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.
<i>Formosa</i>	1895	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.
<i>Formosa</i>	1895	191.0	34.0	24.0	26.0	4,200	4,200	13.7	8 in.	Eight 8-in., six 40 yds.

Austria-Hungary.

NAME.	Date of launch.	Length h. p.	Beam.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armor.	Armament.
<i>Barbette Ships.</i>									
Erzherzog Rudolph.	1887	295 0	62 4	25 8	8,870	7,500	18 0	12 11	Three 12-in., six 4 7-in.
Erzherzogin Stefanie.	1887	278 10	55 9	21 6	5,060	8,300	17 0	9 8	Two 12-in., six 6-in.
<i>Coast-defense Ships.</i>									
A.	.....	.....	.....	.....	5,500	8,500	17 25	11 0	Four 9 4-in., six 6-in.
B.	.....	.....	.....	.....	5,500	8,500	17 25	11 0	Four 9 4-in., six 6-in.
C.	.....	.....	.....	.....	5,500	8,500	17 25	11 0	Four 9 4-in., six 6-in.
Erzherzog Albrecht.	1872	285 2	56 8	22 0	5,940	8,600	13 0	9 7	Eight 9 6-in., 11 R.-F.
<i>Central-battery ships.</i>									
Custoza.	1872	302 3	58 0	24 6	7,080	4,440	14 0	9 7	Eight 9 4-in., 6 R.-F.
Don Juan de Austria.	1875	240 8	50 0	20 0	3,550	2,700	13 0	8 6	Eight 8 4-in., 6 R.-F.
Kaiser.	1871	254 0	54 3	24 8	5,810	3,200	13 0	6 5 1/2	Ten 9-in., 6 R.-F.
Kaiser Max.	1875	240 8	50 0	20 0	3,566	2,700	13 0	8 6	Eight 8 4-in., 6 R.-F.
Prinz Eugen.	1877	240 3	50 0	20 0	3,566	2,700	13 0	8 6	Eight 8 4-in., 6 R.-F.
Tegethoff.	1878	286 11	71 1	24 10	7,390	8,950	15 5	14 14	Six 9 6-in., 5 6-in., 13 R.-F.
<i>Armored Cruiser.</i>									
Kaiserin Maria Teresa.	1893	351 0	52 6	20 0	5,270	10,000	19 1	3 0	Two 9 6-in., six 6-in., 11 R.-F.
<i>Monitors.</i>									
Leitha.	1871	166 0	27 6	3 7	310	320	8 0	2 1/2 0	Two 6-in.
Maros.	1871	166 0	27 6	3 7	310	320	8 0	2 1/2 0	Two 6-in.
Körös.	1892	177 0	26 9	.....	448	1,250	10 0	.....	Two 4 7-in., 2 R.-F.
Szamos.	1892	177 0	26 9	.....	448	1,250	10 0	.....	Two 4 7-in., 2 R.-F.

Brazil.

<i>Turret.</i>									
Lima Barros.	1866	180 0	36 0	13 6	1,350	2,100	12 0	4 1/2 3	Four 7-in.
Bahia.	1866	178 0	35 0	8 3/4	1,000	640	10 5	4 1/2 2 1/2	Two 70-pdrs.
Blachuelo.	1883	305 0	52 0	19 6	5,700	7,300	16 7	7 10	Four 9 2-in. B.-L.
Aquidaban.	1885	305 6	52 0	19 8	5,791	7,201	15 8	.....	Four 9-in. B.-L., four 5 1/2-in. B.-L.
<i>Central Battery.</i>									
Mariz-e-Barros.	1866	198 10	31 0	9 6	1,444	600	9 0	4 1/2 2 1/2	Four 7-in.
Brazil.	1864	173 8	35 0	12 0	1,518	975	11 3	4 1/2 2 1/2	Four 7-in., four 68-pdrs.
Sete de Setembro.	1874	219 0	46 6	11 6	2,145	2,000	12 0	8 1/2 0	Four 9-in.
<i>Monitors.</i>									
Alagoas.	1864	120 0	28 0	9 0	340	75	7 5	4 1/2 2	One 70-pdr.
Rio Grande.	1864	120 0	28 0	9 0	340	75	7 5	4 1/2 2	One 70-pdr.
Flauhy.	1864	120 0	28 0	9 0	340	75	7 5	4 1/2 2	One 7-in.
Maranhão.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pernambuco.	.....	.....	.....	.....	.....	.....	.....	.....	.....

Chili.

Almirante Cochrane.	1874	204 0	46 0	19 2	3,560	3,000	13 0	9 4 1/2	Five 8-in. B.-L.
Huascar.	1864	196 0	35 6	15 6	1,130	1,200	11 0	4 1/2 2 1/2	Two 8-in., four 20-pdrs.
Capitan Prat.	1890	328 0	60 8	21 10	6,900	12,000	18 3	11 8 4	Four 9 5-in., eight 4 1/2-in., 30 R.-F.

China.

Ting Yuen.	1881	308 5	59 0	20 0	7,430	6,300	15 38	14 8	Four 12-in., two 5 1/2 in.
Chen Yuen.	1881	308 5	60 0	19 8	7,500	6,300	14 50	14 8	Four 12-in., two 5 1/2 in.
Tien Sing.	1875	105 0	20 4	7 0	200	340	10 00	3 1	One 6 7/8-in.
Ping Yuen.	1890	200 0	40 0	16 0	2,850	2,400	10 5	8 2	One 10-in., two 6-in., eight light.
Lai Yuen.	1887	270 0	40 0	16 0	2,850	3,600	10 5	8 9 1/2	Two 8 2-in., two 6-in., eight light.
King Yuen.	1887	270 0	40 0	16 0	2,850	3,600	10 5	8 2	Two 8 2-in., two 6-in., eight light.

Denmark.

Helgoland.	1878	257 0	59 2	18 8	5,347	3,888	13 3	12 1/2 6	One 12-in., four 10 1/2 in., five 4 1/2 in.
Odin.	1872	236 10	48 5	14 1	3,083	2,260	12 4	8 4 1/2	Four 10-in., six light.
Lindormen.	1868	216 3	39 4	14 1	2,044	1,560	12 2	5 1/2 3	Two 9-in., two light.
Gorm.	1870	231 8	39 0	14 5	2,304	1,670	12 3	7 4 1/2	Two 10-in., two light.
Rolf Krake.	1863	184 10	38 1	10 8	1,344	750	7 8	4 1/2 2	Two 8-in., two light.
Esbern Snare.	1862	150 0	26 0	10 1	527	500	11 0	2 2	Three 5 1/2-in.
Abalon.	1862	150 0	26 0	10 1	527	500	11 0	2 2	Three 5 1/2-in.
Iver Hvitfeldt.	1886	242 0	49 6	18 0	3,260	5,100	15 6	12 8	Two 10 1/2-in. Krupp, four 5-in. Krupp
Tordenskjold.	1880	221 6	43 3	15 6	2,400	2,600	14 0	8 0	One 52-in. Krupp, four 5 in.
Skjold.	.....	226 8	38 0	13 5	2,150	2,260	13 0	9 8	One 9 6-in., three 5-in., 4 R.-F.

France.

<i>Premier Rang.</i>									
<i>Cuirassés.</i>									
Dévastation.	1879	311 7	60 8	24 1	9,689	8,320	15 17	16 1/2 8 1/2	Four 13 1/2-in., four 10 1/2-in., six 5 1/2-in.
Courbet.	1882	311 7	69 8	24 1	9,689	8,100	15 4	16 1/2 8 1/2	Four 13 1/2-in., four 10 1/2-in., six 5 1/2-in.
Amiral Duperré.	1879	319 10	66 11	26 9	11,100	8,000	14 2	21 1/2 10 1/2	Four 13 1/2-in., fourteen 5 1/2-in.
Calman.	1883	*278 2	59 0	23 7	7,239	6,000	14 5	20 1/2 15 1/2	Two 16 1/2-in., four 4-in.
Indomptable.	1883	*279 9	59 0	23 7	7,239	6,000	14 5	20 1/2 14 1/2	Two 16 1/2-in., four 4-in.
Tonnerre.	1875	*241 6	57 9	21 0	5,580	4,166	14 0	14 1/2 9 1/2	Two 16-in., four 4-in.
Fulminant.	1877	*248 0	57 8	21 0	5,584	3,550	13 22	14 1/2 9 1/2	Two 16-in., four 4-in.
Furieux.	1883	*246 0	58 4	21 4	5,695	3,420	14 0	19 1/2 12 1/2	Two 13 1/2-in.
Redoutable.	1876	312 0	64 6	23 10	8,800	6,071	14 66	15 1/2 10 1/2	Eight 10 1/2-in., six 5 1/2-in.
Trident.	1876	314 1	57 10	26 10	8,814	4,882	14 17	8 1/2 6 1/2	Eight 10 1/2-in., two 9 1/2-in., six 5 1/2-in.
Friedland.	1873	*317 0	58 0	27 6	8,916	4,428	13 3	9 8 1/2	Eight 10 1/2-in., eight 5 1/2-in.
Colbert.	1875	*317 9	57 10	26 7	8,617	4,654	14 47	8 1/2 7 1/2	Eight 10 1/2-in., two 9 1/2-in., six 5 1/2-in.
Marengo.	1869	*282 10	57 2	26 8	7,187	3,673	13 5	7 1/2 7 1/2	Four 10 1/2-in., four 9 1/2-in., seven 5 1/2-in.
Océan.	1868	*282 10	57 7	27 8	7,334	3,781	13 7	7 1/2 7 1/2	Four 10 1/2-in., four 9 1/2-in., two 5 1/2-in., one 4 1/2-in.
Suffren.	1870	*282 10	57 2	27 2	7,604	4,181	14 3	7 1/2 7 1/2	Four 10 1/2-in., four 9 1/2-in., six 5 1/2-in., one 4 1/2-in.
Richelieu.	1873	*322 7	57 10	26 5	8,790	4,006	13 11	8 1/2 7 1/2	Six 10 1/2-in., five 9 1/2-in., seven 5 1/2-in., one 4 1/2-in.
Formidable.	1885	321 5	69 0	25 9	11,441	9,700	16 2	21 1/2 0	Three 17-in., twelve 5 1/2-in.
Terrible.	1881	271 7	59 0	23 7	7,184	6,230	11 7	20 1/2 14 1/2	Two 16-in., four 4-in.
Requin.	1885	*279 9	59 0	23 7	7,184	6,000	15 0	20 1/2 17	Two 16-in., four 4-in.
Amiral Baudin.	1883	321 5	69 0	25 9	11,441	8,320	15 0	21 1/2 13 1/2	Three 16 1/2-in., twelve 5 1/2-in.
Hoche.	1886	330 0	65 6	26 3	10,581	11,000	16 5	17 1/2 13 1/2	Two 13 1/2-in., two 10 1/2-in., sixteen 5 1/2-in.
Magenta.	1890	330 0	65 6	26 3	10,581	12,000	16 5	17 1/2 13 1/2	Two 13 1/2-in., two 10 1/2-in., sixteen 5 1/2-in.
Marceau.	1887	330 0	65 6	26 3	10,581	11,017	16 4	17 1/2 13 1/2	Two 13 1/2-in., two 10 1/2-in., sixteen 5 1/2-in.
Neptune.	1887	330 0	65 6	26 3	10,581	11,000	16 0	17 1/2 13 1/2	Two 13 1/2-in., two 10 1/2-in., sixteen 5 1/2-in.
Brennus.	1891	*344 6	65 0	27 10	10,800	13,000	17 5	17 1/2 15 1/2	Four 13 1/2-in., eight 9 1/2-in., eight 5 1/2-in.

France (continued).

NAME.	Date of launch.	Length h. p.	Extreme breadth.	Mean draught.	Displace- ment.	Indicated horse- power.	Speed.	Armor.	Armament.
Former Rang.									
<i>Cuirassés.</i>		<i>ft. in.</i>	<i>ft. in.</i>	<i>ft. in.</i>	<i>Tons.</i>		<i>Knots.</i>	<i>Inches.</i>	<i>Guns.</i>
Canot.....	1894	394 7	77 1	26 0	11,900	12,400	18 0	18 3	Two 12, two 10½-in., eight 5½-in., 20 R-F.
Laurent-Guiberry.....	1893	356 0	72 8	27 9	11,818	13,275	17 0	18 11	Two 12, two 10½-in., eight 5½-in., 24 R-F.
Charles Martel.....	1893	393 7	71 1	26 3	11,900	12,000	18 0	18 3	Two 12, two 10½-in., eight 5½-in., 20 R-F.
Thémis.....	1892	283 9	57 5	22 0	6,590	7,500	16 5	18 17	Two 13½-in., four 4-in., eight light.
Trochuart.....	1893	283 9	57 5	22 0	6,590	7,500	16 5	18 17	Two 13½-in., four 4-in., eight light.
Talmy.....	1892	283 9	57 5	22 0	6,590	7,500	17 0	18 17	Two 13½-in., four 4-in., eight light.
Montev.....	1892	382 3	70 3	27 7	12,300	13,000	17 5	15½ 8	Two 11½-in., two 10½-in., eight 5½-in., eight 4-in., 32 R-F.
Charlemagne.....	1885	0	66 7	25 10	11,232	14,000	18 0	15½ 3	Four 11½-in., ten 5½-in., six 4-in., 36 R-F.
Dauphin.....	1885	0	66 7	25 10	11,230	14,000	18 0	15½ 3	Four 11½-in., ten 5½-in., six 4-in., 36 R-F.
Vendôme.....	1885	0	66 6	26 3	11,900	12,600	17 5	17½ 9½	Two 11½-in., two 10½-in., eight 5½-in., eight 4-in., 30 R-F.
Dauphin.....	1870	370 6	50 2	21 4	5,320	10,000	20 0	7 2	Two 7½-in., ten 5½-in., 24 R-F.
Saint Louis.....	1885	385 3	66 7	25 10	11,230	14,000	18 0	15½ 3	Four 11½-in., ten 5½-in., six 4-in., 36 R-F.
Current Rang.									
Albatros.....	1876	241 6	57 9	16 9	4,523	2,745	12 8	13 9½	Two 10½-in.
Vigear.....	1878	241 6	57 9	16 9	4,523	2,319	10 83	13 9½	Two 13½-in.
Leconte.....	1880	241 6	57 9	16 9	4,523	2,728	12 8	17½ 13½	Two 13½-in.
La Clissonnière.....	1872	* 255 10	40 2	21 6	4,487	2,670	13 08	5½ 4½	Six 9½-in., six 3½-in.
Thémis.....	1877	* 258 2	48 9	20 9	4,127	2,400	12 89	5½ 4½	Six 9½-in., one 7½-in., six 5½-in., one 4½-in.
Albatros.....	1875	* 258 2	48 9	20 9	4,504	2,214	12 75	5½ 4½	Six 9½-in., one 7½-in., six 5½-in.
Richard.....	1880	* 253 9	57 2	23 3	5,881	4,556	14 53	9½ 6½	Four 9½-in., two 7½-in., six 5½-in.
La Clissonnière.....	1883	* 265 8	57 2	23 3	5,849	4,100	14 0	11 7½	Four 9½-in., one 7½-in., six 5½-in., one 4½-in.
Richard.....	1879	* 265 9	57 2	23 3	5,881	3,955	14 14	9½ 6½	Four 9½-in., two 7½-in., four 5½-in.
Vigear.....	1882	* 263 8	57 2	23 3	5,869	4,100	14 0	11 7½	Four 9½-in., one 7½-in., six 5½-in., one 4½-in.
Albatros.....	1885								
Vigear.....	1887								
La Clissonnière.....	1890	* 181 0	40 4	11 0	1,630	1,700	13 0	9½ 0	One 10½-in., two 4-in.
Albatros.....	1884								
La Clissonnière.....	1886								
Albatros.....	1886	* 165 0	35 7	10 4	1,045	1,500	13 2	9½ 0	One 9½-in.
Albatros.....	1885								
Albatros.....	1890	374 0	52 0	23 3	6,297	14,000	20 0	4 0	Two 7½-in., six 6½-in., two light.
Albatros.....	1892	283 9	57 5	22 0	6,590	7,600	17 0	18 17	Two 13½-in., four 4-in.
Albatros.....	1892	348 0	46 0	19 2	4,745	8,300	19 0	3½ 0	Two 7½-in., six 5½-in.
Albatros.....	1892	348 0	46 0	19 2	4,745	8,300	19 0	3½ 0	Two 7½-in., six 5½-in.
Albatros.....	1893	348 0	46 0	19 2	4,745	8,300	19 0	3½ 0	Two 7½-in., six 5½-in.
Albatros.....	1892	348 0	46 0	19 2	4,745	8,300	19 0	3½ 0	Two 7½-in., six 5½-in.
<i>Gun-vessels.</i>									
Albatros.....	1870	196 10	53 0	17 9	3,390	1,921	12 25	8½ 8½	Two 9½-in.
Albatros.....	1872	196 10	53 0	19 1	3,510	1,827	12 25	8½ 8½	Two 9½-in.

Germany.

Frigates.									
Albatros.....	1874	280 0	62 2	25 1	7,696	8,000	14 5	10-14 5-14	Eight 10½-in., one 8½-in.
Albatros.....	1874	280 0	62 2	25 1	7,696	8,000	14 5	10-14 5-14	Eight 10½-in., one 8½-in.
Albatros.....	1868	345 4	60 0	25 6	9,757	8,000	19 0	9½ 6½	Eighteen 9½-in., four 8½-in.
Albatros.....	1874	307 5	53 6	23 9	6,770	5,400	14 0	10½ 5½	Four 10½-in., two 6½-in.
Albatros.....	1884	249 0	59 0	19 6	5,200	3,900	13 5	12½ 0	Nine 9½-in., five 6-in.
Corvettes.									
Albatros.....	1877	298 6	60 0	19 8	7,400	5,600	14 0	17½ 15½	One 11½-in. B.-L., four 10½-in. B.-L.
Albatros.....	1878	298 6	60 0	19 8	7,400	5,600	14 0	17½ 15½	One 11½-in. B.-L., four 10½-in. B.-L.
Albatros.....	1878	298 6	60 0	19 8	7,400	5,600	14 0	17½ 15½	One 11½-in. B.-L., four 10½-in. B.-L.
Albatros.....	1880	298 6	60 0	19 8	7,400	5,600	14 0	17½ 15½	One 11½-in. B.-L., four 10½-in. B.-L.
Gun-vessels.									
Albatros.....	1876	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1876	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1876	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1877	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1877	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1878	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1878	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1879	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1880	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1880	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Albatros.....	1881	143 0	35 6	10 3	1,109	700	9 0	8 4	One 12-in.
Coast Defense.									
Albatros.....	1880								
Albatros.....	1890								
Albatros.....	1891								
Albatros.....	1893	240 0	49 3	17 9	3,500	4,800	15 0	9½ 8	Three 9½-in., six light.
Albatros.....	1892								
Albatros.....	1892								
Battle-ships.									
Albatros.....	1891								
Albatros.....	1892	354 4	64 0	24 7	9,842	8,000	16 0	16 12	Six 11½-in., sixteen 3½-in.
Albatros.....	1891								
Albatros.....	1891								

Great Britain.

First Class.									
<i>First-class.</i>									
Albatros.....	1876	320 0	75 0	25 3	11,880	8,010	13 81	16 24	Four 16-in., eight 4-in., 6 R-F.
Albatros.....	1875	320 0	63 10	26 6	10,820	8,210	11 0	11 14	Four 12-in., 18 R-F.
Albatros.....	1871	285 0	62 3	27 6	9,330	7,214	14 5	10 14	Four 10-in. B.-L., two 7-pdrs., 14 R-F.
Albatros.....	1872	285 0	62 3	26 8	9,330	6,270	13 4	10 14	Four 10-in., 14 R-F.
Albatros.....	1882	325 0	68 0	26 3	9,120	7,188	14 2	14 18	Four 12-in. B.-L., five 6-in., 14 R-F.
Albatros.....	1882	325 0	68 0	26 3	9,120	6,000	14 2	14 18	Four 12-in. B.-L., five 6-in., 14 R-F.
Albatros.....	1888	345 0	73 0	27 6	11,940	12,000	16 7	20 14	Four 13½-in., six 4½-in., seventeen light.
Albatros.....	1887	345 0	73 0	27 6	11,940	12,000	16 7	20 14	Four 13½-in., six 4½-in., seventeen light.
Albatros.....	1887	340 0	70 0	27 3	10,470	14,500	17 2	18 16	Two 17-in., one 10-in., twelve 6-in., twenty-one light.
Albatros.....	1891	380 0	75 0	27 6	14,150	13,000	17 5	18 17	Four 13½-in., ten 6-in., eighteen light.

Great Britain (continued).

NAME.	Date of launch.	Length ft. p.	Extreme breadth.	Mean draught.	Displace- ment.	Indicated horse- power.	Speed.	Armor.	Armament.
FIRST CLASS.									
<i>Barbette Ships.</i>									
Collingwood.....	1882	325 0	68 0	26 10	9,500	9,570	16 5	10 18	Four 12-in. B.-L., six 6-in., 23 R.-F.
Rodney.....	1884	325 0	68 0	26 9	9,500	11,100	16 75	10 18	Four 13.5-in. B.-L., six 6-in., 14 R.-F.
Howe.....	1885	325 0	68 0	27 3	10,300	11,500	16 8	10 18	Four 13.5-in. B.-L., six 6-in., 18 R.-F.
Camperdown.....	1885	330 0	68 6	27 3	10,000	12,000	16 9	12 18	Four 13.5-in. B.-L., six 6-in., 22 R.-F.
Benbow.....	1885	330 0	68 6	27 3	10,000	11,500	16 7	12 18	Two 17-in. B.-L., ten 6-in., 18 R.-F.
Anson.....	1886	330 0	68 6	27 3	10,000	11,500	16 9	12 18	Four 13.5-in. B.-L., six 6-in., 22 R.-F.
Barfleur.....	1892	360 0	70 0	25 6	10,500	13,000	18 0	12 9	Four 10-in., ten 4.7-in., seventeen light
Centurion.....	1892	360 0	70 0	25 6	10,500	13,000	18 5	12 9	Four 10-in., ten 4.7-in., seventeen light
Royal Sovereign.....	1891	360 0	75 0	27 6	14,150	14,000	18 0	18 17	Four 13.5-in., ten 6-in., 28 light R.-F.
Royal Oak.....	1892	360 0	75 0	27 6	14,150	13,000	18 0	18 17	Four 13.5-in., ten 6-in., 28 light R.-F.
Revenge.....	1892	360 0	75 0	27 6	14,150	13,000	17 5	18 17	Four 13.5-in., ten 6-in., 28 light R.-F.
Resolution.....	1892	360 0	75 0	27 6	14,150	13,000	17 9	18 17	Four 13.5-in., ten 6-in., 28 light R.-F.
Repulse.....	1892	360 0	75 0	27 6	14,150	13,000	17 5	18 17	Four 13.5-in., ten 6-in., 28 light R.-F.
Ramillies.....	1892	360 0	75 0	27 6	14,150	13,000	18 0	18 17	Four 13.5-in., ten 6-in., 28 light R.-F.
Empress of India.....	1891	360 0	75 0	27 6	14,150	13,000	18 0	18 17	Four 13.5-in., ten 6-in., 28 light R.-F.
Magnificent.....	1895	360 0	75 0	27 6	14,900	12,000	+17 5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Majestic.....	1894	360 0	75 0	27 6	14,900	12,000	+17 5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Renown.....	1895	360 0	72 0	26 9	12,350	12,000	+18 0	14 6	Four 10-in., ten 6-in., 30 R.-F.
Prince George.....	.....	360 0	75 0	27 6	14,900	12,000	+17 5	.....	Four 12-in., twelve 6-in., 28 R.-F.
Victorious.....	.....	360 0	75 0	27 6	14,900	12,000	+17 5	.....	Four 12-in., twelve 6-in., 28 R.-F.
Hannibal.....	.....	360 0	75 0	27 6	14,900	12,000	+17 5	.....	Four 12-in., twelve 6-in., 28 R.-F.
Cesar.....	.....	360 0	75 0	27 6	14,900	12,000	+17 5	.....	Four 12-in., twelve 6-in., 28 R.-F.
Mars.....	.....	360 0	75 0	27 6	14,900	12,000	+17 5	.....	Four 12-in., twelve 6-in., 28 R.-F.
Jupiter.....	.....	360 0	75 0	27 6	14,900	12,000	+17 5	.....	Four 12-in., twelve 6-in., 28 R.-F.
Illustrious.....	.....	360 0	75 0	27 6	14,900	12,000	+17 5	.....	Four 12-in., twelve 6-in., 28 R.-F.
SECOND CLASS.									
<i>Turret-ships.</i>									
Agamemnon.....	1873	280 0	66 0	24 0	8,660	4,500	12 1	14 18	Four 12-in., two 6-in., 14 R.-F.
Ajax.....	1880	280 0	66 0	24 0	8,660	6,000	12 1	14 18	Four 12-in., two 6-in., 14 R.-F.
Conqueror.....	1881	270 0	58 0	24 0	6,300	6,000	15 3	8 12	Two 12-in. B.-L., four 6-in., 6 R.-F.
Hero.....	1885	270 0	58 0	24 0	6,300	6,000	15 2	8 12	Two 12-in. B.-L., four 6-in., 10 R.-F.
Rupert.....	1872	250 0	53 0	22 9 1/2	5,440	6,000	14 0	9 14	Two 9.2-in. B.-L., two 6-in., 10 R.-F.
Hotspur.....	1870	235 0	50 0	21 10	4,010	2,500	11 2	8 11	Two 12-in. M.-L., two 6-in., 4 R.-F.
Glatton.....	1871	245 0	54 0	19 5	4,910	2,000	11 0	10 14	Two 12-in. M.-L., 3 R.-F.
Orion.....	1890	245 0	52 0	21 4	4,870	2,600	11 9	12 5	Four 12-in. M.-L., six 6-in., 6 R.-F.
Belleisle.....	1878	245 0	52 0	21 0	4,870	2,600	11 9	12 5	Four 12-in. M.-L., six 6-in., 6 R.-F.
THIRD CLASS.									
<i>Armored Cruisers.</i>									
Superb.....	1875	332 3	59 0	26 5	9,170	8,500	15 0	7 12	Sixteen 10-in. M.-L., six 4-in., 16 R.-F.
Neptune (turret).....	1874	300 0	63 0	25 5	9,310	6,000	13 4	9 12	Four 12-in. M.-L., two 9-in., 8 R.-F.
Monarch.....	1867	330 0	57 6	26 7	8,320	8,000	14 5	6 10	Four 12-in. M.-L., 2 9-in., 1 7-in., 10 R.-F.
Hercules.....	1868	325 0	59 0 1/2	26 6	8,680	8,500	14 7	6 9	Eight 10-in. M.-L., 2 9-in., 4 7-in., 21 R.-F.
Sultan.....	1868	325 0	59 0 1/2	26 8 1/2	9,210	8,000	14 0	6 9	Eight 9.2-in. B.-L., 4 6-in., 7 4-in., 21 R.-F.
Alexandra.....	1873	325 0	63 8	26 3	9,490	7,000	14 3	6 12	Ten 10-in., 2 11-in. M.-L., 6 4-in., 10 R.-F.
Téméraire.....	1876	285 0	62 0	27 1	8,540	6,500	13 8	8 11	Four 11-in. M.-L., four 10-in. M.-L., six 4-in., 14 R.-F.
Nelson.....	1876	280 0	60 0	24 0	7,630	5,500	13 6	6 9	Four 10-in. M.-L., eight 9-in. M.-L., 24 R.-F.
Northampton.....	1876	280 0	60 0	24 0	7,630	4,500	12 6	6 9	Four 10-in. M.-L., eight 9-in. M.-L., 14 R.-F.
Shannon.....	1875	260 0	54 0	22 3	5,390	2,500	12 35	6 9	Two 10-in. M.-L., seven 9-in. M.-L.
Bellerophon.....	1865	300 0	56 1	24 8 1/2	7,550	4,000	12 4	6 0	Ten 9-in. M.-L., 5 7-in. M.-L., 6 4-in., 4 R.-F.
Penelope.....	1867	260 0	50 0	16 8 1/2	4,470	2,700	11 0	15 6	Eight 9-in. M.-L., three 40-pdrs.
Impérieuse (barb.).....	1863	315 0	62 0	27 4	8,400	10,000	16 7	18 10	Four 9.2-in. B.-L., six 6-in., 13 R.-F.
Warspite.....	1884	315 0	62 0	27 4	8,400	10,000	16 7	18 10	Four 9.2-in. B.-L., six 6-in., 13 R.-F.
Orlando.....	1886	300 0	56 0	22 6	5,800	8,500	18 1	10 0	
Undaunted.....	1886	300 0	56 0	22 6	5,800	8,500	18 1	10 0	
Australia.....	1886	300 0	56 0	22 6	5,800	8,500	18 1	10 0	
Narcissus.....	1886	300 0	56 0	22 6	5,800	8,500	18 1	10 0	
Galatea.....	1887	300 0	56 0	22 6	5,800	8,500	18 1	10 0	
Immortalité.....	1888	300 0	56 0	21 0	5,800	8,500	18 1	10 0	
Aurora.....	1886	300 0	56 0	21 0	5,800	8,500	18 1	10 0	
Audacious.....	1869	280 0	54 0	22 3 1/2	6,010	3,310	11 6	6 8	Ten 9-in. M.-L., eight 4-in. M.-L., 10 R.-F.
Invincible.....	1869	280 0	54 0	22 3	6,010	3,500	12 5	6 8	Ten 9-in. M.-L., 4 64-pdrs., 4 4-in., 4 R.-F.
Iron Duke.....	1870	280 0	54 0	21 9	6,010	3,500	12 4	6 8	Ten 9-in. M.-L., four 64-pdrs., 6 R.-F.
Swiftsure.....	1871	280 0	55 0	25 3	6,910	3,500	12 6	6 8	Ten 9-in. M.-L., eight 4-in. M.-L., 6 R.-F.
Triumph.....	1870	280 0	55 0	25 7 1/2	6,640	3,500	12 6	6 8	Ten 9-in. M.-L., eight 4-in. M.-L., 16 R.-F.
FOURTH CLASS.									
<i>Turret-ships.</i>									
Cyclops.....	1871	225 0	45 0	16 4	3,480	1,300	9 9	6 10	Four 10-in. M.-L., four 6-in., 6 R.-F.
Gorgon.....	1871	225 0	45 0	16 4	3,480	1,300	9 9	6 10	Four 10-in. M.-L., 4 R.-F.
Hecate.....	1871	225 0	45 0	16 4	3,480	1,300	9 9	6 10	Four 10-in. M.-L., 4 R.-F.
Hydra.....	1871	225 0	45 0	16 4	3,480	1,300	9 9	6 10	Four 10-in. M.-L., 4 R.-F.
Prince Albert.....	1864	240 0	48 1	19 6	3,880	1,900	9 7	4 1/2 sides 4 1/2 turrets 10 1/2	Four 9-in. M.-L.
Scorpion.....	1863	224 6	42 4 1/2	16 2	2,750	1,450	10 5 1/2	4 1/2	Four 9-in. M.-L.
Wivern.....	1863	224 6	42 4 1/2	15 9	2,750	1,000	8 5	4 1/2	Four 9-in. M.-L.
FIFTH CLASS.									
<i>Rigged Ships.</i>									
Warrior.....	1860	390 2	58 4	26 7	9,210	4,000	12 7	4 1/2	Four 8-in. M.-L., twenty-eight 7-in. M.-L.
Black Prince.....	1861	390 2	58 4	26 9	9,210	4,000	12 7	4 1/2	Four 8-in., twenty-four 7-in. M.-L.
Achilles.....	1868	390 0	58 3 1/2	27 3	9,830	4,000	12 7	4 1/2	Fourteen 9-in. M.-L., two 7-in. M.-L.
Minotaur.....	1863	400 0	59 4 1/2	26 9	10,690	4,000	12 0	5 1/2	Seventeen 9-in. M.-L., 12 R.-F.
Agincourt.....	1865	400 0	59 5	27 6	10,690	4,000	12 0	5 1/2	Seventeen 9-in. M.-L.
Northumberland.....	1866	400 4	59 5	27 3 1/2	10,790	4,000	12 0	5 1/2	Six 9-in. M.-L., 18 8-in., 2 6-in. B.-L.

NOTE.—Many of the older British vessels have been refitted with new machinery, and others are rated at actual present performance, therefore not identical with the original design or trial performance given in the text for historical review.

Greece.

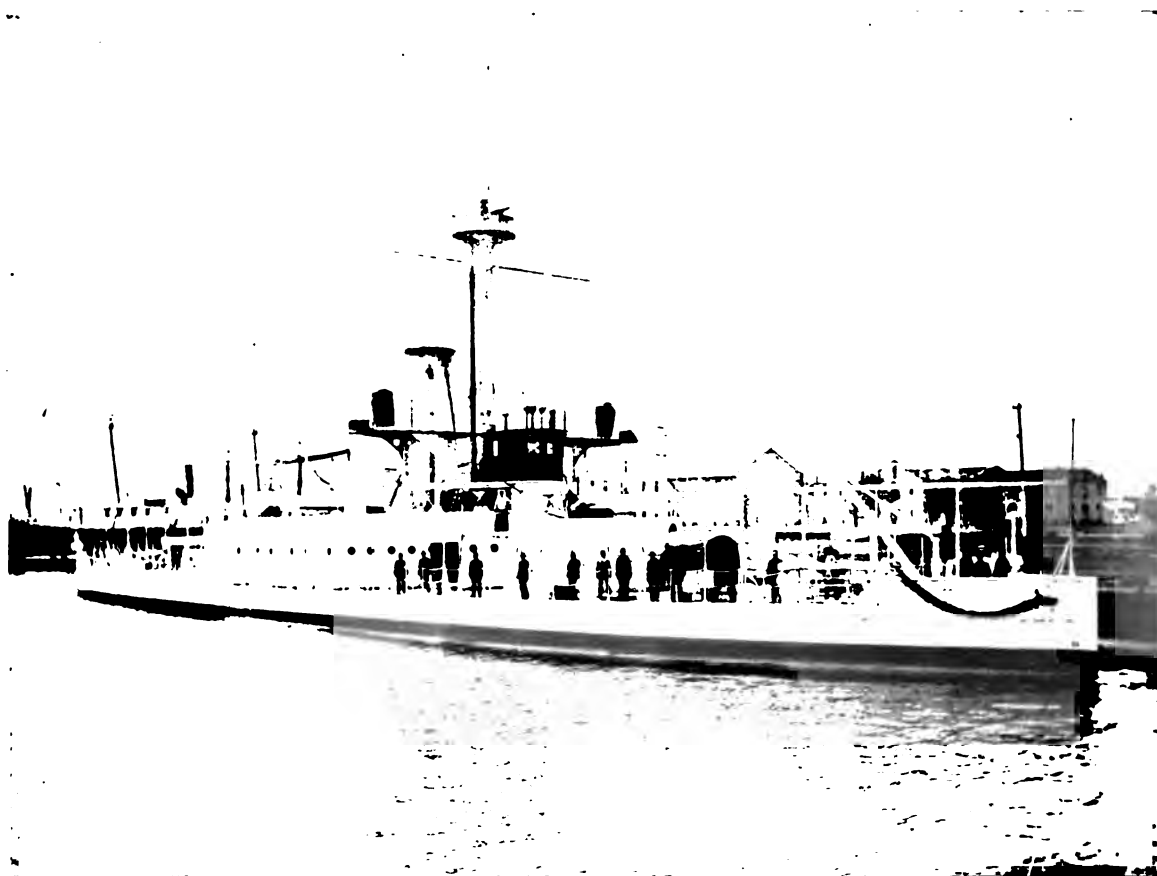
Basileus Georgios.....	1867	200 0	33 0	15 6	1,774	2,400	12 8	7 6 1/2	Two 9-in.
Olga.....	1869	249 0	59 0	22 6	2,060	1,950	10 0	5 1/2	Four 6 1/2-in., two 5 1/2-in., two 4 1/2-in.
Hydra.....	1863	320 0	51 10	18 0	4,885	6,700	17 0	12 4 1/2	Three 10 6-in., five 6-in.
Spetsia.....	1869	320 0	51 10	18 0	4,885	6,930	17 5	12 4 1/2	Three 10 6-in., five 6-in.
Psara.....	1890	320 0	51 10	18 0	4,885	6,900	17 0	12 4 1/2	Three 10 6-in., five 6-in.



French Battleship Hoche.



Argentine Cruiser Nueve de Julio (3,575 tons ; 22 knots).



United States Monitor Amphitrite.

Italy.

NAME.	Date of launch.	Length ft. p.	Breadth ft. in.	Mean draught.	Displace- ment.	Indicated horse- power.	Speed.	Armor.	Armament.
FIRST CLASS.									
<i>Battle-ships.</i>									
<i>Italia</i>	1880	403 6	74 0	31 2	15,300	16,000	18 0	19 0	Four 17-in., twelve 6-in.
<i>Lepanto</i>	1883	403 6	74 0	31 2	15,300	15,840	18 4	19 0	Four 17-in., twelve 6-in.
<i>Repubblica</i>	1876	340 11	64 9	26 7	11,300	7,710	15 4	21 1/2	Four 17-in., four 4 1/2-in.
<i>Italia</i>	1878	340 11	64 9	26 7	11,300	7,900	15 4	21 1/2	Four 17-in., four 4 1/2-in.
<i>Ruggiero di Lauria</i>	1884	328 2	65 4	27 2	11,000	10,600	17 0	17 0	Four 17-in., twelve 6-in.
<i>Francesco Morosini</i>	1885	328 2	65 4	27 2	11,000	10,600	16 0	17 0	Four 17-in., twelve 6-in.
<i>Angela Doria</i>	1885	328 2	65 4	27 2	10,045	10,500	16 1	17 0	Four 17-in., twelve 6-in.
<i>Umberto</i>	1888	400 0	76 9	28 6	13,251	19,500	18 2	19 0	Four 13 1/2-in., eight 6-in., sixteen 4 1/2-in.
<i>Italia</i>	1891	400 0	76 9	28 6	13,251	20,000	18 0	19 0	Four 13 1/2-in., eight 6-in., sixteen 4 1/2-in.
<i>Sardegna</i>	1890	411 0	76 9	28 6	13,940	23,000	19 0	14 1/2 barb. 4 inside	Four 13 1/2-in., eight 6-in., sixteen 4 1/2-in.
<i>Donatello di St. Bon.</i>.....	.....	344 6	68 10	24 9	9,800	13,500	18 0	9 1/2 4	Four 10-in., eight 6-in., 8 4 1/2-in., 16 R.-F.
<i>Amadeo Filiberto</i>.....	.....	344 6	68 10	24 9	9,800	13,500	18 0	9 1/2 4	Four 10-in., eight 6-in., 8 4 1/2-in., 16 R.-F.
SECOND CLASS.									
<i>Amadeo</i>	1871	261 7	57 8	26 3	6,419	3,496	12 9	8 1/2 6	One 11-in., six 10-in.
<i>Amadeo</i>	1872	261 6	57 4	24 8	5,854	3,413	12 4	8 1/2 6	One 11-in., six 10-in.
<i>Roma</i>	1865	261 3	57 5	24 4	5,814	3,000	13 0	4 1/2 4	Eleven 10-in.
THIRD CLASS.									
<i>Amadeo</i>	1865	293 8	40 4	21 6	4,376	3,240	13 0	5 3	Two 10-in., eight light.
<i>Castellardo</i>	1863	249 4	47 11	20 9	4,224	2,115	12 0	4 1/2 3	Two 9-in., nine 8-in., eight light.
<i>Amadeo</i>	1864	249 4	47 11	20 9	4,224	2,471	13 0	4 1/2 3	Two 9-in., nine 8-in., seven light.
<i>Amadeo</i>	1863	247 6	50 0	20 9	4,268	2,924	11 5	4 1/2 3	Two 9-in., nine 8-in.
<i>San Martino</i>	1863	247 6	50 0	20 9	4,268	2,620	11 5	4 1/2 3	Two 9-in., nine 8-in.
<i>Armored Cruisers.</i>									
<i>Amadeo</i>.....	.....	325 0	59 0	23 7	6,500	13,000	18 0	.....	Two 10-in., ten 6-in., six 5-in., 20 R.-F.
<i>Amadeo</i>.....	.....	325 0	59 0	23 7	6,500	13,000	18 0	.....	Two 10-in., ten 6-in., six 5-in., 20 R.-F.
<i>Amadeo</i>.....	.....	325 0	59 0	23 7	6,500	14,000	18 0	.....	Two 10-in., ten 6-in., six 5-in., 20 R.-F.
<i>Amadeo</i>.....	.....	325 0	59 0	23 7	6,500	13,000	18 0	.....	Two 10-in., ten 6-in., six 5-in., 20 R.-F.
<i>Amadeo</i>.....	.....	325 0	59 0	23 7	6,500	13,000	18 0	.....	Two 10-in., ten 6-in., six 5-in., 20 R.-F.

Japan.

<i>Fuji</i>	1877	218 8	47 6	18 0	3,718	3,500	14 0	9 8	Four 9 1/2-in., two 6 1/2-in.
<i>Katsuragi</i>	1877	229 6	40 7	17 6	2,200	2,500	14 0	4 1/2 0	Six 5 1/2-in., three 6 1/2-in.
<i>Katsuragi</i>	1877	229 6	40 7	17 6	2,200	2,500	14 0	4 1/2 0	Six 5 1/2-in., three 6 1/2-in.
<i>Katsuragi</i>	1864	210 6	38 7	17 4	1,459	975	10 0	4 0	Two 6 1/2-in., six 5 1/2-in.
<i>Armored Cruisers.</i>									
<i>Katsuragi</i>	1890	308 0	42 6	14 0	2,450	5,600	19 0	4 1/2 0	Ten 4 1/2-in. R.-F., fourteen light.
<i>Katsuragi</i>	1891	295 0	50 10	21 2	4,300	5,400	17 5	12-in. barb.	One 12 1/2-in., eleven 4 1/2-in., eleven light.
<i>Katsuragi</i>	1889	295 0	50 6	21 2	4,300	5,400	17 5	12-in. barb.	One 12 1/2-in., eleven 4 1/2-in., eleven light.
<i>Katsuragi</i>	1890	295 0	50 6	21 2	4,300	5,400	17 5	12-in. barb.	One 12 1/2-in., eleven 4 1/2-in., eleven light.

Netherlands.

SECOND CLASS.									
<i>De Ruyter</i>	1891	229 7	44 3	14 5	2,490	2,400	16 5	11 4	One 8 1/2-in., one 6 7/8-in., five light.
<i>De Ruyter</i>	1892	328 0	49 3	19 8	4,600	5,000	17 0	11 0	One 11-in., one 8 1/2-in., two 6 7/8-in., fourteen light.
<i>De Ruyter</i>	1874	269 0	49 3	20 0	5,400	4,500	11 95	8 0	Four 11-in., four 4 1/2-in.
<i>De Ruyter</i>	1868	193 2	38 0	16 0	2,200	2,200	12 8	6 0	Two 9-in.
<i>De Ruyter</i>	1870	195 6	40 0	15 8	2,378	2,000	12 0	6 0	One 11 1/2-in., 6 R.-F.
<i>De Ruyter</i>	1868	195 6	40 0	15 6	2,198	2,200	12 7	6 0	One 11 1/2-in., 6 R.-F.
<i>De Ruyter</i>	1868	194 10	38 0	15 6	2,200	2,200	12 3	6 0	One 11 1/2-in., 7 R.-F.
<i>De Ruyter</i>	1877	201 5	49 3	10 10	2,156	800	9 0	8 0	Two 11-in.
<i>De Ruyter</i>	1866	229 7	42 7	18 1	3,375	2,000	12 0	6 4 1/2	Four 9-in., four 4 1/2-in.
<i>De Ruyter</i>.....	.....	283 0	47 0	16 9	3,400	.....	20 0	6 9 1/2	Three 8 1/2-in., two 6 in., 10 R.-F.
<i>De Ruyter</i>.....	.....	283 0	47 0	16 9	3,400	.....	20 0	6 9 1/2	Three 8 1/2-in., two 6 in., 10 R.-F.
<i>De Ruyter</i>.....	.....	283 0	47 0	16 9	3,400	.....	20 0	6 9 1/2	Three 8 1/2-in., two 6 in., 10 R.-F.
<i>Monitors.</i>									
<i>De Ruyter</i>	1869	180 0	46 2	9 6	1,530	680	8 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>De Ruyter</i>	1869	180 0	44 0	9 6	1,530	680	8 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>De Ruyter</i>	1871	186 0	47 4	9 6	1,650	680	7 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>De Ruyter</i>	1868	180 0	43 6	9 6	1,530	680	8 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>De Ruyter</i>	1870	186 0	47 4	9 6	1,650	680	7 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>De Ruyter</i>	1868	180 0	43 6	9 6	1,530	680	8 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>De Ruyter</i>	1876	186 0	43 7	9 6	1,525	680	7 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>De Ruyter</i>	1878	201 5	49 3	10 2	1,935	691	7 0	5 1/2 8	Two 11-in.
<i>De Ruyter</i>	1870	186 4	44 0	9 6	1,566	680	7 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>De Ruyter</i>	1868	187 0	44 0	9 6	1,530	680	8 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>Gunboats.</i>									
<i>De Ruyter</i>	1871	186 4	44 0	10 2	1,566	680	7 0	5 1/2 8	One 11 1/2-in., 3 R.-F.
<i>De Ruyter</i>	1870	120 5	27 6	5 0	340	200	6 0	4 1/2 0	Two 3-in.
<i>De Ruyter</i>	1877	151 0	24 11	4 3	367	320	7 0	5 4	Two 4 1/2-in.
<i>De Ruyter</i>	1878	151 0	28 0	4 3	367	320	7 0	5 4	Two 4 1/2-in.
<i>De Ruyter</i>	1876	151 0	28 0	4 3	367	320	7 0	5 4	Two 4 1/2-in.
<i>De Ruyter</i>	1879	151 0	28 0	4 3	320	320	7 0	5 4	Two 4 1/2-in.

Norway.

<i>Monitors.</i>									
<i>De Ruyter</i>	1872	203 5	49 3	13 2	2,003	600	8 3	14 1/2 6 1/2	Two 11-in.
<i>De Ruyter</i>	1869	200 2	45 11	11 3	1,515	500	8 0	12 1/2 4 1/2	Two 11-in.
<i>De Ruyter</i>	1868	203 5	45 11	11 3	1,515	450	8 0	12 1/2 4 1/2	Two 11-in.
<i>De Ruyter</i>	1866	164 0	43 11	11 3	1,447	350	6 0	12 1/2 4 1/2	Two 11-in.

Portugal.

<i>De Ruyter</i>	1876	200 0	40 0	17 11	2,479	3,625	13 25	10 6	Two 10 1/2-in., one 5-in., three light.
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Russia.

<i>Cruisers.</i>									
<i>De Ruyter</i>	1878	298 6	49 3	21 7	5,740	5,200	13 5	8 5 1/2	Four 8-in., twelve 6-in.
<i>De Ruyter</i>	1875	281 4	47 11	21 0	4,682	5,222	15 2	7 4 1/2	Four 8-in., five 6-in., 12 R.-F.
<i>De Ruyter</i>	1873	281 4	47 11	21 0	4,682	4,472	14 0	7 4 1/2	Six 8-in., two 6-in., 10 R.-F.

Russia (continued).

NAME.	Date of launch.	Length ft. p.	Beam.	Mean draught.	Displace- ment.	Indicated horse- power.	Speed.	Armor.	Armament.
Cruisers.									
Dmitri Donskoi.....	1888	295 0	52 0	24 7	6,000	7,800	16 5	10 6	Two 8-in., twelve 6-in., 16 R.-F.
Wladimir Monarch.....	1882	295 0	52 0	23 0	5,754	7,000	15 8	10 6	Four 8-in., twelve 6-in., 18 R.-F.
Pamyat Azova.....	1887	377 0	51 0	23 0	6,000	8,000	18 0	9 8	Two 8-in., thirteen 6-in., 14 R.-F.
Gremyashtchy.....	1892	225 0	41 0	11 0	1,500	2,000	15 0	5 0	One 9-in., one 6-in.
Grosyashtchy.....	1890	229 0	41 8	11 0	1,492	2,000	15 0	5 0	One 9-in., one 6-in.
Otvalny.....	1892	220 0	41 0	11 0	1,500	2,000	15 0	5 0	One 9-in., one 6-in., 10 R.-F.
Rurik.....	1892	396 6	67 0	26 0	10,923	13,250	18 5	10 0	Four 8-in., 16 6-in., 6 4 7-in., 18 R.-F.
Rossia.....	.....	480 0	68 6	25 0	12,180	15,000	19 0	.....	Four 8-in., 16 6-in., 6 4 7-in., 18 R.-F.
Rurik No. 2.....	.....	446 9	70 0	27 0	12,086	15,000	19 0	.....	Four 8-in., 16 6-in., 6 4 7-in., 18 R.-F.
Battle-ships.									
Tchesmé.....	1886	331 0	69 0	26 6	10,181	11,000	15 0	16 14	Six 12-in., seven 6-in., 8 R.-F.
Sinope.....	1887	331 0	69 0	26 6	10,181	12,750	16 7 3	16 14	Six 12-in., seven 6-in., 8 R.-F.
Catherine II.....	1886	331 0	69 0	26 6	10,800	11,000	15 5	16 14	Six 12-in., seven 6-in., 8 R.-F.
Admiral Nachimoff.....	1885	333 0	61 0	25 3	7,781	8,000	16 7	10 8	Eight 8-in., ten 6-in., 10 R.-F.
Nicholas I.....	1880	327 0	67 0	25 6	8,440	8,000	14 8	14 6	Two 12-in., four 9-in., eight 6-in.
Alexander II.....	1887	327 0	67 0	25 6	8,440	8,000	16 5	14 6	Two 12-in., four 9-in., eight 6-in.
Gangoot.....	1890	278 0	62 0	21 0	6,628	8,300	14 7	16 0	One 12-in., four 9-in., four 6-in.
Twelve Apostles.....	1890	330 0	60 0	25 8	8,200	11,500	16 6	12 14	Four 12-in., four 6-in.
Georgiy Pobeydonosets.....	1891	320 0	69 0	26 7	10,290	15,000	16 5	16 12	Six 12-in., seven 6-in.
Navarin.....	1891	338 0	67 0	26 0	9,476	9,000	16 0	16 12	Four 12-in., eight 6-in.
Sesoi Veliki.....	1894	344 6	68 10	.....	8,800	8,000	16 5	15 7 10 2	Four 11 8-in., six 5 9-in., 20 R.-F.
Sesoi Veliki No. 2.....	.....	344 6	68 10	.....	8,800	8,000	16 5	15 7 10 2	Four 11 8-in., six 5 9-in., 20 R.-F.
Rotislav.....	.....	344 6	68 10	.....	8,800	8,000	16 5	15 7 10 2	Four 11 8-in., six 5 9-in., 20 R.-F.
Paria.....	.....	357 6	72 2	27 0	12,480	10,600	16 0	18 12	Four 12-in., 12 6-in., 4 4 7-in., 16 R.-F.
Petropaulovsk.....	.....	367 6	69 0	26 0	10,960	10,600	17 5	15 10	Four 12-in., eight 8-in., 24 R.-F.
Poltava.....	.....	367 6	69 0	26 0	10,960	10,600	17 5	15 10	Four 12-in., eight 8-in., 24 R.-F.
Sebastopol.....	.....	367 6	69 0	26 0	10,960	10,600	17 5	15 10	Four 12-in., eight 8-in., 24 R.-F.
Tri Sviatitelia.....	1893	357 6	72 2	27 0	12,480	10,600	16 0	18 16	Four 12-in., 12 6-in., 4 4 7-in., 56 R.-F.
SAAGOING:									
Turret-ships.									
Peter the Great.....	1872	328 2	62 4	23 9	8,749	8,258	14 5	14 8	Four 12-in., 13 R.-F.
Admiral Chitshagoff.....	1868	261 10	43 0	17 6	3,800	2,080	10 7 5	6 3 4	Two 11-in., four 4-pdrs., one 3-pdr.
Admiral Spiridoff.....	1868	261 10	42 9	17 3	3,700	2,081	10 7 5	6 3 4	Two 11-in., four 4-pdrs., one 3-pdr.
Admiral Greig.....	1869	261 10	42 9	18 3	3,754	2,000	10 0	4 2 2	Three 11-in., four 4-pdrs., one 9-in. m.r.
Admiral Lazareff.....	1867	261 10	42 9	17 10	3,754	2,000	10 0	4 2 2	Six 9-in., four 4-pdrs., one 9-in. mortar
Battery-ships.									
Kniaz-Pojarski.....	1867	263 5	49 0	21 0	4,506	2,835	10 0	4 2 2	Eight 8-in., two 6-in.
Pervenetz.....	1864	220 3	52 11	14 8	3,300	800	9 0	4 4	Fourteen 8-in., four 4-pdrs.
Netronj-menja.....	1864	214 8	52 11	16 1	3,870	1,140	8 0	5 4	Fourteen 8-in., six 6-pdrs., one 9-in. m.r.
Kreml.....	1864	215 0	52 11	16 8	3,865	2,822	8 5	6 4	Fourteen 8-in., six 4-pdrs., one 9-in. m.r.
Netron Menja.....	1864	219 10	53 0	15 6	3,494	2,393	9 0	4 4 4	Fourteen 8-in.
Single-turreted Monitors.									
Edinorog.....	1864	200 0	46 0	11 2 1/2	1,406	450	7 0	5 0	Two 9-in.
Bronenositz.....	1864	200 0	46 0	11 2 1/2	1,381	481	7 7	5 0	Two 9-in.
Circular Ironclads.									
Novgorod.....	1873	101 0	101 0	13 2	2,490	2,270	7 0	11 9	Two 11-in.
Admiral Popoff.....	1875	121 0	121 0	13 0	3,610	3,500	9 0	18 16	Two 12-in., four light.
Coast-defense Ships.									
Admiral Oushakov.....	1898	278 8	52 6	17 0	4,126	5,000	16 0	10 0	Four 10-in., two 9-in., four 6-in., 20 R.-F.
Admiral Senjavin.....	1898	278 9	52 6	17 0	4,126	5,000	16 0	10 0	Four 10-in., two 9-in., four 6-in., 20 R.-F.

Spain.

Pelayo.....	1887	344 6	66 2	24 8	9,902	6,800	15 0	17 7	11 8	Two 12-in. B.-L., two 11-in. B.-L., thirteen smaller guns.
Pulguedá (turret-ship).....	1874	127 11	29 6	6 7	553	326	8 0	3 1/2	3	One 6 1/2-in., two 4 1/2-in.
Broadside Ships.										
Vitoria.....	1865	316 7	57 0	24 11	7,250	4,500	11 5	5 1/2	4	Eight 9-in., three 8-in.
Numancia.....	1863	313 7	52 10	25 2	7,905	3,700	8 0	5 1/2	4	Eight 10-in., seven 8-in.
Sagunto.....	1869	279 2	54 1	24 3	7,352	3,200	8 0	5 1/2	4	Eight 9-in., three 7-in.
Zaragoza.....	1867	270 7	54 1	23 9	5,620	3,700	10 9	5 1/2	3	Four 9-in., three 7-in., ten 6 1/2-in.
Duque de Tetuan (gunboat).....	1874	141 0	31 0	6 11	703	190	8 0	3 1/2	0	One 6 1/2-in., four 4 1/2 M.-L.
Armored Cruisers.										
Emperador Carlos V.....	1892	364 0	65 0	22 0	9,325	15,000	+20 0	6	0	Two 11-in., ten 5 1/2-in., sixteen light.
Infanta Maria Teresa.....	1890	340 0	65 0	21 6	7,000	13,000	+20 0	12	10	Two 11 1/2-in., ten 4 1/2-in., sixteen light.
Vizcaya.....	1891	340 0	65 0	21 6	7,000	13,000	+20 0	12	10	Two 11 1/2-in., ten 4 1/2-in., sixteen light.
Almirante Oquendo.....	1891	340 0	65 0	21 6	7,000	13,000	+20 0	12	10	Two 11 1/2-in., ten 4 1/2-in., sixteen light.
Cardenal Cisneros.....	.....	340 0	65 0	21 6	7,000	13,000	+20 0	12	10 1/2	Two 11 1/2-in., ten 5 1/2-in., 16 R.-F.
Cataluña.....	.....	340 0	65 0	21 6	7,000	13,000	+20 0	12	10 1/2	Two 11 1/2-in., ten 5 1/2-in., 10 R.-F.
New ship.....	.....	364 0	69 0	22 0	9,235	15,000	+20 0	12	10 1/2	Two 11 1/2-in., ten 5 1/2-in., four 4-in., 7 R.-F.
Princesa de Asturias.....	.....	340 0	65 0	21 6	7,000	13,000	+20 0	12	10 1/2	Two 11 1/2-in., ten 5 1/2-in., one 3 6-in., 10 R.-F.

Sweden.

Monitors.										
John Ericsson.....	1865	197 0	46 10	11 8	1,522	380	7 0	10 1/2	4 1/2	Two 15-in.
Thordön.....	1866	197 0	46 10	11 8	1,522	380	7 5	10 1/2	4 1/2	Two 9 1/2-in.
Tirfing.....	1866	197 0	46 10	11 8	1,522	380	7 5	10 1/2	4 1/2	Two 9 1/2-in.
Loke.....	1871	206 3	45 4	12 0	1,620	460	8 0	17 1/2	4 1/2	Two 9 1/2-in.
Gunboats.										
Hildur.....	1871	131 0	22 3	8 3	461	133	8 0	16 1/2	2 1/2	One 9 1/2-in.
Ulf.....	1873	131 0	22 3	8 3	461	155	8 0	16 1/2	2 1/2	One 9 1/2-in.
Björn.....	1873	131 0	22 3	8 3	461	155	8 0	16 1/2	2 1/2	One 9 1/2-in.
Berserk.....	1873	131 0	22 3	8 3	457	155	8 0	16 1/2	2 1/2	One 9 1/2-in.
Sölve.....	1874	131 0	22 3	8 3	457	155	8 0	16 1/2	2 1/2	One 9 1/2-in.
Folke.....	1874	131 0	22 3	8 3	457	155	8 0	16 1/2	2 1/2	One 9 1/2-in.
Skold.....	1868	104 0	22 7	7 6	240	17	3 7	8 1/2	2 1/2	One 9 1/2-in.
Fennis.....	1871	104 0	22 7	8 7	260	43	6 0	10 1/2	2 1/2	One 9 1/2-in.
Gerda.....	1871	131 0	22 3	8 3	461	133	8 0	16 1/2	2 1/2	One 9 1/2-in.
Turret-ships.										
Svea.....	1886	248 4	48 7	11 10	2,900	3,100	15 5	11 1/2	7 8	Four 6-in. B.-L., two 10-in.
Göta.....	1890	248 4	48 7	11 10	2,900	3,100	15 5	11 1/2	7 8	Two 10-in., four 6-in. B.-L.
New ship.....		270 0	48 0	17 0	3,403	3,700	+15 0			Two 10-in., four 4 7-in., 16 R.-F.
Thule.....	1892	249 4	49 3	15 9	3,135	3,150	+16 0	11 1/2	7 8	Two 10-in., four 6-in., 5 R.-F.

Turkey.

NAME.	Date of launch.	Length b. p.	Beam.	Mean draught.	Displace- ment.	Indicated horse- power.	Speed.	Armor.	Armament.
		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Inches.	Guns.
<i>Armored Cruiser.</i>									
<i>Hamid-Kader</i>	1868	341 0	65 6	...	8,000	12,000	...	14 0	Four 11·2-in., six 6-in., 10 R-F.
<i>Central-battery Ships.</i>									
<i>Assat-Schofket</i>	1868	203 5	42 7	16 5	2,080	1,750	11·0	6 4½	One 9-in., four 7-in.
<i>Assat-Tefvik</i>	1868	272 4	52 6	24 11	4,687	3,568	13·0	8 9	Eight 9-in., two 8-in.
<i>Assat-Ilhar</i>	1869	226 4	36 0	16 5	2,380	2,450	12·0	6 5	Four 9-in.
<i>Assat-Bulend</i>	1869	236 3	39 4	18 1	2,806	3,250	13·0	9 6	Four 9-in.
<i>Assat-Bih</i>	1865	232 0	55 9	24 10	6,700	4,500	13·0	9 5	Ten 9-in., two 7-in., 6 R-F.
<i>Assat-Bih</i>	1870	213 3	42 7	17 4	2,266	1,800	11·0	6 4½	Two 9·5-in., two 7-in., one 4-in.
<i>Assat-Bih</i>	1874	332 0	59 0	25 0	9,140	7,910	13·74	12+1½ 8	Twelve 10-in., three 6-in.
<i>Assat-Zaffer</i>	1869	230 0	36 0	16 5	2,380	2,555	13·0	6 5	Four 9-in., one 5-in.
<i>Assat-Hair</i>	1872	236 3	39 4	18 1	2,806	3,000	12·0	9 6	Four 9-in.
<i>Assat-Schofket</i>	1868	203 5	42 7	16 5	2,046	1,900	11·0	6 4½	One 9-in., four 7-in.
<i>Burlette Ships.</i>									
<i>Assat-Bih</i>	1864	292 0	55 8	25 6	6,400	3,735	13·0	5½ 5	Two 11·2-in., eight 6-in., six 4-in.
<i>Assat-Bih</i>	1864	292 0	55 8	25 6	6,400	3,735	12·0	5½ 5	Two 11·2-in., eight 6-in., six 4-in.
<i>Assat-Bih</i>	1865	292 0	55 8	25 6	6,400	3,735	12·0	5½ 5	Two 11·2-in., eight 6-in., six 4-in.
<i>Assat-Bih</i>	1864	292 0	55 8	25 6	6,400	3,735	12·0	5½ 5	Two 11·2-in., eight 6-in., six 4-in.
<i>Turret-ship.</i>									
<i>Hafzi-el-Kahman</i>	1868	304 0	45 11	14 5	2,500	2,500	12·0	5½ 4½	Two 9-in., two 7-in., one 5-in.
<i>Armored Gunboats.</i>									
<i>Fah-el-Islam</i>	1864	101 9	24 7	5 11	335	290	7·0	3 3	Two 4-in.
<i>Fah-el-Islam</i>	1875	144 4	30 10	5 7	404	400	7·0	3 3	Two 4-in.
<i>Hambooyeh</i>.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

United States.*

NAME.	Date of launch.	Length b. p.	Beam.	Mean draught.	Displace- ment.	Indicated horse- power.	Speed.	Armor.	Armament.
		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Inches.	Guns.
<i>Battle-ships.</i>									
<i>Massachusetts</i>	1893	348 0	69 3	24 0	10,300	9,000	15·0	17 8	Four 13-in., eight 8-in., four 6-in., 26 R-F.
<i>Indiana</i>	1893	348 0	69 3	24 0	10,300	9,000	15·0	17 8	Four 13-in., eight 8-in., four 6-in., 26 R-F.
<i>Oregon</i>	1893	318 0	69 3	21 0	10,300	9,000	15·0	17 8	Four 13-in., eight 8-in., four 6-in., 26 R-F.
<i>Wisconsin</i>	1892	301 4	64 1	22 6	6,300	8,600	17·0	12 8	Two 12-in., six 6-in., 22 R-F.
<i>Florida</i>	1890	318 0	57 0	21 6	6,648	9,000	17·0	12 8	Four 10-in., six 6-in., 16 R-F.
<i>Alabama</i>.....	.....	360 0	72 2½	24 0	11,266	11,000	16·0	15 3	Four 12-in. B-L., eight 8-in. B-L., six 4-in. R-F., twenty 6-pdrs., six 1-pdrs.
<i>Armored Cruisers.</i>									
<i>New York</i>	1891	380 6½	64 10	23 11	8,200	17,401	21·0	6 0	Six 8-in., twelve 4-in., 12 R-F.
<i>Brooklyn</i>.....	.....	400 6	64 0	24 0	9,153	16,000	20·0	8 4	Eight 8-in. B-L., twelve 5-in. R-F., sixteen R-F.
<i>Monitors.</i>									
<i>Monitor</i>	1891	256 0	59 0	14 10	4,084	5,244	13·6	14 8	Two 12-in., two 10-in., six 6-pdrs., 4 1-pdrs.
<i>Albatross (iron)</i>	1883	259 8	55 10	14 6	3,500	+1,600	12·0	11½ 5	Four 10-in. B-L., two 4-in., 6 R-F.
<i>Albatross (iron)</i>	1876	259 8	55 10	14 6	3,500	+1,426	10·5	11½ 5	Four 10-in. B-L., two 4-in., 6 R-F.
<i>Albatross (iron)</i>	1883	259 8	55 10	14 6	3,500	+3,000	14·5	11½ 5	Four 10-in. B-L., two 4-in., 6 R-F.
<i>Albatross (iron)</i>	1883	259 8	55 10	14 6	3,500	+1,600	12·0	11½ 5	Four 10-in. B-L., two 4-in., 6 R-F.
<i>Albatross (iron)</i>	1882	240 0	60 0	18 2	6,000	+3,700	12·4	14 18	Four 10-in. B-L., two 4-in., 6 R-F.
<i>Albatross (iron)</i>	1885	225 0	43 8	13 6	2,100	340	6·0	10 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1882	225 0	43 8	13 6	2,100	340	6·0	10 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1882	200 0	46 0	11 6	1,875	340	6·0	11 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1883	200 0	46 0	11 6	1,875	340	6·0	11 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1882	200 0	46 0	11 6	1,875	340	6·0	11 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1882	225 0	43 8	13 6	2,100	340	6·0	10 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1882	225 0	43 8	13 6	2,100	340	6·0	10 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1882	200 0	46 0	11 6	1,875	340	6·0	11 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1883	200 0	46 0	11 6	1,875	340	6·0	11 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1882	200 0	46 0	11 6	1,875	340	6·0	11 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1882	225 0	43 8	13 6	2,100	340	6·0	10 5	Two 15-in. S-B.
<i>Albatross (iron)</i>	1883	250 9	43 5	15 0	2,183	4,800	17·0	6 0	Four 6-pdrs. R-F.

UNARMED VESSELS.*

United States.

NAME.	Date of launch.	Length b. p.	Beam.	Mean draught.	Displace- ment.	Indicated horse- power.	Speed.	Armor.	Armament.
		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.		Guns.
<i>First Rate.</i>									
<i>Albatross</i>	1892	412 0	58 2½	22 6½	7,375	18,509	22·8		One 8-in., two 6-in., eight 4-in., sixteen R-F.
<i>Albatross</i>	1893	412 0	58 2½	22 6½	7,375	20,493	23·0		One 8-in., two 6-in., eight 4-in., sixteen R-F.
<i>Albatross</i>	1892	340 0	53 0	21 6	5,500	13,500	20·0		Ten 5-in. R-F., four 8-in., twenty R-F.
<i>Second Rate.</i>									
<i>Albatross</i>	1888	327 6	48 7½	19 6	4,413	10,064	20·1		Four 8-in., six 6-in., twelve R-F.
<i>Albatross</i>	1885	325 0	48 2	19 0	4,500	5,084	15·3		Four 8-in., eight 6-in., two 5-in., ten R-F.
<i>Albatross</i>	1889	327 6	48 7½	19 2½	4,324	8,815	19·7		Twelve 6-in., thirteen R-F.
<i>Albatross</i>	1889	310 0	49 2	18 9	4,098	8,869	19·0		Twelve 6-in., thirteen R-F.
<i>Albatross</i>	1889	310 0	49 2	18 9	4,098	9,913	19·5		Twelve 6-in., thirteen R-F.
<i>Albatross</i>	1888	312 7	46 2	18 7	3,790	6,666	18·2		Two 8-in., six 6-in., fourteen R-F.
<i>Albatross</i>	1884	271 3	42 0	16 10	3,000	4,030	15·6		Two 8-in., six 6-in., ten R-F.
<i>Albatross</i>	1884	271 3	42 1½	16 10	3,000	4,030	15·6		Two 8-in., six 6-in., ten R-F.
<i>Albatross</i>	1882	300 0	42 0	18 0	3,183	10,000	19·0		One 6-in., ten 5-in. R-F., twelve R-F.
<i>Albatross</i>	1882	300 0	42 0	18 0	3,183	10,000	19·0		One 6-in., ten 5-in. R-F., twelve R-F.
<i>Albatross (wood)</i>	1858	235 8	46 0	19 2	3,250	733	9·6		Ten 8-in. M-L., nine R-F.
<i>Third Rate.</i>									
<i>Albatross</i>	1888	290 0	36 0	14 0	1,710	3,392	16·1		Six 6-in., seven R-F.
<i>Albatross</i>	1890	290 0	36 0	14 0	1,710	3,405	17·0		Six 6-in., seven R-F.
<i>Albatross</i>	1890	290 0	36 0	14 0	1,710	3,436	17·5		Six 6-in., seven R-F.
<i>Albatross</i>	1891	257 0	37 0	14 7	2,094	5,327	19·1		Nine 5-in. R-F., eight R-F.
<i>Albatross</i>	1891	257 0	37 0	14 7	2,094	5,327	18·7		Eight 5-in. R-F., eight R-F.
<i>Albatross</i>	1892	257 0	37 0	14 7	2,089	5,457	18·4		Nine 5-in. R-F., eight R-F.
<i>Albatross</i>	1884	240 0	32 0	14 3	1,485	2,253	15·5		Two 4-in. R-F., five R-F.
<i>Albatross</i>	1892	204 0	32 0	12 0	1,177	1,873	15·5		Eight 4-in. R-F., six R-F.
<i>Albatross</i>	1892	204 0	32 1½	12 0	1,177	2,199	16·0		Eight 4-in. R-F., six R-F.

* All vessels are of steel, except as noted after the name.

United States (continued).

NAME.	Date of launch.	Length h. p.	Beam.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armament.
		ft. in.	ft. in.	ft. in.	Tons.		Knots.	Guns.
Gunboat No. 7.		220 0	38 3	11 0	1,371	1,750	+14.0	Eight 4-in. R-F., four 6-pdrs., two 1-pdrs.
Gunboat No. 8.		250 9	40 11	9 0	1,392	1,600	+13.0	Eight 4-in. R-F., two 6-pdrs., four 1-pdrs.
Gunboat No. 9.		250 9	40 11	9 0	1,392	1,600	+13.0	Eight 4-in. R-F., two 6-pdrs., four 1-pdrs.
Marion (wood).	1873	216 0	37 0	16 6	1,900	753	11.2	One 8-in. M-L. R., six 9-in. S-B., two 20-pdrs. B-L.
Mohican (wood).	1883	216 0	37 0	16 6	1,900	618	10.6	Eight 9-in. S-B., one 8-in. M-L. R., two 20-pdrs. B-L.
Iroquois (wood).	1889	198 10	33 10	15 3	1,575	1,202	10.7	Two 8-in. M-L., four 60-pdrs. M-L., one 60-pdr. B-L.
Adams (wood).	1874	185 0	35 0	14 3	1,375	550	9.8	Four 9-in. S-B., one 8-in. M-L., two 37 H.
Alliance (wood).	1875	185 0	35 0	14 3	1,375	668	10.0	Eight 4-in., four 6-pdrs., two 1-pdr.
Essex (wood).	1874	185 0	35 0	14 3	1,375	505	10.4	Eight 4-in., four 6-pdrs., two 1-pdr.
Enterprise (wood).	1874	185 0	35 0	14 3	1,375	790	11.4	Four 9-in. S-B., one 8-in. M-L., one 37 H.
Monocacy (iron).	1885	255 0	35 0	9 0	1,370	850	11.2	Four 8-in. S-B., two 60-pdrs. B-L., six 37 H., two 4 H.
Thetis (wood).		166 0	30 3	18 0	1,250	490	7.5	One Hotchkiss 53.
Alert (iron).	1874	175 0	32 0	12 9	1,020	365	10.0	Two 9-in. S-B., one 11-in. S-B., one 60-pdr. B-L., 2 37 H.
Ranger (iron).	1874	175 0	32 0	12 9	1,020	365	10.0	
Fourth Rate.								
Petrel.	1886	176 3	31 0	11 7	892	1,095	11.79	Four 6-in. B-L., six R-F.
Vesuvius.	1886	252 4	36 6	10 7	950	3,800	21.5	Three dynamite-guns, three R-F.
Yantic (wood).	1864	190 0	30 0	12 2	900	225	8.3	Two 9-in. S-B., one 8-in. M-L., one 60-pdr. B-L.
Michigan (iron).	1843	163 3	27 14	9 0	695	305	10.5	Four 30-pdrs. B-L.
Plata (iron).	1865	137 0	26 0	10 0	550	190	8.5	Four 12-pdrs. S-B.
Torpedo-boats.								
Alarm (iron).	1874	158 6	28 0	10 6	800	600	10.0	
Cushing.	1880	138 9	14 3	4 10	105	1,720	22.5	Three torpedo-tubes.
Stiletto (wood).	1889	88 6	11 0	3 0	31	359	18.2	
Ericsson.	1894	149 7	15 6	4 9	120	1,800	24.0	Three torpedo-tubes, three 1-pdrs. R-F.
Torpedo-boat No. 3.		160 0	16 01	5 0	142	2,000	24.5	Three 1-pdrs., 3 torpedo-tubes.
Torpedo-boat No. 4.		160 0	16 01	5 0	142	2,000	24.5	Three 1-pdrs., 3 torpedo-tubes.
Torpedo-boat No. 5.		160 0	16 01	5 0	142	2,000	24.5	Three 1-pdrs., 3 torpedo-tubes.

FRANCIS T. BOWLEN.

Ship-worm: any bivalve of the family TEREDINIDÆ (q. v.).**Shipwreck** (in law): See WRECK.

Shiras, GEORGE, JR., LL. D.: justice U. S. Supreme Court: b. at Pittsburg, Pa., Jan. 26, 1832; educated at Ohio University, at Yale College, where he graduated 1853, and at Yale Law School; admitted to the bar at Pittsburg and practiced in that city; appointed associate justice of the Supreme Court of the U. S. July 19, 1892. The degree of LL. D. was conferred upon him by Yale University in 1883. C. H. T.

Shiraz, shee'raaz, or **Sheeraz**: town; capital of the province of Fars, in Persia; in lat. 29° 36' N. and lon. 52° 44' E. (see map of Persia and Arabia, ref. 4-H); situated at an elevation of 4,500 feet above the sea, in a valley made familiar by Moore's *Lalla Rookh*, and still celebrated for the abundance and excellence of its fruits of every description. Founded in 697, it was during more than five centuries a favorite residence of the Persian princes, and a seat of science and art. Sa'di and Hafiz were born, lived, and died here. Shiraz contains the tomb of Hafiz, and that of Sa'di is a few miles to the N. E. The city suffered fearfully from earthquake in 1812 and again in 1824. Rebuilt, it was almost destroyed by another earthquake 1853. It was again rebuilt, but on a less extended scale. Its manufactures and trade have greatly declined, but its wine, rose-water, carpets, and inlaid work are still famous in the East. Pop. about 25,000. E. A. GROSVENOR.

Shire: See COUNTY.

Shiré, shee'ra: river of Southeastern Africa, issuing from the Lake of Nyassa, in lat. 14° 28' S. It flows with many rapids and cataracts from the elevated plateau of the interior into the flat coastland, where it forms a broad, calm stream, navigable for the largest vessels, and joins the Zambezi about 90 miles above its mouth.

Shirlaw, WALTER: genre-painter; b. at Paisley, Scotland, Aug. 6, 1838. His parents removed to the U. S. in 1840, and in time he became a bank-note engraver; in 1870 he went to Munich, where he was a pupil of Raab, Wagner, Ramberg, and Lindenschmidt; became a National Academician 1888. His *Sheep-shearing—Bavarian Highlands* (1876), exhibited in 1877 at the National Academy, New York, attracted much attention. As an illustrator his designs for Goldsmith's *Hermit* are notable. Studio in New York. W. A. C.

Shirley, JAMES: dramatist; b. in London, Sept. 13, 1596; educated at Merchant Taylors' School, St. John's College, Oxford, and Catharine Hall, Cambridge; took orders in the Church of England, and obtained a curacy in Hertfordshire, but soon vacated it by becoming a Roman Catholic; taught for some time a grammar school at St. Albans, but, being unsuccessful, became a dramatic writer in London; had produced thirty-nine plays before the Great Rebellion; founded a classical academy at Whitefriars, and wrote several grammatical treatises. D. in London from exposure

consequent upon the great fire of 1666, and was buried Oct. 29. His *Dramatic Works and Poems* (6 vols., 1833) were first edited by Gifford and Dyce. He is regarded as the last of the Elizabethan dramatists. *The Traitor* (1631) is, by common consent, his best tragedy, and *The Lady of Pleasure* (1635) his best comedy. Revised by H. A. BEERS.

Shirley, WILLIAM: colonial governor of Massachusetts: b. at Preston, Sussex, England, in 1693; became a lawyer; settled in Boston, Mass., 1734; was commissioner for fixing the boundary-line between Massachusetts and Rhode Island; was royal governor of Massachusetts 1741-45; planned the successful expedition against Cape Breton 1745; was in England 1745-53; returned to Massachusetts as governor in the latter year; treated with the Eastern Indians 1754; explored Kennebec river, erecting there several forts; was commander-in-chief of the forces in British North America at the outbreak of the French war 1755; planned the expedition of Gen. Prideaux against Niagara, and proceeded himself as far as Oswego; was appointed lieutenant-general 1759; became afterward governor of the Bahama islands, but returned to Massachusetts, where he built a fine residence at Roxbury. D. at Roxbury, Mar. 24, 1771. Author of *Electra*, a tragedy; *The Birth of Hercules*, a masque; *A Letter to the Duke of Newcastle, with a Journal of the Siege of Louisbourg* (1745); and *The Conduct of Gen. William Shirley briefly Stated* (1758).—His son WILLIAM, an officer in the army, was killed at Braddock's defeat 1755.—Another son, Sir THOMAS, b. in Boston, became a major-general in the British army, was created a baronet 1786, and was governor of the Leeward islands. D. Mar., 1800.

Shir'wa: lake; a little S. E. of Lake Nyassa, Southeast Africa; formerly supposed to have as its outlet the Lujenda river, but discovered (1887) to be nothing more than a huge evaporating-pan with an area of about 350 sq. miles, into which a number of small rivers discharge. Its waters are brackish, are gradually drying up, and there is evidence that formerly the lake stood at a much higher level and discharged into the Lujenda river. C. C. A.

Shi'shak: the Hebrew name of the Egyptian king *Shashank*, first ruler of the twenty-second (Bubastite) dynasty (966-800 B. C.). He was probably of Libyan lineage, and at the close of the twenty-first (priestly) dynasty grasped the royal power which he had actually wielded previously. This was largely due to the increased influence of the Libyan mercenaries from whom the Egyptian army had been recruited since the time of Seti I. and Ramses II. The dominion of Egypt was much extended by Shishak, who waged war in Palestine against Rehoboam, King of Judah. His inscriptions on the south wall of the Temple of Amen at Karnak contain the names of 128 cities or regions in Palestine and Syria which fell into his hands. The list is really larger, but a considerable number of names are no longer legible. Jerusalem was among the captured places.

and from it he removed much land (1 Kings xiv, 25, 26). Jeroboam, who had fled from Solomon, sought protection in Tyre, under Hiram (1 Kings x, 15), and later upon the accession of the Hebrew nation became king of the realm, presumably with the support and aid of Hiram. The name also belonged to the fifth, seventh, and ninth kings of the twenty-second dynasty, but particulars concerning them are meagre; beyond the statement that the last two reigned fifty-two and thirty-seven years respectively. Their period is one of the darkest and least known in Egyptian history. (CHARLES R. GILLIES.)

Shil'han: (1) wood of the shillal-tree, reputedly mentioned in Exodus as the timber principally employed in building the tabernacle. It has been identified with the *domin ayal*, which abounds in the Sinai peninsula. The wood is light, fine-grained and enduring, and of a fine orange-brown. The leaves are small, and in spring the tree is covered with tufts of yellow blossoms. It yields the gum arabic of commerce. (2) A fertile plain, so called from its acacia-groves, just opposite Jericho, in which the Israelites were encamped before crossing the Jordan. There the Israelites fell easy victims to the seductions of the Moabite women, who prostituted themselves in honor of their god Baal-peor, and there the punishment followed on them and on the Midianites (Num. xxi, xxxi, 1-12). There went the spirit to Jericho (Josh. ii, 1). Revised by S. M. JACOBSON.

Khu'a: the most southern part of the Abyssinia highland, East Africa; formerly an independent state, but since 1888 a part of Abyssinia, the rule of its king, Menelik, having been extended over the whole of Abyssinia, except the northern district, appropriated by Italy. The whole territory of the king became (1890) a protectorate of Italy. The capital and chief residence of the king is Antotto, and there are several other large towns, of which the most important are Ankober and Hoaghe, situated about 8,000 feet above sea-level. The soil is very fertile, and most of the inhabitants are Catholic Christians. Pop. less than 3,000,000. Area about 15,000 sq. miles. (C. C. ADAMS.)

Shuals, Isles of: See ISLES OF SHUALS.

Shock (from M. Dutch *schok*, a bounce, jolt; O. H. Germ. *scoc*, a swing; cf. O. Eng. *scoca*, shake, and Fr. *choc*, collision (from M. Dutch) 1) sudden vital depression, the peculiar effect upon the animal system produced by violent injuries. Surgical shock must be distinguished from mental shock, caused by grief, terror, or other mental emotions. Following serious accidents, the crushing of a limb by a railway injury or its removal by a cannon-ball, extensive superficial lacerations, extensive surgical operations, as amputations or hysterectomy, and as the result of blows over important organs, concussion of the brain, a kick or sudden blow in the region of the stomach over the solar plexus—a powerful impression is made on the nerve-centers proportionate to the extent of the superficial or peripheral excitation. The condition is induced by paralysis of the vaso-motor centers, but is not limited in its manifestations to the nervous system, all the tissues of the body being affected in sympathy with the injured part. The symptoms of shock are extreme pallor and coolness of the face and surface of the body, a small, feeble, slow pulse, infrequent and often irregular respiration, pinched features, cold sweat, and the appearance of impending dissolution. If the bodily temperature falls more than 2° F., death is apt to follow. In special cases, delirium, hiccup, or convulsions are present. The circulation and respiration may be so depressed that death is immediate, or speedily ensues unless reaction is artificially hastened. Sensation of pain is annulled: in the utmost injury, as the laceration and removal of a limb by a cannon-ball, there may be no pain and no loss of blood during the period of shock. The period of shock, if survived, is followed by reaction, a resumption of ganglionic or central nerve-power, and revival of the dependent functions. Extensive loss of blood renders the patient more susceptible to shock, predisposing sudden assemia, inanition, and disturbed action of nerve-centers. Concussion of the brain is often accompanied by shock, but is in itself an entirely distinct condition. Exposure to cold increases shock, and is particularly to be avoided in operations. No satisfactory lesson or organic change has been found to explain shock, the only marked post-mortem lesion being distension of the right side of the heart and great venous trunks with blood, sometimes fluid and always coagulating with difficulty. The treatment of shock is to be directed to the immediate development of reaction. The sinking pulse must be rallied

by ammonia and alcohol, by stimulating stimulants by heat to the extremities and surface. Hypodermic injections of digitalis, atropia, strychnia ether, or brandy are often used. Quinine is sometimes given before an operation as a prophylactic. In mild cases of shock external warmth, a little diffusible stimulant and rest are all that is required. Reaction is sometimes excessive, the patient passing into a condition of trematous delirium, or may be imperfect, when he falls into the state of prostration with exsanguination. What is called secondary or lightning shock is due to the terminal hour of desaturation, and often proves fatal.

Revised by JAMES ANNANDER, Jr.

Shoddy (originally, the wool that was shed or wanted in carding and spinning); in a stricter sense, a fiber made by tearing in pieces in a suitable mill bags of woollen or combi-wool goods. The corresponding fiber of carded-wool rags is called mungo; but more frequently both kinds are classed together as shoddy or "devil's dust." Some classes of useful goods can not be profitably made without shoddy, and if used in reasonable proportion the pressure can not be detected, and the wear of the goods is not much diminished. None but the very best sorts of woollen goods are perfectly free from shoddy.

Shoe [O. Eng. *shōc*; O. H. Germ. *schuh* (cf. Mod. Germ. *schuh*); Ital. *scar*; Goth. *skōh*]; in general, any covering for the foot (with the exception of *boots*) of which warmth and protection are the special purposes. If the foot-covering encloses mainly a sole, it is called a sandal; if it also has a part coming up to the ankle, it is called a shoe; while one that covers a portion of the leg is called a boot. (See *boots*.) A loose light shoe into which the foot may be easily slipped is appropriately called a "slipper." The earliest form of the shoe was the simple sandal, which was secured to the foot by thongs, and often by a lashing running between the first and second toes. Almost every material has been used for the construction of shoes, the skins of animals, tanned or untanned, more frequently than any other. In some parts of Europe wooden shoes, or *sabots*, are very common among the poorer classes. In Japan the sandals worn by the common people are made of straw; in South America they are made of plaited thongs of hemp. There have been great changes in the forms of shoes as worn in different countries and at different periods among civilized nations. The early Greeks usually went barefoot, or confined themselves to simple sandals, which in time came to be highly ornamented. The early shoes of the Romans were buskins, not very dissimilar to the moccasins of the American Indians; thick soles, sometimes of metal, were a later invention. In time they grew into shoes, or even boots, sometimes covering the entire leg. In Europe, during the Middle Ages, shoes often were made in fantastic shapes. At one time they had pointed toes about two feet long, which were often brought up and tied to the knee; and not infrequently a man of fashion would wear them of different colors, as a red one on one foot and a yellow one on the other. For many years there has been very little change in the general form of the covering for the foot as worn by either sex; the main variations being in the height of the heel and the shape of the toe, whether pointed, round, or square.

Manufacture.—A boot or shoe consists essentially of two parts, the sole, almost universally made of thick leather, and the upper, usually of a softer leather, but not unfrequently of cloth of some kind, for women often of silk or satin. These parts are attached to each other in various ways, usually by sewing. A few years ago a boot or shoe was made throughout by a single person; at present the production of a shoe is the work of several persons, each performing only a single part of the operation, a considerable portion being done by ingenious machinery. Indeed in no single trade is there a more perfect division of labor or a greater adaptation of machinery. Boots and shoes put together by pegging were in extensive use a few years ago. Now only some of the cheapest grades are pegged, much of the work being done by the pegging-machine invented by A. C. Gallatone in 1851. Pegging, however, as a method of fastening the soles to the uppers, has been almost entirely superseded by a process known as the "stand-and-screw," in which the outer soles are fastened to the inner soles and the uppers by a machine that uses a threaded brass wire, which is supplied from a reel. In the performance of its work the machine threads a portion of the wire into the substance of which the shoe is composed, gives it a half turn, and automatically discharges it. An-

other important invention is that of a machine for sewing soles, which was improved by Gordon McKay. One of these machines in the hands of a good operator will easily sew on the soles of 800 pairs of women's shoes in ten hours. Originally, shoes made by the McKay process were not so well finished as to the inner part of the sole where the stitches came through, but this defect was overcome by the use of a smooth inner sole, cemented to the sole in such a way as entirely to cover the stitches. A later and more important invention is that of the Goodyear welt machine, as it is called, which has enabled manufacturers of shoes to produce footwear so closely resembling hand-work in appearance and durability as to render it extremely difficult to distinguish one from the other. Indeed in the best grades what difference exists may be fairly said to be in favor of the machine-sewed goods. A great part of the boots and shoes used in the U. S., especially the finer kinds, are made in large establishments in New York, Philadelphia, Baltimore, and other large cities, but more in several towns in Massachusetts, Maine, and New Hampshire; Lynn, Mass., is the greatest seat of this manufacture, and among the other large centers are Haverhill, Brockton, Milford, Marblehead, Worcester, Braintree, and Danvers, in Massachusetts; Portland, Augusta, and Lewiston, in Maine; Dover and Farmington, in New Hampshire. Until about 1890 the U. S. did but little export business in boots and shoes.

Revised by VAUGHAN SNIDER.

Shoebill: a large wading bird (*Baleniceps rex*) inhabiting the region of the White Nile, Africa. It is named from its large, peculiarly shaped beak, and is also termed whale-headed stork, although its affinities are rather with the herons. It stands nearly 5 feet high, is gray, and has a little recurved crest. F. A. L.



Shoebill.

Shoeburyness: a promontory in the county of Essex, England; on the northern shore of the estuary of the Thames, directly opposite Sheerness (see map of England, ref. 12-L). Shoeburyness was selected by the Government as the locality of experimental firing at armored targets and for trial of new guns. It is the seat of a school of gunnery, with artillery, barracks, batteries, targets, etc.

Shoeing of Horses: See FARRIERY.

Shōgun (Jap., liter., general, the Chinese *Tsiang-K'ün*): a Japanese military title, said to have been first employed by the Emperor Suijin in the first century B. C., when he divided the empire into four military divisions. The name began to have a political significance with YORITOMO (q. v.), who was appointed in 1192 *Sei-i-tai-Shōgun*, or generalissimo, against the barbarians. Henceforward the shōgunate more and more represented the real governing force in the empire, until in the seventeenth century the Tokugawas (see IYEWASU) became a real reigning dynasty. The empire was centralized afresh from Yedo, so that in 1868 when the emperor resumed power he merely fell heir to the bureaucratic system developed by these rulers. J. M. DIXON.

Sholapur: district and city in the southern part of the Bombay Presidency, British India; on the border of Haidarabad. The district lies between the parallels 17° 13' and 18° 35' N.; has an area of 4,521 sq. miles; is bleak and treeless, and generally flat or slightly undulating, and is subject to great irregularity in the amount of rainfall, making agriculture dependent on irrigation. Its silks, finer cotton cloths, and blankets have a good name, and the chief exports besides cloths are oil, oil-seeds, ghee, and turmeric. The population numbers about 600,000, mostly Hindus. The city of Sholapur, chief town and administrative headquarters of the district, is in lat. 17° 40' N., lon. 75° 57' E., near the Sina river (see map of S. India, ref. 4-D). It is a station on the Great Indian Peninsular Railway. It is one of the principal cotton-markets of the Dekkan. Pop. (1891) 61,915.

MARK W. HARRINGTON.

Sho'mer, Shammer, or Jebel Shomer: a territory, part of the great central plateau of Arabia; bounded N. by the Syrian desert, from which it is separated by mountains

9,000 feet high, N. E. by Irak Arabi, S. by the sultanate of the Wahabees, and W. by Turkish Arabia. The Arabs here have always remained in a savage condition, little influenced by the rise of the Mussulman empire. About the end of the eighteenth century they came under the power of the Wahabees, but since the overthrow of the latter have been independent. The country is divided into five provinces, said to contain eighty-six towns and villages, the chief of which is Hayel. Between it and Medina considerable trade is carried on. Corn and fruit are raised by artificial irrigation. Dates, cotton, horses, and asses are exported. Pop. of territory estimated at 450,000. E. A. G.

Shooting Stars: See METEORS.

Shore: See COAST.

Shore, JANE: mistress of Edward IV.; b. in London, England, about 1445; married a rich London goldsmith named Matthew or William Shore; became mistress of King Edward IV. about 1470, and of Lord Hastings after the death of the former, 1483. She was accused of witchcraft as an accomplice of Hastings, who was beheaded for that pretended crime, though the real reason for the proceedings against them was their known partiality to the cause of the young princes. According to More's account, Jane Shore was charged by King Richard III. with having withered his arm by her arts of sorcery; was committed to the Tower and her property confiscated; was never brought to trial, but was compelled by the Bishop of London to do public penance for impiety and adultery. The king's solicitor, Thomas Lynon, desired to marry her after the death of Hastings, but Richard tried to dissuade him, and whether the marriage took place is not known. She survived until after the accession of Henry VIII., and popular legend represented her as having died of hunger in a ditch—a version which long retained currency through the famous drama of Rowe bearing her name; but the legend was probably derived from the name of a London locality still called Shoreditch. Sir Thomas More bears emphatic testimony to her beauty, kindness, and wit.

Shore, Sir JOHN: See TEIGNMOUTH, BARON.

Short, CHARLES, LL. D.: educator; b. at Haverhill, Mass., May 28, 1821; received his early education at Bradford Academy and Phillips Andover Academy; graduated at Harvard 1846; classical instructor in Roxbury and Philadelphia 1847-63; president of Kenyon College, O., and Professor of Intellectual and Moral Philosophy 1863-67. On the death of Dr. Anthon, Professor of Greek in Columbia College, New York, Dr. Henry Drisler was transferred to the Greek chair, and Dr. Short succeeded Dr. Drisler as Professor of Latin in 1868. He edited, with additions, *Advanced Latin Exercises* in Schmitz and Zumpt's Latin Series (1860); revised Mitchell's *New Ancient Geography*; wrote an elaborate essay on the *Order of Words in Greek*, prefixed to Dr. Drisler's edition of Yonge's *English-Greek Lexicon* (1870); and, with Charlton T. Lewis, revised (1879) Andrews's *Freund's Latin Dictionary*. He contributed many articles, mostly critical, to reviews and other periodicals, chiefly to the *Bibliotheca Sacra*. He was from the outset a member of the American committee co-operating with the British committee in the revision of the English Bible. D. in New York, Dec. 24, 1886.

Revised by BENJ. IDE WHEELER.

Short, WILLIAM: diplomatist; b. at Spring Garden, Va., Sept. 30, 1759; studied at William and Mary College; was at an early age a member of the executive council of Virginia; accompanied Thomas Jefferson on his embassy to France as secretary of legation 1784; was appointed *chargé d'affaires* to France by Washington 1789 (being the first commission signed by him as President), and was subsequently minister to the Netherlands and to Spain, where in 1795 he concluded the negotiations which resulted in the treaty of friendship, commerce, and boundaries. D. in Philadelphia, Pa., Dec. 5, 1849.

Shorthand: See PHONOGRAPHY and STENOGRAPHY.

Shortorns: a breed of beef-cattle which originated in the valley of the river Tees, between the counties of Durham and York, in England. They are often called Durham, shorthorned Durham, and Teeswater cattle. Since very early times the cattle of the northeastern coast of England have differed in type from those of other parts of Great Britain, and there are many reasons for believing that this is due to an admixture of the blood of the cattle of the adjacent countries of continental Europe, brought over at the time

of the French invasion. At all events, in their large size, heavy heads, short horns, and angular forms the short-horned cattle of this part of England closely resemble the Danish, Devon, and Flemish races of cattle. Durham, Yorkshires, and Northumberland have long been famous for the amount and superior quality of the beef produced there, and early in the eighteenth century numerous breeders became famous for the size, quality, and great fattening propensity of their cattle.

However, it is to a few men who were in active life in the closing years of the eighteenth century and the early part of the nineteenth that most of the fame of the breed as we now know it is due. The sires famous of these men were Charles and Robert Colling, Thomas Bates, and Richard and John Hoadly. The Collings were the earliest improvers of the short-horns. Charles in particular produced extensively and with great skill the closest fattening in the foundation of all or nearly all his various families. The bull Comet brought at public sale in 1810, when six years old, 1,000 guineas.

Two Durham Ox and The White Heifer that Traveled, animals sent by Charles and Robert Colling respectively, were esteemed to a great weight, and were taken from town to town to be exhibited. Their fame had a great effect in making the breed widely known throughout Great Britain. The Durham Ox, supposed to have been the largest animal of the cattle kind ever bred up to that time, is estimated to have weighed 3,400 lb.

The most famous family of the short-horns is that known as the Duches, or Basse Duches. They are descended from a cow, Duches, that Charles Colling bought from the Warwick estate of the Duke of Northumberland, and the bull Huddock and Favourite. They were closely inbred by Colling, and afterward by Thomas Bates, who for nearly forty years (1810-50) bred this family with scarce an admixture of outside blood. After Bates' death some of the best representatives were taken to the U. S., where they were still kept pure in the hands of Samuel Thorne, of Thomdale, Durham co., N. Y., J. O. Sheldon, of Geneva, N. Y., and William and Campbell, of New York Mills. Their fame grew both in the U. S. and in England, and culminated in 1874, when the eighth Duches of Basse brought at public sale \$30,000.

Short-horns are large, round-bodied, squarely built animals, maturing early, and producing large amounts of best-quality beef. In color they are red, white, or any admixture of these two colors. Red is a very common color. White or a large proportion of white is not liked in the U. S. Their legs are short, the horns fine, the hair soft and thick, and the horns short, curved, and of a waxy texture.

In numbers they far exceed all other breeds of pure-bred cattle in the U. S. The American Short-horn Herd-book (1887) records the pedigree of nearly 130,000 bulls, and a much larger number of cows and heifers. H. W. Wilson.

Shorthouse, JAMES HENRY, novelist; b. in Birmingham, England, in 1834; was educated at Grove High School, Tottenham, and engaged in manufacturing at Birmingham. He is best known from his novel *John Ingelman* (1891), a tale with a strong Anglo-Catholic or Tractarian flavor. Others of his books are *The Little Schoolmaster* (1891-94); *Air Patrol* (1896); *A Trasher of the Pit-lane* (1898); and *Blanche, Lady Palace* (1901). H. A. R.

Shoshonean Indians: a linguistic stock of North American Indians. The term Shoshoni, of which the stock name is an adaptation, is not a Shoshoni word, although recognized in the tribe as applying to themselves. *Shoshon* signifies female dog in the Teton dialect; *shoshole*, robin, and *shoshone*, long-eared (alluding to the rabbit in Yankton. It is not improbable that *shoshone* originated in one of these words, and was of appreciable significance. The habitat of this great stock extended from the head-waters of the Missouri in Central Montana to Southern Texas, and from Western Kansas to Western Central Oregon, and the coast of Northwestern California. See the map accompanying the article *Indians of North America*.

According to some authorities the Shoshonean stock, as here recognized, is but part of a linguistic group embracing the Shoshonean, Pima, and Arizonan or Nahueli tribes; but the relationship of these peoples is not proved. The principal Shoshonean tribes are: Bannock, Comanche, Goshute, Paiute (including the Chemachevi), Paviotse, Shoshoni (including the Tukwarish, Tobikhar, Tumyan, Ute. The estimated population is 20,000.

Owing to the extent of country occupied, and its varied climate and topographic features, the Shoshonean tribes differ widely. The habits of the Shoshoni, Bannock, Ute, and Comanche divisions in the north were essentially those of hunting Indians. The Comanche and Eastern Shoshoni alone can be said to have been "buffalo Indians," although the buffalo was hunted more or less by all the northern Shoshonean tribes. In general character these were fierce and warlike. To the W. of the Rocky Mountains the tribes (Paviotse, Paviotse, Goshute, and western Shoshoni) were of a different character. Rabbits and small game, generally, fish, roots, and seeds formed the chief support of these tribes, among which were included the lowest representatives of the stock. It was principally to these that the name *Shoshone* was apparently applied, although they were by no means so low as many writers have asserted. They made and used bows and arrows, were hunters, lived under a simple social system, and even practiced a rude agriculture.

Bannock.—The native tribal designation of the Bannock is *Pawash*, from which their common name is derived. This tribe was divided into two geographically distinct portions—one claiming the territory between lat. 42° and 43° and from 100° 115' to the main chain of the Rocky Mountains; the other division, or southern Bannock, formerly occupying Southwestern Montana, where they had been driven by the Blackfeet. It is probable that at no very distant time the scattered bands of both divisions were united in one locality—Southeastern Idaho and extreme Western Wyoming, where they were pressed upon by the Shoshoni, and to some extent incorporated with them. The Bannock were a tribe of widely roving habits, which favored their dispersal and separation. In language they differ markedly from the Ute, Comanche, Paviotse, and others. About 1860 the southern Bannock—always the more populous division—numbered about 8,400 in 1,200 lodges. Many of them affiliated with the Shoshoni of Western Wyoming, and as early as 1850 had extensively intermarried with them. In 1860 500 or 600 of this division were placed on the newly established Wind river reservation, Central Wyoming (where they are now officially classed as Shoshoni). In 1874 all the scattered Bannock and Shoshoni of Southeastern Idaho were assigned to Fort Hall reservation, Idaho. The northern or Salween river Bannock, after having been decimated by the stockpots and ravages of the Blackfeet, numbered in 1860 about 550 in 815 lodges. There were 405 Bannock on Fort Hall reservation in 1891, and 75 on Lemhi reservation, Idaho, in 1890.

Comanche.—The popular name of this tribal division originated with the Spanish Mexicans. Their own tribal designation is *Núsha*, i. e. people, Indians. This was formerly one of the most powerful divisions of the Shoshonean family. Evidence, mostly traditional, tends to show that their present habitat was in the Snake river region of the northwest, more recently occupied by the Shoshoni. In the sixteenth and seventeenth centuries they were found under the name *Chumaw* and *Jumano* in Western Texas; in the east of New Mexico, and in northern Chihuahua; in 1724 they were on upper Kansas river, and later appear to have centered to the S. of the Red river, Texas. The later Comanche territory may be given as the extensive plains from the Rocky Mountains eastward into Indian Territory and Texas to about lat. 37°, although they raided the country from Kansas southward as far as Durango, Mexico, a distance of 600 miles. Always a wandering tribe, the early possession of the horse by the Comanche intensified their nomadic propensities and gave full scope to their martial character. The theft of horses and the capture of women and children for adoption or ransom were the chief motives for their raids, particularly into Mexico, until 1783, when their power in that direction was broken. They suffered severe loss in numbers at the hands of the Texans in the Texan-Mexican war. They depended largely upon the buffalo for subsistence, and lived in skin tents or tipis during their peripatetic settlements. They have a tribal chief, and are divided into fourteen bands, each headed by a recognized chief. In 1790 the warriors were estimated in number 5,000, equivalent to a population of about 25,000. The reservation in Oklahoma occupied by the Comanche was set aside for them in 1867, when their population was about 2,500. In 1891 they numbered 1,024.

Goshute.—This name, with the variants Goshoot, Goshute, etc., is contracted from Goship (the name of a former chief) and Ute. The group was a confederacy of five tribes—the Payayute, Pucraiate, Torontogute, Towurute, and

Unkagarits—inhabiting the northwestern part of Utah, west of Utah and Great Salt lakes, and a strip in Eastern Nevada. They were one of the few Shoshonean divisions engaging in agriculture, and were scattered over the country as the springs and watercourses afforded arable land. According to some authorities the Gosiute are a mixture of Shoshoni and Ute. There seems to be no aboriginal name of the confederacy—a fact indicating very recent organization as such. Pop. (1890) 256.

Paiute.—The generally accepted idea is that the term originated from *pah*, water, and Ute, hence "water Ute"; more likely it is derived from *pai*, true, and Ute, thus signifying "true Ute." The name has been applied at various times to most of the Shoshonean tribes of Eastern Utah, Northern Arizona, Southern Idaho, Eastern Oregon, Nevada, and Eastern and Southern California, whereas it properly belongs exclusively to the Corn creek tribe of Southwestern Utah. Paiute, however, is a convenient divisional name for the tribes occupying the southwestern part of Utah, Central Nevada, and Northern Arizona, and including the Chemehuevi of Colorado river. Under it are also included the tribes of Southeastern California from the neighborhood of Owens valley along the eastern slopes of the sierras, and to the S. of Tulare Lake and E. of the Coast Range. The principal Paiute tribes are: Chemehuevi or Tantawats, formerly about the great bend of Colorado river and now attached to the Colorado river agency—population about 200; Kwaiantik-wokets, formerly E. of Colorado river, in Arizona, where they affiliated largely with the Navajo, and numbered 62 in 1874; Shivwits and Uinkarets in Northern Arizona—population 182 and 40, respectively, in 1874. There are 19 insignificant tribes or bands in California, among them the Mono (a term collectively applied), Keats, and Moquats; 17 in Nevada, and 8 in Utah (including the Kaivawits and Unkakaniguts). The Paiute population approximates 2,500, there being in Utah 500, Northern Arizona 500, Southern Nevada 1,000, and Southeastern California 500.

Panamint.—This division is linguistically related more closely to the Shoshoni than to any other of the tribes of the stock, and it is not improbable that they became detached from that body through the intrusion of the Gosiute, and gradually drifted to their later habitat in and around Panamint and Death valleys, between lat. 36° and 37°, Eastern California. A few individuals live in the mining town of Darwin, while about 150 are scattered in the desert country to the E. of Panamint valley.

Paviotso (strong, able).—These Indians form a confederacy of twenty-eight insignificant tribes, chiefly in Western Nevada, but extending into Oregon as far north as Lakes Harney and Malheur, and westward to about Warner Lake near the southern boundary, and Camp Bidwell in Northeastern California. The shores of Honey Lake in Eastern California were also occupied by them. In the east they extended to the Shoshoni territory in lon. 117° 30'. Their lowermost settlements were in Owens valley, Eastern California. Like many other tribes of this region, the Paviotso were early confounded with the Paiute, whom they closely resemble. Their extension north into the Pyramid Lake region of Western Nevada and into Oregon has been comparatively recent, having after a long conflict displaced the Saitika. They probably number about 4,000.

Shoshoni.—This is the most northerly division, and formerly occupied Wyoming, the entire central and southern parts of Idaho, except the area occupied by the Bannock, a small part of Eastern Oregon, Eastern and Central Nevada, and a small strip of Utah W. of Great Salt Lake. The Snake river country in Idaho is perhaps to be considered their chief seat, whence they are also called Snake Indians. In 1803 Lewis and Clark found the northern bands of the Shoshoni on the head-waters of the Missouri in Montana, but they had earlier ranged farther east on the plains, whence they had been driven into the Rocky Mountains by the hostile Atsina and Blackfeet, who early obtained firearms.

The more northerly and eastern Shoshoni were horse and buffalo Indians, and in character and warlike prowess compared favorably with most western tribes. Those of Snake river and to the south in Nevada represented a lower type, since most of this country was barren and comparatively devoid of large game. They depended for food to a large extent upon fish, supplemented by rabbits, roots, nuts, and seeds. The Shoshoni, more commonly than any others of the Shoshonean tribes, were called Diggers and Shoshokos (walkers). None of them were agriculturists. In general, the style of their habitations corresponded to the two types

of Shoshoni. In the north and east they lived in pole and skin lodges, but in the sage country to the west brush shelters were used, some of them in the Snake river region being mere roofless semicircles that afforded little protection against the wind and snow. There were many dialects corresponding to the degree of isolation of the several tribes, but mutually intelligible. The most important of the original divisions or bands of the Shoshoni are the Tukuarika or Sheep-eaters, Tussawehe, and Wihinash. They have materially decreased in numbers; those surviving are in Nevada; on Fort Hall and Lemhi reservations, Idaho (pop. 948 and 357 respectively); western Shoshoni reservation, Nevada (pop. 367), and the Shoshoni reservation, Wyoming (pop. 883). Their entire number approximates 5,000.

Tobikhar.—This term, meaning settlers, belongs strictly to a group of small tribes formerly about San Gabriel mission and Los Angeles, Southern California, but has been adopted as a group name to include the Shoshonean tribes who spoke related dialects, and lived about the missions of San Luis Rey, San Juan Capistrano, San Fernando, Los Angeles, San Bernardino, and San Gabriel. These formed the southwestern or coast division of the stock, and their remnants compose the bulk of the so-called Mission Indians, which embrace also a few representatives of the Yuman stock. The status of the Indians of this group and their relation to the State government have never been fully defined. They appear not to have been agriculturists prior to the mission period; hence upon the disestablishment of the missions some of the Indians returned to their primitive mode of life, while others practiced the rude arts of agriculture learned under mission sway. Notwithstanding their docile and submissive character the Tobikhar, like most of the Shoshonean tribes, were doubtless once of a more aggressive and warlike disposition, and were able to force their way to the coast through the Chumashan and Mariposan tribes on the north, and those of Yuman stock on the south. The population is about 2,200.

Tusayan (probably from the Navajo *Zilh-Tásdun*, signifying country of the isolated buttes).—The so-called province of Tusayan comprises seven pueblos on the summits of four mesas in Northeastern Arizona, about 50 miles E. of the Rio Colorado Chiquito, and about the same distance S. of the Rio San Juan. The pueblos constitute three groups: Walpi, Sichumovi, and Hano or Tewa in one; Mashongnovi, Shumopovi, and Shupaulovi the second, 7 miles westward; Oraibi the third, 8 miles still farther west. Six of these villages are inhabited by the Hopi (signifying "people," but improperly called by the opprobrious Zufi term *Moki*), the seventh pueblo, Hano, being occupied by a division of the Tewa tribe, of Tanoan stock, who left their kindred on the Rio Grande about 1680, and settled at Tusayan, where they maintain their distinctness. The Hopi afford the only instance of tribes of the predatory Shoshonean stock who have adopted a strictly pueblo life. Tusayan was known to the earliest Spanish explorers of the Southwest. Marcos of Niza in 1539 spoke of it under the name Totontec. It was first visited by whites in 1540, when Tobar and Padilla, and afterward Cardenas, of Coronado's army reached the so-called province from Zufi. Expeditions to Tusayan were also made by Espejo in 1583 and Oñate in 1598. Missions were established at the now ruined pueblos of Awatobi and at Mashongnovi and Shumopovi at an early date, but were abandoned upon the murder of the missionaries and destruction of the churches during the Pueblo revolt of 1680. Tusayan tradition seems to indicate that the present Hopi villages are a confederacy of phratries, or perhaps independent groups, who, after various wanderings, settled in one place. The union is not a close one, and tradition points to feuds and even to bitter wars between the towns, during one of which Awatobi (once the principal pueblo) was totally destroyed. Like the other Pueblo tribes, the Hopi have been agriculturists since first known to history. They early acquired possession of sheep, and are expert weavers, potters, and basket-makers. The estimates of population given by the early explorers are greatly exaggerated. They number about 1,750.

Ute.—This division formerly occupied the central and western portions of Colorado and Southeastern Utah, including the eastern part of Salt Lake valley and Utah valley. They extended also into New Mexico, occupying much of the drainage area of the Rio San Juan. None of the Ute were agriculturists, but they appear to have been always a warlike people, and their early possession of horses intensified their aggressive character. The various divisions or

geographic basis, were probably originally united in a loose confederacy, and while dialectal differences exist in the language, intercourse was carried on with little difficulty. The Ute Indians in the northernmost part of the range have intercourse more or less extensively with the Navaho, Shoshoni and Paiute, and in the south with the Shaville Apaches. The first Ute treaty was proclaimed Sept. 9, 1867. In 1864 a treaty was made with the Tabagumaho band and a reservation set apart for it and the Muncie band in Southwestern Colorado. In 1888 a third treaty provided for all the different bands, while the final treaty, by which the Utes are confined within the present reservation limits, was made in 1873. The restless character and unfriendly spirit of these Indians have rendered even an approximately correct census impossible. The official figures of the reservation for 1901 are: Southern Ute agency, Colorado, 985; Arapaho reserve, Utah, 1,929; Uintah reserve, Utah, 840—total, 2,854. There are probably twice as many more not confined to reservations. See INDIANS OF NORTH AMERICA.

SHREWSBURY.—Davies, *Bibliography and Philology of Missouri Valley* (Philadelphia, 1862); Powell, *Ancient Peoples of the Missouri (Northern's Magazine, New York, Dec., 1876)*, and *Indian Linguistic Families* (Seventh Annual Report of the Bureau of Ethnology, Washington, 1891); Stephen Powers, *Indians of California* (Cal. N. A. Eth., 18, Washington, 1877); Wheeler Survey Report (vol. vii, Archaeology, Washington, 1879); J. G. Bourke, *Snake Dance of the Moquis of Arizona* (New York, 1884); O. H. Bancroft, *Native Races* (vols. i-iv, San Francisco, 1882), and *History of Utah* (San Francisco, 1889); H. W. Henshaw, *Shoshone and Muncie Indians of California* (Popular Science Monthly, New York, Oct., 1890); V. Mindeff, *Shoshone and Ute* (Eighth Annual Report of the Bureau of Ethnology, Washington, 1891); P. Y. Coville, *Permanent Indians of California* (The American Anthropologist, Washington, Oct., 1902); and the various writings of J. Walter Powell on the Shoshone. J. W. POWELL.

Shoshone (shóshó-né) Falls: a cataract in Idaho, formed by Snake river plunging over a cliff of trachyte 180 feet high. Half a mile above the falls the river is 1,200 feet broad, and flows in a canon 800 feet deep. At the falls the stream narrows to 1,000 feet, and descends into a gorge 1,000 feet deep. The falls are due to the fact that the river in descending its channel in horizontal sheets of basalt has reached a ridge of more resistant rock beneath. L. U. R.

Shot: projectiles for firearms. For those used in cannon, see PROJECTILES. The smaller kinds, ranging in size from buck-and-a-half-shot, are composed of an alloy of lead with about 1 per cent. of arsenic, the addition of which gives greater softness and ductility. They are made in shot-towers by passing the molten metal through orificers perforated with holes from 1/16 to 1/8 inch in diameter, and letting the particles fall from 100 to 150 feet into water. Another method lessens the height through which the particles must fall in order to assume the spherical shape and harden, by using a tube through which a strong upward current of air is forced. The shot are afterward assorted, rolled down an inclined plane so arranged that the misshapen shot fall out, and finally polished by being piled in a rotating cylinder with some powdered graphite.

Shoveler, or Spoonbill-duck: a river duck of the genus *Anas*, so named on account of the form of the bill, which is much widened toward the tip. The common shoveler (*Anas platyrhynchos*) of the northern hemisphere has the head and neck green, the breast white, belly chestnut, wing-coverts blue, speculum green (bordered by black and white), rump and tail-coverts black. The female is brownish, with blue wing-coverts. *A. platyrhynchos* from South America, *A. cinnerea* from South Africa, *A. chrysolotis* from Australia, and *A. marginata* from New Zealand are the other species.

Shrapnel. See PROJECTILES.

Shreve, Henry Miller: inventor; b. in Hurlingham, N. J. Oct. 21, 1795; was reared in Western Pennsylvania, and became interested in the navigation of the Western rivers. In 1810 he took a cargo of lead from Galena river to New Orleans, and opened a business which had been previously monopolized by the British. In 1814 he took command of a steamboat, and a few days before the battle of New Orleans carried supplies to Fort St. Philip, passing the British batteries, his vessel being protected from their fire by cotton-bales. In May, 1815, he ascended the Mississippi to Louisville in the Enterprise, the first steam-vessel that

had ever performed that voyage, and subsequently built the Washington, of 481 tons burden, with improvements upon Robert Fulton's steamboat, especially in the saving of fuel. On Mar. 9, 1817, the Washington made her first trip. The return trip from New Orleans was made in twenty-five days. The enterprise of Capt. Shreve soon excited the hostility of Fulton and his associates, who had obtained the exclusive rights to "navigate all vessels propelled by fire and steam" in the rivers of the Territory of Orleans. The boats were seized in New Orleans and he was arrested. A protracted lawsuit followed, which was finally decided in his favor. He finished the George Washington in 1824 upon a new model, which continued in use for over fifty years, having side-wheels each worked by a separate engine. In 1829 he completed his snag-boat, the Heliopolis, for removing snags and sawyers from rivers, and with it removed the great Red river raft, a collection of timber and driftwood 16 miles in length. In 1829 Capt. Shreve invented a steam marine battering-ram for harbor defense. He was made superintendent of Western river improvements in 1830, and continued in that position until 1841. D. in St. Louis, Mar. 6, 1854.

Shreve, Simon Henry, A. M., J. D., B.: civil engineer; b. in Trenton, N. J., Aug. 2, 1829; graduated at Princeton 1848, at Harvard Law School 1850; studied civil engineering; was chief engineer of several railroads; published in 1873 a treatise on the *Strength of Bridges and Roofs*, and became in 1875 engineer of the New York Rapid Transit Commission. He was consulting engineer of the Metropolitan Elevated Railroad and engineer-in-chief of the Brooklyn Elevated Railroad. D. in New York, Nov. 27, 1904.

Shreveport: city (incorporated in 1830); capital of Caddo parish, La.; on the Red river, and the Houston and Shreve, the Queen and Cress, Route, the St. Louis S. W., and the Tex. and Pac. railways; 41 miles S. of Louisville, Ky., and 330 miles N. W. of New Orleans (for location, see map of Louisiana, ref. 6-B). It is the second city in population in the State, is in a cotton-growing region, has an extensive river trade, and handles large quantities of cotton, hides, wool, and wax. The city is provided with improved water-works, gas and electric-light plants, sewers, and street-railways, and contains a U. S. Government building, parish court-house, a public hospital, the headquarters of the State board of health, several cotton-compresses, cottonseed-mill, ice-factories, and machine-shops. There are 10 public-school buildings, public-school property valued at \$20,000, 2 national banks with combined capital of \$300,000, an incorporated bank with capital of \$150,000, a private bank, and 3 daily and 2 weekly newspapers. In 1892 the city had a total assessed valuation of \$3,250,000, and in Feb., 1894, the total debt was \$156,500. Pop. (1880) 8,000; (1890) 11,979; (1895) estimated, 14,000.

Shrew, or Shrew-mouse: a small, insectivorous, mouse-like mammal of the family Soricidae (q. v.). Shrews are found in nearly all parts of the northern hemisphere; they are



Shrew.

nocturnal, frequently aquatic, produce their young blind and naked, do not hibernate, and have an elongated and pointed muzzle, small eyes, plantigrade, five-toed feet, and glands which secrete a musky fluid.

Shrewsbury (anc. Pengwern): capital of Shropshire, England; on the Severn, which is crossed here by three bridges; 42 miles W. by N. of Birmingham and 163 N. W. of London (see map of England, ref. 6-G). It is an old picturesque town, though the streets are steep and narrow. The Norman castle still remains, and of the same date is the Church of the Holy Cross. St. Mary's church, a quadrangular building with a tower and spire, was founded in the tenth century. Among other buildings are the market-house (1575), the shire-hall, rebuilt in 1883, and the new market-hall (1868). Shrewsbury School, founded in 1531, is one of the seven great public schools of England, and has a rich endowment. Near here on July 21, 1403, Henry IV.

defeated Hotspur, and in 1644 the town was besieged by the parliamentary army. Shrewsbury sends one member to Parliament. Pop. (1891) 26,967.

Shrike [O. Eng. *scric*, thrush, (perhaps also) shrike: Icel. *shrikja*, shrike, liter., shrieker; cf. Eng. *shriek*]: any one of the *Laniidae*, a family of passerine birds. The best known North American species is the butcher-bird (*Lanius borealis*). They are noted for their habit of impaling insects and small birds upon the points of thorns.

Shrimp [cf. *shrimp*, another form of *scrimp*]: a name properly restricted to crustaceans of the genus *Crangon*, but



The shrimp.

more usually applied to any of the smaller long-tailed crustaceans. The common shrimp of Great Britain, *C. vulgaris*, is esteemed a delicacy as food.

Shropshire, or **Salop**: a west midland county of England; on both sides of the Severn, and bounded W. by Wales. Area, 1,319 sq. miles. The northern part is level, with the exception of the Wrekin (1,320 feet), and is chiefly under tillage; the southern is hilly, reaching 1,800 feet in the Clee Hills, and mainly devoted to cattle-breeding. The county has a fine breed of sheep. There is a considerable production of coal and some of iron, limestone, and freestone. Pop. (1891) 236,324.

Shrove-Tuesday [from *shrive*, to confess sin]: the day preceding Ash-Wednesday, so called from the old custom of confessing and receiving shrift on that day as a preparation for the forty days' fast. It is in general a day of pleasure in most Roman Catholic countries. It is the Carnival of the Italians, the Mardi Gras of the French, and the Pancake-Tuesday of former days in England.

Shu'brick, WILLIAM BRANFORD: rear-admiral U. S. navy; b. on Bull's island, South Carolina, Oct. 31, 1790; entered Harvard in 1805, but was appointed midshipman June, 1806. He became lieutenant Jan., 1813; commanded a gunboat in Hampton roads in 1813, and assisted in the defense of Norfolk and the navy-yard at Gosport; in 1813 was transferred to the Constitution, and made two cruises, aiding in the capture of three ships of war, including the Cyane and the Levant; was awarded a sword by his native State and a medal by Congress; was promoted to the rank of commander 1820, and served at the navy-yards at Charlestown, Mass., and New York until Apr., 1826, when he was appointed to the command of the Lexington; in 1831 was commissioned captain; commanded the West India squadron 1838-40; was in command of the navy-yard at Norfolk, Va., Oct., 1840-Oct., 1843; chief of the bureau of provisions and clothing for the navy 1845-46; was appointed to command the Pacific squadron July, 1846, and during the war with Mexico captured several ports; was appointed to the lighthouse board Sept., 1852; placed in command of the eastern coast squadron for the protection of American fishermen July, 1853, and in September returned to Washington and resumed his duties as chairman of the lighthouse board; appointed president of board to prepare regulations for the navy Aug., 1857; commanded the Brazil squadron and Paraguay expedition 1858-59, returning to resume duty as chairman of the lighthouse board; was retired in 1861, but continued a member of the advisory board until 1870; was commissioned rear-admiral in 1862. D. in Washington, D. C., May 27, 1874.

Shu'feldt, ROBERT W.: rear-admiral U. S. navy; b. in Red Hook, N. Y., Feb. 21, 1822; entered the navy as a midshipman May 11, 1839; commanded several vessels on the coast during the civil war, and was actively engaged against the defenses of Charleston; commanded the flag-ship of the East Indian squadron during 1865 and 1866, and that of the Mediterranean from 1871 to 1873; in 1875 appointed chief

of the bureau of equipment and recruiting. He was consul-general to Cuba during the first year of the civil war—a place of great importance, which he filled with admirable judgment and discretion. Retired Feb. 21, 1884.

Shullsburg: city; Lafayette co., Wis.; on the Ch. Mil. and St. P. Railway; 24 miles E. by N. of Dubuque, 60 miles S. W. of Madison (for location, see map of Wisconsin, ref. 7-C). It is in an agricultural and lead-mining region, and contains 4 churches, 3 hotels, a national bank with capital of \$50,000, a State bank with capital of \$50,000, and two weekly newspapers. Pop. (1880) 1,168; (1890) 1,393; (1895) estimated, 1,400.

EDITOR OF "PICK AND GAD."

Shu'magin Islands: small archipelago of Alaska, in lat. 55° N., lon. 160° W., just E. of the peninsula of Alaska, from which they are separated by Unga Straits, consisting of Unga, Nagai, Popoff, Korovin, Big Koniushii, Little Koniushii, Simeonoff, and many smaller islands and islets. Unga is about 10 miles long by 7 broad, and contains the only settlement of any size on the islands, viz., the little town of Unga near the southeast angle. Nagai is about 30 miles long by 4 broad, and of very irregular shape. The islands are generally mountainous, are without tree-growth, have abundant rainfall, and several excellent harbors. Good lignite has been found on Unga. Salmon abound in the streams in early summer, and good cod-banks are near by. These islands were discovered by Lieut. Waxel in 1741, and were given the name of one of his sailors buried there. Area about 600 sq. miles.

MARK W. HARRINGTON.

Shumla: town; in Bulgaria, half way between Rustek and Varna; in a fertile plain, inclosed on three sides by inaccessible spurs of the Balkans and strongly fortified (see map of Turkey, ref. 3-D). It is also an important commercial center and manufactures leather, copper ware, and cloth. Pop. (1893) 23,517.

E. A. G.

Shur [Heb., wall]: the name applied by the Hebrews to the desert which bordered Egypt on the E. of the southern half of the Isthmus of Suez (Ex. xv. 22). Some have derived the name from the wall, 1,500 stadia long, which is alleged by Diodorus (i., 57) to have been built by Sesostris from Pelusium to Heliopolis for the defense of Egypt against the eastern Bedouin. (Trumbull, *Kadesh Barnea*, pp. 44 ff.) An *anbu haq* (wall of the ruler) in this region certainly is mentioned in a papyrus of the twelfth dynasty, but it antedated Sesostris-Rameses by more than the whole Hyksos period. In most of the Old Testament passages *Shur* seems to have been the name of a place near Egypt (Gen. xvi. 7, xx. 1, xxv. 18; 1 Sam. xv. 7, xxvii. 8), and it has been conjectured that it corresponded with the Egyptian *Anbu* (wall, Gr. *Gerrhon*), which probably lay near the Mediterranean to the N. of the isthmus, and was a fortified place on one of the highways to the East (Strabo, *Geogr.*, xvi., 2, 23).

CHARLES R. GILLET.

Shurtleff, NATHANIEL BRADSTREET, M. D.: antiquary; b. in Boston, Mass., June 29, 1810; graduated at Harvard 1831, and at the Medical School 1834; became a physician in Boston; mayor of Boston 1868-70. He was the author of *An Epitome of Phrenology* (1835); *A Perpetual Calendar for Old and New Style* (1848); *Passengers of the Mayflower in 1620* (1849); *Notice of William Shurtleff of Marshfield* (1850); *Genealogy of the Leverett Family* (1850); and *A Topographical Description of Boston* (1871), besides many minor publications and contributions to *The Genealogical Register*. He was the editor of the series of *Records of the Governor and Company of Massachusetts Bay 1628-86* (6 vols. 4to, 1853-54), and, with David Pulsifer, of the equally important *Records of the Colony of New Plymouth* (12 vols. in 11, 4to, 1855-61). D. in Boston, Oct. 17, 1874.

Shusha: town of Elisabethpol, Asiatic Caucasus, Russia; lat. 39° 46' N., lon. 46° 25' E.; formerly a fortress, on an isolated rocky hill, inaccessible on three sides; celebrated for its silk-culture, carpets, and horses; 70 miles S. by E. of the city of Elisabethpol (see map of Russia, ref. 12-G). The climate is rigorous. This place was formerly capital of the khanate of Karabagh, annexed by Russia in 1822. Pop. (1891) 26,806.

M. W. H.

Shuvaloff: another form of the name SCHUVALOV (q. v.).

Sialagogues [Gr. *σάλαιον*, saliva + *ἀγωγός*, leading, deriv. of *ἀγειν*, lead]: drugs that cause an increased secretion of saliva. Mercury has this property more than any other substance, but as the increased salivary flow is simply one among many effects of a poisonous dose of the drug, the term sialagogue is not a proper definitive appellation.

Stakkot', or Sealkote, ancient city of the Panjab, British India, 33 miles N. of Amritsar, lat. 32° 01' N., lon. 74° 30' E.; not far E. of the Chinab, a station on the branch railway from Rangoon to Jambh, capital and commercial center of the district of Stakkot (see map of N. India, 107, 110). It is a well-built and beautiful city, with well-paved principal streets and squares. In the center are the ruins of a very old fort used during the revolt of 1857-59. It is a sacred place for the Sikhs, and contains the mausoleum of Baba Nanak, their first apostle or guru. The old highway connecting from Lahore, Amritsar, Multan, and Delhi passes at the bridge near this place over the Akh tributary to the Chinab, but are usually lost in the sand before reaching this station. It is a center for great numbers and merchants, who are mostly Sikhs. Cotton and paper are manufactured, but the industry is declining. The foundation of the city is attributed to houses of the Mahadharis. Pop. (1881) 32,087, two-thirds Mohammedans. M. W. A.

Siam, *si-am*, or *si-iam* (from Malay *Siam*, the brown name; *Siamu* *Huang* *Tha*, *liang*, kingdom of the free) kingdom of Central Indo-China, consisting of a central kingdom by the Menam valley and several tributary states around it and on the Malay Peninsula (see map East Indies, 107, 111, 112). The E. it was long limited by the Anson watershed, but in 1893 France took possession of the whole territory E. of the Mekong. On the N. E. it is bounded by Cambodia, on the N. and W. the boundaries are ill-defined and subject to negotiation with the British and French, but Siam claims the territory N. to beyond the parallel of 20° N. and westward to the Salween river in latitudes 18° to 20° N. Further S. the boundary is more to the westward and is irregular. On the Malay Peninsula the Siamese influence is exerted on the coast coast from the head of the Gulf of Siam to Peking, lat. 4° 30' N. and over the whole peninsula from the latitudes of 6° to the British province of Wellesley in lat. 6° 05' N. The total area is about 990,000 sq. miles.

Geography.—Siam is bounded N. and W. by mountain ranges having a general N. and S. direction, and consists of three distinct areas. The first is the Menam basin, practically a plain rising to the northward, at first slowly, then rapidly, and occupied by the kingdom proper and some of the tributary states to the N. It is about 400 miles long by 150 broad, and ascends only 300 feet in the first 200 miles, but 900 to 1,000 feet in the next 150. The northern end, in which lie the sources of the Menam, is mountainous. The second is the Mekong or Lao plateau, to the E. of the preceding, about 300 miles N. and S. by 200 E. and W., separated from the preceding by hills and low mountains, and drained by the left-hand affluents of the Mekong, S. of its great bend to the westward. It is somewhat more elevated than the Menam basin adjacent. The last is the Malay Peninsula, consisting of a central ridge of mountains flanked by extensive plains. The kingdom is well watered. The Menam has as level a course that it divides several times into two or more streams which unite farther down after including islands of large size. This delta-like characteristic extends to about 250 miles from the mouth. The stream is well suited to navigation by native craft and by sails. The climate is tropical, but moderate and generally healthy. There are three seasons in the year, each of four months duration. The hot season begins in January and the temperature rises until the rains begin in early May. The mean temperature in April in Lower Siam is about 85°. The rains come with the S. W. monsoons, but are less heavy than on the Burmese coast. The rainfall is heaviest on the west coast of the Malay Peninsula (100 inches) and decreases westerwardly to 40 inches. The cool season begins in September and brings pleasant temperatures, clear skies, and serene weather. The thermometer at Bangkok may descend in this season to 55°, or even lower. This is the season for *pu*—harvest, to which the Siamese are much devoted.

Mineral Products.—Siam is rich in minerals, especially in the peninsula and along the western mountains. Gold, tin, iron, copper, argentiferous galena, and antimony have been found, but only the first two are mined. Precious stones are found in considerable quantities in the southeast. The production of rubies is important; that of sapphires, emeralds, lapis, and jade less so. Rich mines of sapphires were opened near Chaiburi in 1874, but were soon abandoned because of the instability of the climate. Coal has been found in the peninsula; petroleum springs occur in the Siam coast to the N., and rock-salt in several places. *Cassia* stem essence oil is produced along the coast of the gulf.

Vegetation and Agricultural Products.—The forests of Siam have been much encroached on where they lie along settling streams, but elsewhere they continue in unbroken luxuriance, and contain many valuable woods of oak and ebony. At the highest elevations in the north the forests become like those of the temperate zone, resembling those of Central Japan and containing oaks and pines. The soil is alluvial and very fertile, and numerous crops are produced with little labor. The chief agricultural product, and the staple article of diet, is rice, of which the Siamese have about fifty varieties. In 1893 it is estimated that the rice product was about 800,000 tons. Other crops are pepper, coconuts, hemp, sugar, opium, tobacco, cotton, coffee, and maize, most of them only in quantities sufficient for local consumption.

Fauna.—The fauna is very rich and varied. This is the traditional land of the elephant, though the natives are not so skillful in taming and breaking them in as the natives of Hindustan. The tributary state of Chienmai is estimated to have 8,000 domesticated elephants that of Lakhon 10,000, and they are not less numerous elsewhere. The price of an elephant is from \$750 to \$1,000. Small white elephants are considered sacred and are tenderly cared for. These are albino, and the rest is not so much the color of the skin as of the eyes and the hair on the temples. Albino monkeys are also sacred. The simians are very numerous, and their most important representatives are the gibbons, anthropoid apes, of which there are several species. Bats are abundant, and in mountain caves form large colonies of guano. Birds' nests are collected in such quantities that the tax on them produces \$125,000 annually. Among the numerous and varied domestic animals, besides the elephant, may be mentioned the ox, several kinds of horse, a peculiar race of hog, the sheep, the goat, and several kinds of domestic fowls. The horned cattle form the most important source of wealth. About 70,000 are annually exported to Singapore, the Siam states, and Burma. Fishing is an important industry, and considerable quantities of dried fish are exported.

Inhabitants.—The population is estimated at 5,000,000, of whom about two-fifths are Siamese proper and the remainder about equally divided between other Siamese, the Chinese, and the Malays. The Chinese are generally from Kwangtung and there are many Sino-Siamese half-breeds. They are for the most part in the kingdom proper, where they have largely appropriated trade and commerce to themselves, and form the chief source of free labor. They are of independent spirit, and their turbulent character causes the Government much trouble. The other people of the same ethnic race as the Siamese are the Shan proper in the north and the Lao in the northeast and east. They occupy the tributary states, and the Siamese influence has been extended over them by conquest. The Malays are found chiefly in the tributary states of the peninsula.

The Siamese proper are found chiefly up the Menam valley to the vicinity of Phumuck (about lat. 15° N.) and around the head of the gulf. Though for many centuries warlike, they appear indolent, gentle, and patient. They are small but well formed, with an olive or yellowish complexion and jet-black hair, hospitable, humane, not inventive, untruthful, and capricious. In customs, manners, and civil institutions they are curiously intermediate between India and China, and thus especially deserve the name of Indo-Chinese. The religion is Buddhist. Indeed Siam assumes in an especial way the character of protector of Buddhism, and this has made the relations between Siam and Ceylon especially close.

Language and Literature.—The language is of the Shan stock, monosyllabic in character, very different from Annamese and Burmese, and written with a script borrowed from the Pali. The literature is abundant and varied, consisting of religious, legal, and scientific books and a considerable body of *belles-lettres*. The religious works are largely derived from Buddhist sources; the others are chiefly of indigenous origin. The chief science is astronomy, and they have their own system of chronology. The romances and stories are said to be Indian and lacking in refinement. There is relatively little industry because of a system of forced labor under which each man, except a few privileged classes, owes the Government three months' labor each year. Domestic slavery is little practiced, and is in process of abolition. Free labor is difficult to obtain. Foreign labor is making considerable progress. Education is generally in the hands of the priests and is much hampered by tradition. Three large public schools have been established in Bangkok, where

European arts, sciences, and languages are taught, and for many years it has been the custom to send a few young Siamese abroad for a technical education.

Government.—The throne is hereditary, but the king may choose his successor in his own family. The legislative power is in the hands of the king, assisted by a council of ministers. The tributary states are ruled sometimes by their own princes, sometimes by a royal commissioner, and there is a strong tendency toward increased centralization. The kingdom proper is divided into forty-one districts under royal governors. The king's annual revenue is estimated at \$10,000,000, produced by a land-tax, customs, taxes on opium, spirits, tin mines, fruit-trees, edible birds'-nests, fisheries (in the order of the amount of revenue from each), and other sources. All taxes, except customs, are farmed. There is no public debt. The standing army consists of 12,000 men, well supplied with arms and artillery, is largely officered by Europeans, and is said to be in a very effective condition. All males of suitable years are subject to military duty. The Government has a small navy, and the mouth of the Menam is fortified at Paknam.

Commerce.—Bangkok, the capital, is also the commercial center and chief port. In 1893 the imports were valued at \$11,295,390 and the exports at \$22,285,570. About one-fourth of the imports in value was cotton goods, and of the exports five-sevenths consisted of rice. Other exports were teak, pepper, salt and dried fish, and bullocks and hides. Both imports and exports are chiefly exchanged with Hongkong and Singapore, and there is a considerable trade to the northward to the Shan states and Yunnan. In 1892 292 vessels (248 of them British) entered Bangkok, and 288 vessels (242 British) cleared from that port. A railway, 14 miles long, connecting Paknam, at the mouth of the river, with Bangkok was opened in 1893. A railway from Bangkok to Korat, 165 miles N. E., is under construction, and many others have been projected. Bangkok has an electric tramway in operation. Telegraph lines, with a total length of 1,780 miles, connect Bangkok with Chiangmai, Chantabun, and other Siamese cities; also with Saigon in Tonquin and Maulmein in Burma. There is a postal service with 98 stations outside of Bangkok (1890), and Siam belongs to the International Postal Union. In 1890 189,970 domestic and 219,170 foreign letters were handled. The unit of money is the *tical*, a silver coin worth forty-one cents in average exchange. Silver and bronze are coined in fractions of the *tical*, and paper money is current in multiples of this coin. The unit of weight is the *chang* (2½ lb., avoirdupois); and of length, the *niu* (1½ English inches) or the *wah* (48 niu = 80 inches).

History.—The Siamese apparently came from the north and first appear in history in 575 A. D., when they founded Labong, about lat. 18° N., in the Upper Menam valley. The date of introduction of Buddhism among them is put at 638 A. D. They pressed steadily southward as invaders until in the thirteenth century they had reached the gulf and peninsula, and had apparently more territory than they have now. In 1350 they made Ayuthia the capital, and it so continued until 1782, when the Government removed to Bangkok, where it remains. For many centuries they carried on wars with their neighbors, the Burmese, Peguans, Cambodians, and with the people they displaced, with varying fortune but final success. The Burmese twice took their capital (1555 and 1767), the second time only after a two years' siege. In 1592 Siam entered into close diplomatic and commercial relations with Japan, and many Japanese settled in the country, where they played the part now taken there by Europeans, but native jealousy finally resulted in their expulsion with violence in 1632. Very similar is the history of their relations with France, begun in 1684. The present dynasty succeeded a Chinese one, and began with the removal of the capital to Bangkok (1782). The conquests of Shans and Laos have been chiefly under this dynasty. The last three kings have made especial effort to extend the relations of Siam with the Western world. Maha Mongkut (1852 to 1868), the immediate predecessor of the present king, was a man of great learning and enterprise, and the present king, Chulalongkorn, continues his broad-minded policy. Siam is, however, weak, and, wedged in as she is between British and French possessions, owes her continued existence to suzerainty on their part. In 1893 France possessed herself of Siam's territories across the Mekong, and in 1895 negotiations were in progress between France and Great Britain to form a buffer state between Siam and China, Tonquin and Burma.

REFERENCES.—The classical work on Siam is that of Mgr. Pallegoix, *Description du royaume Thaï ou Siam* (2 vols., 1854). See also Bowring, *The Kingdom and People of Siam* (2 vols., 1857); Mouhot, *Travels in the Central Parts of Indo-China*, etc. (2 vols., 1864, translated from the *Tour du Monde*); Vincent, *Land of the White Elephant* (1874; new ed. 1889); Leonowens, *An English Governess at the Siamese Court* (1870); Bock, *Temples and Elephants* (1884); Colquhoun, *Among the Shans* (1885). MARK W. HARRINGTON.

Siamese Twins: See ENG AND CHANG.

Siberia [from Russ. *Sibir*, Siberia, a word perhaps of Tartar origin from *Saibir*, the name of the seat of the Tartar rulers on the Irtysh]: a territory in Northern Asia, belonging to Russia. It is bounded on the N. by the Arctic Ocean from the mouth of the Kara river on the W. to Bering Straits; on the E. by Bering Sea, the Sea of Okhotsk, the Tartar Channel, and the Sea of Japan S. to the mouth of the Tumen-kiang on the Korean frontier; on the S. by Korea, Manchuria, Mongolia, and the Russian provinces Semipalatinsk, Akmolinsk, and Turgai of the steppes; on the W. by the upper Ural river, the Ural Mountains, and the Kara river. It includes portions of the governments of Orenberg and Perm usually classed as European. Thus limited Siberia has an area of 4,925,000 sq. miles, and a population of about 6,000,000. It is about a quarter larger than all Europe, but has only the population of Belgium.

Political Divisions.—Politically, Siberia includes Saghalien with the above, but excludes Orenburg and Perm, giving an area of 4,833,496 sq. miles, and a population, according to official estimates from 1889 to 1892, generally for 1890, of 4,538,561, or a little less than one per square mile. In this territory are the governments of Tobolsk and Tomsk, formerly composing the government of Western Siberia, but now directly administered under the Russian Minister of the Interior; the governments of Yeniseisk and Irkutsk, and the province of Yakutsk, formerly composing the general government of Eastern Siberia, now called the general government of Irkutsk; the provinces of Transbaikalia, and of the Amur, the Coast Province or Primorskaia Oblast, and the circle of Saghalien, forming the general government of the Amur. For details as to these governments and provinces, see each under its own heading.

Configuration.—The Ural Mountains, which separate Siberia from European Russia, reach an elevation of only 5,522 feet at their culminating point at Mt. Konchakof in the government of Perm. They can be traversed without difficulty, and their slopes are especially gentle on the Asiatic side. These mountains aside, Siberia has a very simple structure, consisting of an elevated plateau in the southeast, set in mountains, and passing toward the W. and N. by an enormous plain. The plateau is called the plateau of Vitim, from the branch of the Lena which takes its rise there. It is the northward extension of the great plateau of Asia, which has its highest and broadest part abutting the Himalaya Mountains and extends nearly to Bering Straits. In Siberia it is narrow and relatively low, rarely surpassing 3,000 feet. In this plateau all the great rivers of Siberia take their rise. The margins consist of a series of mountain ranges with relatively gentle slope where they abut on it, and abrupt descents toward the plain or sea. On the sea of Okhotsk the mountains rise abruptly from the water, and there is an outlying range in Kamchatka. In the Amur region plains of considerable magnitude intervene between the ranges at the eastern margin of the plateau and the coast ranges, which extend from Korea to the mouth of the Amur. The termination of the plateau toward the N. E. is in a region very imperfectly explored. The area so far described includes only about one-fourth of Siberia. The remainder consists of an enormous plain extending W., N. W., and N., and sloping N. and W., with an ill-defined intermediate hilly region. This is the great plain of Asia, and is continued beyond the Urals in the plain of Russia and Germany. In Asia it consists southwestward of steppes, grassy and sandy, which rise very gradually to the low, rounded, imperceptible watershed between the Arctic and Turkestan systems of drainage. Its slope northward is rapid near the mountains, thence growing more and more gradual. The steppes pass gradually into the tundras of the north, which extend to the Arctic Ocean along the entire northern boundary. They are level or rolling plains, subarctic and arctic in character, with an alluvial soil. They are of a depressing sameness, are well-watered, and would be suitable for cultivation did the climate permit. Their

along northward is extremely gentle, and is continued under the Arctic Ocean as far as soundings have been made. At 200 miles from the coast soundings have given depths of 13 or 14 fathoms only.

The coast of Siberia measures 19,000 miles, of which 10,000 belong to the Arctic Ocean. The northernmost point of the mainland is Cape Chukotsk in lat. 77° 06' N., about 8° farther N. than Point Barrow, the northernmost point of the U. S., and 9° farther N. than North Cape of Norway. On the north coast are the great indentations called the Gulf of Ob, the two great peninsulas of Yana and Taimyr, and to the N. of Yakutsk the large archipelago of the New Siberian islands, the northernmost known point of which is on Borzoi Island in about the same latitude as Cape Chukotsk. Nordenskiöld first traversed this coast in 1878-79, to his celebrated voyage in the Vega. The rigor of the climate of these high northern latitudes prevents profitable commerce, notwithstanding the ready access given to the interior in summer by the great Siberian rivers. The shores of floating ice are provided with harbors, and are accessible for a longer season each year, but the country inland is barren and relatively inaccessible. Along the Sea of Japan the coast is bold and rocky, furnishing generally little protection for commerce. The exceptions are the bays of St. Vladimir (lat. 41° 55' N.), of St. Olga (lat. 41° 44' N.), which afford good anchorages, and the Gulf of Peter the Great near the Korean border, where the Russian naval station and town of Vladivostok is situated. It has several smaller bays, and the town is on a peninsula between the Bay of Amur and the Bay of Ussuri. At the Korean border is the Bay of Posset, with the Pallas anchorage and two interior bays. The entire Siberian coast is rising slowly, and marine shells are found far inland from the Arctic shore.

Hydrography.—Siberia is provided with a magnificent system of rivers. Belonging entirely or in part to it are 38 streams 400 miles or more long, when the minor meanders are neglected, 27 more than 600 miles long, and 8 which are 1,000 or more miles long. The four largest are the Ob (2,900 miles), the Lena (2,800 miles), the Amur (2,800 miles), and the Yenisei (2,500 miles). All rise about the plateau already described—if of sufficient length—and all, except the Amur and Anadyr, contribute to the Arctic Ocean. The long and relatively straight course of many of these streams adapts them to display the effects of the earth's rotation under which all moving bodies in the northern hemisphere tend to diverge toward the right of their course. The long Siberian rivers show a decided tendency to leave their left-hand (western) banks, leaving them low, flat, and subject to overflow, while they cut out their right (eastern) banks, making them high and steep. The Siberian towns are practically all riverine. The length and magnitude of the streams greatly favor navigation in its season, and in 1893 there were 107 steamers plying on the streams of Western Siberia, with an aggregate traffic of 322,000 tons. There were also sixty-eight steamers on the interior waters of Eastern Siberia. The ease of river traffic N. and S. is evident, but their great importance also adapts these rivers to an east and west traffic, and Siberia can be crossed from Khatanga to Nikolayevsk, at the mouth of the Amur, almost entirely by water. The principal land stretch is at the western end from Khatanga to Thunin, and this was supplied with a railway in 1893. The principal difficulties to navigation are to be found in shiftings of the channels and in the shortness of the warm season. The rivers are closed by ice from two to eight months; the opening begins at the S. and proceeds slowly N. In front of the open water accumulate great ice-packs, and these serve as dams and cause the most serious floods. Several parts of Siberia are rich in small lakes. The plains of the west are thickly strewn with them, usually shallow, and in the midst of marshes, and their distribution in area and depth is progressing more rapidly from west to east. The plateau of Vitim is also thickly studded with small bodies of fresh water. On the other hand, large lakes are relatively rare. The largest is Lake Baikal, area 10,200 sq. miles, just W. of the plateau of Vitim, long and narrow, in a deep valley between two mountain ranges, drained by the Angara, an affluent of the Yenisei. There are two others with areas between 1,000 and 1,500 sq. miles, two of between 700 and 1,000 sq. miles, three of between 500 and 700 sq. miles, and ten of between 200 and 400 sq. miles.

Climate.—The climate of Siberia is continental, rigorous, and cold. The temperatures are especially low; they are less than around Hudson Bay, but are colder. The mean

annual temperatures through Central Siberia from Tula to Kamchatka are like those of the Yukon basin in Alaska and of Labrador. They vary from a mean annual temperature of 32° F., along a line which extends from Archangel on the White Sea to Lake Baikal and thence eastward, to 14° F.—or 17° below freezing—along a line which extends from Nava Zenshik to Yakutsk and thence northeastward. To the S. of the first line is a narrow strip with the temperatures of New Brunswick and Manitoba. To the N. of the second line the mean temperatures are below 15°, and for a considerable part of the coast are near 0° F. The coldest place known in the world, and not at high altitudes, at which observations are taken is Verkhoyansk (lat. 67° 54', lon. 143° 52' E., on the Yana river), where the mean annual temperature is 2° F. The mean temperature of January is 20° below zero, and the observed minimum is 60° F. below zero. This is the best-known pole of cold on the earth. All Siberia is colder than the average for the other places on the same parallels of latitude, and at this pole of cold it is about 20° colder. At the same time the change of temperature between summer and winter is greater than known elsewhere at low altitudes, and at Verkhoyansk the difference between the January and July mean temperatures is 116°. For the Missouri valley it is only 55°, and for Maudslayi 63° or 70°. With the other continental features Siberia is dry, having a rainfall varying from 5 to 45 inches. In general the rainfall or snow is about that of the Great Plains E. of the Rocky Mountains, but in the northwest it is still less. The principal rainfall is in summer and autumn. Hailstorms are not rare, and are very destructive to stock toward the end of winter.

Mineral Productions.—The most productive metalliferous districts of Russia are along the Ural, and especially in those governments which lie partly in Asia, partly in Europe. It is not always possible therefore to separate the Asiatic from the European statistics, but the Asiatic variant of the Ural is in general much richer in mineral products than the European. Siberia is celebrated for her gold, platinum, and precious stones. The mines belong chiefly to the state, and their income to the imperial family. Gold is for the most part from places in the Ural and Altai Mountains, but has been found in several other districts. The production began in 1736, reached its maximum in 1825-50, and has since declined, except for a favorable fluctuation in 1871-76. The total production of the Russian empire (mostly from Siberia) in 1876 has been estimated at two-thirds of a billion of dollars, and the annual product remains about one-sixth of the world's total output of gold—in 1892 it was 1,168,011 oz. Russian platinum is from the Ural, chiefly from the Asiatic slope in Perm. Most of the platinum product of the world comes from this area. Mines of precious stones are numerous, and their product large, and the best are on the eastern slope of the Ural—diamonds, sapphires, emeralds, superb beryl from several places in Perm, aquamarines and topazes from Herson in Orenburg, etc. There are equally rich mines in the Altai Mountains and in Transbaikalia. Silver, copper, iron, carbon, graphite, and rock-salt are also important products.

Flora and Fauna.—The flora is very varied, as might be expected for so large an area, but it falls naturally into five principal types, viz., that of Kamchatka and the islands, which is closely allied to that of the Aleutian islands of the U. S.; that of the Amur basin, which is a continuation of the Manchurian; that of the southwest steppes, which are an extension of those of Russian Turkestan; that of the tundras along the Arctic Ocean; and that of the forests covering Central Siberia, an extension of those of Russia. The tundras have a considerable variety of low woody plants or shrubs, especially of the genera *Rubus* and *Fumexium*, also alders and willows. Mosses predominate, but some flowering plants extend even to Cape Chukotsk. The northern margin of the forest area is generally formed by two species of larch which, between the Yenisei and the Kolyma, reach N. of the Arctic Circle, sometimes passing the parallel of 70° N., and on the Bay of Khatanga reaching 72° 30' N. W. of the Yenisei the margin of forest growth descends below the Bays of Tazovsk and Obi, and E. of the Kolyma the forest-line descends rapidly southward to Kamchatka. Next to the larches come the pines, spruces, the poplar, and birches, and the last replaces the larches in the extreme east. The forest area of Siberia is enormous. That of Tomsk and Tobolsk is estimated at 250,000 sq. miles, and probably this is only a third or a quarter of the area for all Siberia, but the forests are visibly decreasing in Asiatic as in European

Russia. The Siberian forests are sometimes dense and continuous, but they are more often open, with intervening prairies. The oaks, lindens, and maples are found only on the Pacific versant, and here they are of unfamiliar species. The common fruits—the apple, pear, cherry, gooseberry—do not flourish in Siberia, but the hop is very common. The northern limit of cereals is about 60° N. lat. in the basin of the Obi, and rises to 61° or 62° in Yakutsk and the Aldan basin, but descends to 54° N. on the Sea of Okhotsk and in Kamchatka. They do not flourish on the elevated plateaus.

The fauna is not unlike the European, except in the southwest, where it is like that of Turkestan, and the southeast, where it is closely allied to the Manchurian. The northern shores have the reindeer, the northern hare, two species of fox and a wild dog, two species of lemmings, and the Siberian bear, the last becoming more and more rare. The mammoth and a rhinoceros abounded in these plains apparently at a time antedating the Glacial epoch. Farther S. animal life is abundant, and even the tiger penetrates into the Amur valley. Lake Baikal, though a body of fresh water, has its own species of seal, and the waters, both running and standing, abound in fish. Among the domesticated animals is the reindeer, which here descends to lat. 50° N. on the mountains bordering on Mongolia, where its habitat touches that of the camel. Siberia offers abundant pasturage, and is especially suited to the raising of live stock. According to recent estimates, it possessed over 2,000,000 each of horses and horned cattle, nearly 3,000,000 sheep, 500,000 swine, 200,000 goats, 146,000 domesticated reindeer, and 3,600 camels. The collection of furs (fox, ermine, marten, sable, bear, squirrel) forms an important industry.

Agriculture.—The amount of arable land is estimated at from one-third to one-fifth of the total area, more in proportion in Western than in Eastern Siberia. The maritime province, adjoining Manchuria and the Pacific, is more favorable for agriculture, so far as climate and water-supply are concerned, but it is little known. Agriculture is very primitive, but the virgin lands yield enormous crops. The chief crops are wheat (spring and winter), rye, oats, barley, the potato, and tobacco. There are few manufacturing industries. Trade is mostly with European Russia, but is very profitable, with high prices and high rates of interest.

Population.—The population is most dense over a long and slender triangle, whose base is on the Ural Mountains, and whose axis passes from Ekaterinburg to Vladivostok, through Lake Baikal. In this space the greater portion of the inhabitants are of European descent, mostly Russians, with a few Poles and still fewer Germans. N. of this area, and over three-fourths of Siberia, the population is very sparse, and consists of tribes of Finnish relationship in the west (Ostiaks, Samoyedes, etc.) and of uncertain relationships in the east (Chukchees, Koriaks, Kamchadales, etc., with a few Eskimos about Cape East). S. of the area above described are Turco-Tartars in the west (Kalmuks, etc.) and Mongols in the east (Buriats, Tunguses, etc.). The Buriats occupy much of the Amur valley, and the Tunguses extend northward into the Yenisei basin until their area adjoins that of the Samoyedes. There are also a few thousands of Jews and gypsies scattered through Siberia. The abundant archaeological remains show that Siberia has been occupied from the earliest times, and the peoples along the Arctic coast appear to be the ethnic remnants of the aborigines. Peoples of Turkish or Mongolian races in wave after wave have swept over the country and left remnants of their own tribes in its southern parts. The lot of the indigenes, whether aboriginal or not, is not pleasant. Oppressed by imposts of the nature of tribute, robbed of their lands most suited for the chase, fleeced by functionaries and merchants, exposed to new and destructive maladies, and demoralized by spirituous liquors, their number is decreasing rapidly.

The religions are as diverse as the peoples. The Russians are generally Orthodox, but many dissenters have been deported. The Poles are usually Roman Catholics, the Tartars Mohammedans, the Mongols Lama-Buddhists, and the northern indigenes pagans of the Shaman type. Missionary effort is active throughout the country, and especially in the west. Many of the indigenes profess Christianity.

The conquest of Siberia was begun in 1582. The latest addition to its territory was SAGHALIEN (q. v.) in 1875. From the beginning a stream of voluntary colonists has poured into Siberia from European Russia, although immigration was at times forbidden by the Government and is strictly regulated. The number of such colonists from 1860 to 1880 is officially estimated at about 100,000. In the latter part of

the eighties it had increased to about 35,000 per year, and since the Samara famine it has greatly increased and is estimated to have been 100,000 in 1892.

Increase through Deportation.—Deportation to Siberia was important in the seventeenth century, and adds annually about 20,000 to the population, of whom about one-fourth are voluntary, accompanying their families. From 1823 to 1869 there were over 600,000 persons deported to Siberia, and of them 167,000 were voluntary. About 15 per cent. of the deported were women; 12 per cent. were sentenced to hard labor, 20 per cent. to loss of civil rights, 13 without such loss, and 24 were free to change residence in Siberia; 52 per cent. were deported by executive act, or otherwise without process of courts. When deported they are sent to prisons at Tiumen and thence distributed, some to the extreme north, some to hard labor in mines in the Amur, some to the convict island of Saghalien, but generally to some less remote or less forbidding place where the chief reminder of their condition is the strict police surveillance to which they are subjected. The political exiles are the most intelligent and worthy, but the worst treated. The criminals sometimes become vagabonds, and may continue their unlawful careers. The exiles in Siberia make 5 per cent. of the population as a whole—1 in Yakutsk, 3 in Tomsk, 4 in Transbaikalia, 5 in Tobolsk, 10 in Yeniseisk and Irkutsk, and in Saghalien about 70.

Vital Statistics, etc.—Aside from the unfavorable conditions induced by the introduction of criminals by deportation, the social state of Europeans in Siberia is not bad. The birth-rate is very high (45.5 in 1890) and the death-rate somewhat high (31), but not so high as in European Russia. Only 9 per cent. of the population as a whole live in the towns. The number of females (1888) surpassed that of the males by 1 in 100. In 1891–92 there were 1,446 primary schools with 49,118 pupils, 55 middle schools with 7,401 pupils, 17 professional schools with 974 pupils (only 75 girls in the last), and a university at Tomsk, opened in 1887.

Means of Communication, etc.—A telegraph line extends from the Urals to Nikolaevsk at the mouth of the Amur. Besides the railway to Tiumen one across the country from Orenburg to Vladivostok was begun in 1892, and is (1895) well advanced. The section from Cheliabinsk (where it connects with the European system) to Omsk is already completed, as is also a piece 255 miles long at the eastern end, extending N. W. from Vladivostok. The chief towns are Omsk (pop. 54,721 in 1890); Irkutsk (50,274); Tomsk (41,856); Tiumen (35,396); Tobolsk (21,336).

LITERATURE.—The encyclopædic and more complete works on Siberia are naturally in Russian, and the German literature is large. The following are the works available in English and the more classical of the German books: Middendorff, *Reise in dem äussersten Norden und Osten Sibiriens* (4 vols., 1851–60); Kennan, *Tent-life in Siberia* (1870), a magazine article by this author; Seeböhm, *A Visit to the Valley of the Yenisei* (1879); Mudge, *Fur-clad Adventures through Alaska, Kamchatka, and Eastern Siberia* (1888); Nordenskiöld, *Voyage of the Vega* (1881); Iadrintzef, *Sibirien, geographische, ethnographische, und historische Studien* (trans. from Russian, 1886); Landsell, *Through Scythia* (2 vols., 1882); Woeikof, *Die Klimate der Erde* (2 vols., 1887); De Long, *Voyage of the Jeannette* (2 vols., 1881); Melville, *The Lena Delta* (1885); *Lenamündung* of the Russian International Polar Expedition; Price, *From the Arctic Ocean to the Yellow Sea* (1892).

MARK W. HARRINGTON.

Sibilants [from Lat. *sibilans*, partic. of *sibilare*, to hiss]: in phonetics, a group of fricatives or spirants characterized by a hissing sound. This hissing sound is produced by a current of breath directed by the blade of the tongue against the teeth. The commonest examples are *s* as in *sun*, *sh* (ʃ) as in *shine*, *z* as in *zinc*, *zh* (ʒ) as in *azure*; *s* and *sh* are voiceless, *z* and *zh* are voiced; *s* and *z* are produced by a sharper or more concentrated current of breath than *sh* and *zh*, in which the tongue is drawn back and the point slightly raised. See SPIRANTS and CONSONANT.

BENJ. IDE WIEFLER.

Sibler, WILHELM, Ph. D.: clergyman; b. at Breslau, Prussia, Nov. 12, 1801. After a gymnasium course he served for two years and a half in the Prussian army, rising to a lieutenantancy; studied in the military school at Berlin; abandoning military life, studied philosophy and philology in Breslau and Berlin; gymnasium professor at Dresden 1834–37; tutor in Livonia, Russia, 1837–41. Having studied the-

might certainly, he answered an appeal for Ragman missionaries for the U. S. and removed to North America in 1832. He became a member of the Joint School of Ohio, and for a brief time a pastor at Painesville, O., and then at Fort Wayne, Ind. He founded a seminary at Fort Wayne, Ind. (1836), of which he became professor, and was one of the founders and leaders of the Synod of Missouri. He was the author of *Narrative in the Hapsburg and Lippold of the Missouri River*, and of various controversial tracts. (D. Oct. 21, 1883. His biography (Lithuanian) in two volumes was published at St. Louis, Mo., 1880. H. K. JAMES.

Sidley, Henry Roberts: soldier; b. at New Rochelle, La., May 28, 1816; graduated at the U. S. Military Academy July 1, 1838; appointed second lieutenant of Second Dragoon Regt. June 1, 1840; captain 1847, and major (1848-1851); served in Florida was 1838-39 and 1840-41; adjutant of his regiment 1841-49. In the war with Mexico he participated in the siege of Vera Cruz, battles of Cerro Gordo, Churubusco, Chapultepec, Molino del Rey, and final capture of the city of Mexico, gaining the brevet of major for gallantry in the affair at Molino, near Vera Cruz, Mar. 28, 1847. Before the civil war he was actively engaged in frontier duty and on numerous expeditions, notably the Utah expedition (1857-58, 1859-60), and that against the Navajos (1860). The breaking out of civil war in 1861 found him in New Mexico, where he resigned from the U. S. army, in which he had just been promoted to the rank of major (May 12), and entered the Confederate service, in which he was soon a brigadier-general. Having organized a brigade in Northwest Texas, he left Fort Bliss in Jan., 1862, with between 2,000 and 2,500 men, to effect the conquest of New Mexico, and Feb. 18 appeared before Fort Craig, commanded by Col. R. S. Canby. The action of Valverde was fought Feb. 21, closing by the withdrawal of Col. Canby's troops to the fort. Albuquerque and Santa Fe were occupied by Sidley in March, but the following month he was compelled to evacuate the territory and return to Fort Bliss. After the close of the war he was in the service of the khedive in Egypt as brigadier-general 1869-72. He was the inventor of the tent known by his name. D. at Fredericksburg, Va., Aug. 22, 1880.

Revised by JAMES MARRAS.

Sidley, Henry: financier; b. at North Adams, Mass., Feb. 8, 1807; was a shoemaker by trade; removed early to New York state, where he became a machinist, and also engaged in manufacturing machinery. When telegraphy came into practical use he associated a few gentlemen with himself, and bought or leased several unsuccessful lines, until finally over twenty corporations were merged into the Western Union Telegraph Company. Sidley subsequently conceived the idea of a line to California, and was mainly instrumental in carrying through Congress, in the face of the most intense opposition, a bill which secured a line to the Pacific coast. He also completed negotiations with the British and Russian governments for a European line across Bering Strait. The Atlantic cable proved a success and, consequently, the Asiatic line followed. He engaged in railway-building, in manufacturing timber and saw, wool-raising, and in farming on a large scale. He expended \$200,000 in founding Sidley College of Mechanical Engineering at Cornell University, and \$100,000 on a fireproof library building for the University of Rochester. D. at Rochester, N. Y., July 12, 1888.

Sidharp, Jura, M. D., P. R. S.: botanist; b. at Oxford, England, Aug. 28, 1758; graduated at Oxford University about 1785; studied medicine at Oxford, Edinburgh, and on the Continent; made botanical researches in France, Switzerland, Southern Italy, Crete, Cyprus, Asia Minor, parts of European Turkey, and Greece; Professor of Botany at Oxford; one of the founders of the Linnean Society; made a second botanical exploration of Greece and the Ionian Islands 1794-95; published the *Flora Oecidenalis* (1794); and at Bath, Feb. 8, 1796. He bequeathed to the university £1,200 per annum for the publication of his great work, *Flora Graeca*, which was edited by J. E. Smith and John Lindley (30 vols., royal folio, with 1,000 colored plates, 1897, rev.).

Revised by CHARLES K. BRADY.

Sihyl [from Lat. *sihylus* = Gr. *σῆλη*, *sihyl*]; the name given to certain old women inspired by the god of prophecy. Pausanias of his own story, Aristotle of several, and Varro of two. *Liberia*, the first *sihyl*, was the daughter of Zeus and *Lamia*, and prophesied at Delphi. The second and famous *sihyl* was *Herophile*, a sister or daughter or wife of *Apollon*, who is named of even before the Trojan war. Troy-

land seems to have been her real home, though, from her wanderings in the interior of her god, she was known by a number of other names. So also is the *Sithonian*, *Trojan*, *Carian*, *Melphian*, *Cyrenian*, *Carian*, *Crethronian*, *Sihyl*. She lived for ages, and she it was who sold the books of prophecy to *Thargimus Syriacus*. The twelve extant books of *sihyl* are of late Greek Christian origin, and have nothing in common with the old *sihyl*. J. R. S. MERRITT.

Sicilian Vespers: the uprising of the Sicilian people against the French marriage Charles of Anjou, at Palermo on Easter Day, Mar. 30, 1282. In 1264 Pope Urban IV. had granted the kingdom of the Two Sicilies to the infant Charles of Anjou, brother of King Louis IX. of France. Charles' brutal Manfred at Benevento took possession of the kingdom, and converted the government into an oppressive despotism. This was long borne without organized resistance, but the brutality of a French soldier toward a Sicilian woman produced an outbreak of popular resentment which began with the instant massacre of the French soldiers, and ended with the slaughter of most of Charles' foreign and native adherents throughout the island, and the final overthrow of his domination in Sicily. See *Amari, La guerra dei Vespri Siciliani* (2 vols., Palermo, 1842; many times reprinted).

Sic'lies, The Two: the name given formerly to a kingdom composed of the island of Sicily and the southern part of the mainland of Italy. In 1130 the Norman house (v. s.), King of Sicily, having obtained the Italian territories of Apulia, Capua, Naples, and the Abruzzi, was crowned at Palermo as King of Sicily and Italy, a title afterward altered. Thus was formed a dominion whose two parts were frequently divided and united and transferred from one ruler to another, but always with hardly any change of boundary. Ferdinand the Catholic (1479-1516), King of Aragon and the island of Sicily, conquered the continental Sicily and called himself the king of the Two Sicilies, which then remained united up to 1708. (See *SICILY*.) From 1735 up to their annexation to the kingdom of Italy in 1860 the parts were again united, except during the period 1848-49, when the continental Sicily was ruled over by Joseph Bonaparte and Murat as Kings of Naples. The continental Sicily comprised what are now the two *compartimenti* of Abruzzi e Molise, Campania, Apulia, Potenza or Basilicata, and Calabria, and is divided into sixteen provinces. See FREDERICK IV. (King of Naples), FERDINAND II., FRANCIS I., and FRANCIS II. (Kings of the Two Sicilies). R. A. JONES.

Sicily, *sic-i-le* (Ital. *Sicilia*; Lat. *Sicilia*, *Sicania*, *Trojan*; Gr. *Σικελία*, *Sicilia*, *Trojan*); the largest and most important island in the Mediterranean, lying near the center of that sea, between 36° 41' and 38° 15' N. lat., 12° 00' and 15° 40' E. lon. It is separated from Italy by the narrow Faro or Strait of Messina. Its western extremity, Cape Bon (anc. *Lilybæum Panormitarum*), is 90 miles from Cape Bon in Africa. It forms a nearly isosceles triangle, its shortest side fronting the E. Area, 9,930 sq. miles. Together with the islands Pantellaria and Ustica and the Lipari or *Æolian* group on the N. and the *Ægades* group on the W., it constitutes a *compartimento* of the kingdom of Italy.

Physical Features, etc.—The coast is about 700 miles long, but has few natural harbors. The most important are those of Messina, Catania, Agosta, and Syracuse on the E. and of Palermo on the N.; also in the small harbors of Trapani and Marsala on the W. and in the roadstead of Licata on the S. a large trade is carried on. The most northeast point is Capo del Faro; next S. E., Cape Passero; N. W., Cape San Vito. Near the northeast corner of the island begins a mountain chain corresponding to the Calabrian range on the mainland. Its general direction is S. S. W. to Taormina, then westward, running parallel to and near the north coast with a general elevation of from 2,000 to 3,000 feet. Its highest summit, the Pizzo dell' Antenna or Pizzo di Corno, S. W. of Catania, is 6,478 feet high. There the chain divides into three ridges, or rather series of detached mountains, diminishing in height, which run S. W., S., and S. E. The general surface of the island is an uneven plateau descending toward the S. E. Its most famous and important mountain is the isolated volcanic peak of Etna (v. s.). There are few lakes or ponds. Lago Pergusa, near Castro Giovanni (see *ENNA*), and the *Diavoli* di Lentini, or Lake of Lentini, are the largest. The forests, which were formerly extensive, have been largely destroyed in modern times, not only by volcanic eruptions, as along the slopes of Etna, but by im-

provident felling and abuse of pasturage. In consequence the water-supply is uncertain and limited. The heavy winter rains are of little benefit, being neither absorbed by the soil nor collected in natural or artificial storehouses for the dry season. Still, evaporation from the surrounding seas mitigates the heat, and its condensation on the summits of the northern coast range furnishes a supply of water which, though badly economized, somewhat protects the soil from droughts. The principal rivers are the Giaretta, formed by the union of the Simeto and Gurnalunga, the Cantara, Salso, Platani, and Belici. The numerous smaller streams are often obstacles to internal communication from the violence of their currents in winter and from the difficulty of constructing secure bridges over them. The larger number are dry in summer. The temperature is generally agreeable, except during the prevalence of the parching sirocco. The climate is not unhealthful, except in the many localities rendered almost uninhabitable by malaria.

Minerals.—The minerals correspond with the geologic formations of which the island is composed—Primitive at the N. E., Secondary along the N., and mainly Tertiary through the rest of Sicily. Sulphur and rock-salt are the most important mineral products. The marbles, jaspers, and agates are fine. Lignite and alum are found, and also at the eastern coast amber, usually of a transparent yellow, but sometimes blue or green.

Agriculture and other Industries.—The soil, almost nowhere alluvial, is exceedingly fertile wherever water can be secured for irrigation. Agriculture is carried on only in the rudest and most primitive way, and until recent years insecurity of life and property have prevented investment in rural improvements. Excellent wheat is raised in large quantities, but generally exported, the necessities of the inhabitants being supplied by the importation of a cheaper and inferior article. The vineyards produce delicious wines of various kinds. Hemp, saffron, and sumach are grown. The mulberry is cultivated for the silkworm. Almonds, figs, olives, lemons, oranges, and tobacco are raised extensively. The cultivation of cotton and the sugar-cane has greatly decreased. Manufactures are unimportant and hardly more than supply the wants of the working-classes. Fishing is prosecuted with energy. The tunny is taken and cured at different points along the coast, and sardines and anchovies are shipped to foreign ports in large quantities. Means of intercommunication are very defective. There are few highways, the roads are mostly bridle-paths, and the towns of the interior are generally not accessible by small carriages. In 1894 633 miles of railway had been opened up.

Language and Literature.—The Sicilian dialect resembles that of Calabria. It generally agrees with the Tuscan in vocabulary, but with the frequent substitution of *u* for *o* final, of *u* by *da*, and with the omission of the *u*-sound after *q*; but it possesses many words from the Arabic and others from unknown sources. Though not a literary language, it has ancient chronicles in the popular speech and some modern poems justly admired. Education, though making progress, is still in a backward state, and Sicily is far behind continental Italy.

History.—The earliest known inhabitants were the Sicani or Siculi, who crossed from Italy. At an early period the Phœnicians planted their factories along the coast and introduced the Phœnician worship. They were shortly followed by Greeks, who so thoroughly colonized the island in the eighth and seventh centuries before Christ that all its ancient culture and civilization were of Greek origin; but the colonists, being from many different states, were disinclined to unite in any common organization. The cities they founded were governed by oligarchies or tyrants, but though often at war with each other rose to great wealth and power. The Carthaginians in great force invaded Sicily, but received a crushing defeat at Himera (480 B. C.). Then followed the most brilliant half century of the Greek domination. Troubles among the cities furnished a pretext for the disastrous Athenian expedition (415 B. C.). After 409 B. C. the Carthaginians gradually mastered most of the island, but were sturdily resisted by Dionysius, tyrant of Syracuse. At the close of the first Punic war (241 B. C.) they were forced to cede their Sicilian possessions to the Romans, Syracuse still remaining independent; but all Sicily became a Roman province—the first Rome possessed—at the close of the second Punic war, and so continued until 395, when, on division of the Roman empire, it became part of the empire of the East. Christianity was early intro-

duced, apparently from Rome. Overcome by the Goths, Sicily was delivered by Belisarius and continued a Byzantine possession until 827, when its subjugation was commenced by the Saracens and was completed in 878. Under the Mussulman sway agriculture, manufactures, and commerce steadily increased. In 1061 the wealthy island tempted the Normans under Roger Guiscard, but it was not wholly subdued until 1090. The Normans held it until 1194, when it passed to the Hohenstaufen emperors, who were replaced in 1268 by Charles of Anjou and the French. The massacre of the SICILIAN VESPERS (*q. v.*) ended the power of the latter (1282), and the island came into the hands of Peter III. of Aragon. The Aragonese dynasty reigned till 1504, after which until 1706 Sicily was under the Spanish crown. Then for brief periods it was held by Austria, Savoy, Austria, and Spain, till in 1735 it was reunited with Naples under Don Carlos as King of the Two Sicilies, and was ruled by his house until its liberation (1860) by Garibaldi and its incorporation into the kingdom of Italy. Its condition in the Middle Ages was deplorable. Its nominal independence was limited to control of its internal affairs, while its rulers constantly neglected to defend it against the Mussulmans; but great progress has been made since 1860.

All the ancient peoples who ruled Italy—the Siculi, Phœnicians, Greeks, Carthaginians, and Romans—have left monuments of their occupation. Those by the Greeks are stupendous, and include the vastest and most splendid existing remains of Greek temples. These are specially to be seen at Selinonte, Girgenti (*Agrigentum*), Segesta, Syracuse, and Himera. Even the reconstructed Roman theaters of Syracuse, Segesta, Taormina, and Palazzolo rest on Greek foundations. In Sicily are found very beautiful ancient pottery and unsurpassed medals. Some edifices date from the Byzantines and Saracens, but the most important memorials of the latter are the useful plants, such as sugar-cane and cotton, which they introduced.

Population.—Sicily is divided into the provinces of Catanzetta, Catania, Girgenti, Messina, Palermo, Siracusa, and Trapani. Total population (1881) 2,927,901; 1893 (official estimate), 3,404,665. Principal cities: Palermo, 276,000; Messina, 146,400; Catania, 121,000.

LITERATURE.—See Freeman, *History of Sicily* (4 vols., Oxford, 1891); also Freeman, *Story of Sicily* (New York, 1892); Amari, *Storia dei Musulmani di Sicilia* (3 vols., Florence, 1854–72); Lloyd, *History of Sicily to the Athenian War* (London, 1872); Chiesi, *La Sicilia illustrata nella Storia, nell'Arte, nei Paesi* (1892); Di Giovanni, *Filologia e Letteratura Siciliana* (2 vols., Palermo, 1871); Lo Faso, *Duca di Serradifalco, Antichità della Sicilia* (5 vols., folio); Evans, *The Classic and Connoisseur in Italy and Sicily* (3 vols., London, 1835); also the *Tours of Brydone*, Sir R. C. Hoare, and Simond.

E. A. GROSVENOR.

Siekingen, FRANZ, von: champion of the Reformation; b. Mar. 2, 1481, in the castle of Ebernburg, near Kreuznach, in the present Rhenish Prussia; was one of the wealthiest and most powerful knights of his time, and was treated with much regard both by Charles V. and by the French king, Francis I. He spent all his time in feuds with his neighbors, and, having come into contact with the new religious ideas through his friend Ulrich von Hutten, he formed a plan of carrying through the Reformation by force. As the despoiling of the Roman Catholic Church of all its property and the distribution of its estates among the knights formed the principal points of his plan, he expected support from the nobility, and pamphlets were written and spread among the peasantry in order to arouse them, too, against their ecclesiastical lords; but the attempt entirely failed. One after another his castles were taken, and at last he was compelled to surrender himself, together with his last castle, Landstuhl, near Kaiserslautern. D. May 8, 1523.

Sickles, DANIEL EDGAR: soldier; b. in New York, Oct. 20, 1825; was educated at the University of New York, but left without graduating; learned the printer's trade, then studied law, and was admitted to the bar in 1846. He soon became identified with politics, and in 1847 was elected to the State Legislature as a Democrat. In 1853 he was appointed corporation attorney of New York city, and the same year accompanied Mr. Buchanan to England as secretary of legation. Returning in 1855, he was elected State Senator, and the following year was chosen member of Congress from New York city, and re-elected in 1858 and in 1860. On Feb. 27, 1859, he shot and killed Philip Barton

Ker in Washington for improper intimacy with his wife, and was placed on trial for murder, but acquitted. On the outbreak of civil war he raised the Greenback Brigade, and in June, 1861, was appointed colonel of one of its regiments, the Twenty-fifth New York. In Sept., 1861, he was nominated a brigadier-general of volunteers. The appointment was at first negatived by the Senate, but subsequently confirmed to date from original appointment. In the Virginia Peninsula campaign his brigade was attached to Hooker's division of the Third Corps, in the command of which he succeeded in Sept., 1862, and having been commissioned major-general of volunteers Nov. 30, 1862, was assigned to the command of the Third Army Corps in Feb., 1863. He was distinguished at the battle of Chancellorsville May 2-4. At Gettysburg he lost a leg early in the second day's fight. In 1865-67 he commanded the military district comprising North and South Carolina. On July 28, 1866, he was appointed colonel of the Forty-second Infantry of the regular army, and in Apr., 1869, was retired from active service with the rank of major-general. In the latter year he was appointed U. S. minister to Spain, which position he resigned in 1872. Returning to New York he became president of the State board of civil service commissioners. He received the honors of brigadier and major-general U. S. army for gallantry. In 1866 he was appointed minister to Belgium and in 1869 minister to Mexico, but declined both positions. In 1890 he was appointed sheriff of New York by Gov. Hill, and in 1892 was elected to the Fifty-third Congress.

Sicyon, *sí-sí-on* (Gr. *Síkyon*): capital of the province of Sicyonia, in the Peloponnese, which was founded on the N. in the Corinthian Gulf, on the W. by Achaea and Argolis, on the E. by Cleone and Phlacha, on the S. by Corinth. Its site is occupied by the village of Vasilika. Sicyon was distinguished in earliest times as the original home of painting and bronze-casting. In history Sicyon played only a secondary rôle. Excavations have been made by the American School of Classical Studies at Athens. J. H. S. S.

Siddons, *Sí-don*: actress; daughter of Roger Kemble; b. at Brecon, South Wales, July 5, 1755; played as a girl in her father's company; married Mr. Siddons, an actor, at the age of eighteen; made her first appearance at Drury Lane, with Garrick, as Portia in *The Merchant of Venice*, in 1772, but, made no mark; retired in disappointment, but played in the provinces with success, and reappeared in London in 1782. This time she made a deep impression as Isabella in *The Fatal Marriage*, and began her career of extraordinary success. For thirty years, until her retirement June 29, 1812, she was the queen of the English stage. Her favorite and famous characters were Lady Macbeth, Queen Gonzago, Queen Catharine, Jane Shore, Isabella, Ophelia, Desdemona, Portia, and Imogen—impersonations of tragic pathos and melody. To her contemporaries she was a prodigy of genius. Yet in the opinion of judges her ordinary reputation was imperfect. Her effects were produced by passion, action, attitude, expression of voice and countenance, and by intense concentration of feeling, which lifted and dilated her form, transporting her audience as well as herself. The public readings she gave from Shakspeare after her withdrawal from the stage did not add to her fame. Her last appearance as an actress was in 1818, when she played for Charles Kemble's benefit. Thenceforth she lived in retirement, honored as a woman of stainless reputation, and respected in all the relations of life. D. in London, June 6, 1831. Her portrait was painted by Sir Joshua Reynolds, and is one of his best; her *Life* was written by Thomas Campbell (1834) and by Mrs. Kemble (London, 1896).

Revised by R. B. VALLENTINE.

Sidell, *Wí-li-am* *Hevry*: soldier; b. in New York, Aug. 11, 1810; graduated at the U. S. Military Academy, sixth in his class, July, 1833, when assigned to the First Artillery as second lieutenant; resigned the following October, and adopted the profession of civil engineering. For a time he was a city surveyor of New York, an assistant engineer on the Croton aqueduct, and division engineer of railroads in Massachusetts and New York; was assistant engineer in the hydrographic survey of the delta of the Mississippi river; in 1851-52 was assistant in the exploration and survey of a railway route across the Isthmus of Tehuantepec. The work of construction was abandoned till 1858, when he became chief engineer. On the outbreak of civil war he was commissioned major of the Fifteenth U. S. Infantry, but without joining his regiment was at once assigned

to duty as mastering officer in the department of the Cumberland. In July, 1862, he was detailed as acting assistant adjutant-general of that department, continuing so much until transferred to Louisville, May, 1864, as acting assistant provost-marshal-general of Kentucky, resuming soon after the duties of general superintendent of recruiting and chief mastering officer of the state. In 1867 he joined his regiment, the Tenth Infantry (to the lieutenant-colonelcy of which he had been promoted in 1864), with which he served in Dakota Territory until 1869, when placed in charge of the depot of the general recruiting service at Fort Lawrensvorth, Kan. He retired from active service Dec. 15, 1870. D. in New York, July 1, 1874. For meritorious and faithful services in the war he was breveted colonel and brigadier-general U. S. army.

Sidereal System: See ASTRONOMY, GALAXY, NEBULÆ, and STARS.

Sidereal Time: See TIME.

Sid'elite [from (Gr. *sídeas*, iron); the mineralogical name for spathic iron ore. See IRON.

Sidgwick, *Sí-dj-ik*, *Lí-f*, D. L. E. D. C. L.: philosopher and economist; b. at Skipton, Yorkshire, England, May 31, 1838; educated at Rugby School and Trinity College, Cambridge; became fellow and lecturer at Trinity College 1859, reader in moral sciences in 1875, and Professor of Moral Philosophy in Cambridge University in 1883. He has published *Methods of Ethics* (1874; 4th ed., 1894); *Principles of Political Economy* (1883); *Outlines of the History of Ethics* (1886); *Elements of Politics* (1891); and many articles and special publications. J. M. B.

Sidmouth, *Sí-dm-uth*, *Viscount*: statesman; b. at Reading, England, May 30, 1757; educated at Winchester School and at Brasenose College, Oxford; studied law; was admitted to the bar 1784; entered Parliament the same year through the influence of the younger Pitt, to whom he gave an efficient support during his administration; was Speaker of the House of Commons from 1789 until 1801, when, on the resignation of Pitt as Prime Minister, he formed a new ministry, accepting the posts of Chancellor of the Exchequer and First Lord of the Treasury; directed the negotiation of the Peace of Amiens 1802; supported a war policy 1803; resigned office 1804; was raised to the peerage and made president of the council Jan. 12, 1805; was Lord Privy Seal in the Grenville and Fox ministry 1806-07; was Home Secretary 1812-22, and a member of the cabinet without a portfolio 1822-24, when he became unpopular on account of his coercive measures, after which he retired from public life. D. at Richmond Park, Feb. 15, 1844.

Sidney: village; capital of Shelby co., O.; on the Miami river, the Miami and Erie Canal, and the Cin., Ham, and Dayton, and the Cleve., Cin., Chi. and St. L. railways; 31 miles S. of Lima, 40 miles N. of Dayton (for location, see map of Ohio, ref. 4-U). It is in an agricultural region, is principally engaged in manufacturing, and contains a public high school, public library (founded in 1886), 2 private banks, and a daily and 4 weekly newspapers. Pop. (1880) 3,523; (1890) 4,550.

Sidney, or **Sydney**, *Al-berny*: revolutionist; b. at Penshurst, Kent, England, in 1622, a son of the second Earl of Leicester; in 1632 accompanied his father, who was appointed ambassador to Denmark, and four years later to France. In 1641 he served as captain of a troop of horse in Ireland, of which his father had been made lord-lieutenant. When the great rebellion broke out, he took the side of the Parliament, and was made a captain of horse in the regiment of the Earl of Manchester. He was severely wounded at the battle of Marston Moor July 2, 1644; and in 1645 was made colonel of a regiment in Fairfax's army and governor of Chichester. In 1646 his brother, Lord Lisle, was appointed Lord-Lieutenant of Ireland, and he was made lieutenant-general of horse and governor of Dublin; in 1647 he received the thanks of the House for his services in Ireland, and was made governor of Dover. In 1648 he was one of the judges at the trial of Charles I., but was not present when sentence was passed, and did not sign the warrant for the execution, though he afterward characterized it as "the justest and bravest action that ever was done in England or anywhere else." Being opposed to the protectorate of Cromwell, he retired from Parliament in 1653, but when the Long Parliament was restored in 1659, he resumed his seat, and was named one of the council of state, and was sent as one of the

English commissioners to negotiate a peace between Sweden and Denmark. He was absent from England at the time of the Restoration, and, not acceding to this, he lived abroad in exile for nearly eighteen years. In 1677 he received a pardon from the king, with permission to return to his native country; twice unsuccessfully stood for a seat in Parliament, and was considered as being in league with Monmouth, Essex, William Lord Russell, and other popular leaders. The discovery of the Rye House plot in 1683 gave the court an opportunity of ridding itself of so dangerous an opponent. He and Russell were arrested and committed to the Tower on a charge of high treason. The only witness as to the main facts charged was Lord Howard, who by his own confession had been a party to the plot, and was ready to swear away the lives of his associates in order to save his own. The law required two witnesses to prove the alleged crime, and under the decision of the infamous Chief Justice Jeffreys the other witness was found in a manuscript on government which had been discovered among the papers of Sidney, in which it was maintained that a people had the right to depose an unworthy sovereign. The trial was opened Nov. 7, 1683; sentence was pronounced on the 26th; and on Dec. 7 he was beheaded on Tower Hill, London, and buried the next day at Penshurst. The reversal of the act of attainder was one of the earliest acts of the first Parliament of William and Mary. His *Discourses concerning Government* was published in 1698, and a 4th ed., with some miscellaneous writings, in 1772. *Lives of Sidney* have been written by Meadley (London, 1813), Van Santvoord (New York, 1851), and A. C. Ewald (London, 1873).

Sidney, or Sydney, Sir PHILIP; author and statesman; b. at Penshurst, Kent, England, Nov. 9, 1554; studied at Oxford and at Cambridge; traveled extensively, visiting Belgium, Germany, Hungary, and Italy, in all of which countries he was noted for his skill in knightly exercises as well as for his fondness for literature and art. He returned to England in 1575, and, aided by the influence of his uncle, the Earl of Leicester, rose to high favor at court. In 1576 he was sent on a mission to Vienna, but after his return he lost the queen's favor, probably in consequence of his bold remonstrance against the project of her marriage to the Duke of Anjou, and retired for a time to the seat of his brother-in-law, the Earl of Pembroke, where he devoted himself mainly to literary pursuits. Here he wrote, between 1579 and 1581, his pastoral romance *Arcadia*, which was never completed, and his *Defence of Poesie*, upon which his literary fame mainly rests. In the meantime the queen's favor for him revived, and he took a prominent part in all pageants of the court. He fell deeply in love with Lady Penelope Devereux, afterward Lady Rich and Lady Mountjoy, whom he celebrated under assumed names in his *Arcadia* and in the series of love sonnets entitled *Astrophel and Stella*, published soon after his death (1591). In 1593 he was knighted, and married the daughter of Sir Francis Walsingham. In 1585 he wished to join Sir Francis Drake in his second expedition against the Spaniards in the West Indies, but the queen forbade this, fearing, as she said, "lest she should lose the jewel of her dominions." It is said, probably without good grounds, that the crown of Poland was offered to him. The war was raging between Spain and the Netherlands, and Elizabeth made some show of assisting the Dutch. In 1585 Sidney was appointed governor of Flushing, and soon after was made general of horse under his uncle, the Earl of Leicester, in which capacity he gave promise of much military ability. On Sept. 22, 1586, he encountered a body of the Spaniards under the walls of the town of Zutphen. Sidney was severely wounded, and died at Arnheim, Oct. 7, 1586. The well-known story of his refusing the cup of wine, when fainting from loss of blood, in order to give it to a wounded soldier, has been questioned, but, whether true or false, well illustrates his chivalrous and generous character. His body was conveyed to England, where it lay in state for several days, and a general mourning, the first of the kind in English history, was observed. Sir Philip Sidney is perhaps the best English model of knightly virtues, and his character has always been a favorite theme with poets. His writings had great celebrity in their day, but they are marked by the strained and artificial style of the period. His *Arcadia* was first published soon after his death (1590) as *The Countess of Pembroke's Arcadia* (reprinted, London, 1868). His *Complete Works* appeared in London in 3 vols. in 1725; his *Miscellaneous Works*, with a

memoir, were published at Oxford in 1826, reprinted at Boston in 1860; his *Complete Poems*, edited by Rev. A. B. Grosart, were published at London in 1873. See the *Life*, by J. A. Symonds (London, 1886; 2d ed. 1889). See ENGLISH LITERATURE.

Revised by H. A. BEERS.

Sidon, or Zidon [from Lat. *Sidon* = Gr. *Σιδών*, from Heb. *Tsidhōn*, Sidon, liter., fishing-place]: an ancient city in Phœnicia, on the Mediterranean, in lat. 33° 34' N. (see map of Palestine, ref. 3-E). Its origin, lost in antiquity, is due, according to Josephus, to Sidon, the oldest son of Canaan, and it is referred to even in the book of Genesis. Celebrated for its manufactures and commerce, its name was applied to the whole country and nation. Homer calls the Sidonians "skillful in all things." Sidon had trade-stations in Sicily, Sardinia, Spain, and Northern Africa; its fleets visited the British islands and the Baltic; and its purple, glass, linen, gold, silver, and ivory wares were famous a thousand years. Its most brilliant period began about 1600 B. C., but it was ultimately eclipsed by Tyre. Captured by Shalmaneser, King of Assyria, about 720 B. C., it was almost utterly destroyed during its revolt against the Persian Artaxerxes (351 B. C.). Rebuilt, it never regained its former splendor. Under the Greek, Syrian, and Roman dominion, it further declined. Alternately held during the crusades by the Christians and Mussulmans, it was razed by Malek Ashraf in 1291. In the vicinity were discovered (1887) sarcophagi of unsurpassed workmanship (now the chief treasure of the Museum of Constantinople), one of which is perhaps that of Alexander the Great.

E. A. GROSVENOR.

Sidonius Apollinaris: See APOLLINARIS SIDONIUS.

Sidra, Gulf of: See SYRTIS.

Siebold, zee'bōlt, PHILIPP FRANZ, Freiherr von: traveler, physician, zoölogist, and botanist; b. at Würzburg, Bavaria, Feb. 17, 1796; studied medicine and natural sciences; entered the service of the Dutch East India Company, and was appointed leader of a scientific mission which arrived at Nagasaki in 1823. He soon acquired an extraordinary influence over the Japanese, whose language he mastered, and in 1826, when he accompanied the Dutch embassy to Yedo, he was allowed to remain behind, the only foreigner in the hermit city. The sale of a map, however (see Ixoa), brought him into difficulties, and after a term of imprisonment he was finally banished from the country in 1830. On his arrival in Holland he was created a baron, and spent the next twenty-nine years of his life in writing and in arranging his scientific collections at Leyden, Munich, and Würzburg. European gardeners owe to him the introduction of Japanese lilies, peonies, camellias, chrysanthemums, and other attractive plants. At the close of his life he returned to Japan. His great work is a folio, magnificent y illustrated, *Nippon, Archiv zur Beschreibung von Japan*. D. at Munich, Oct. 18, 1866.

J. M. DIXON.

Siedlee, si-ed'lt'sā: town of Russia; the capital of the government of Siedlee (see map of Russia, ref. 8-A). It has a fine palace surrounded with beautiful gardens, distilleries, sugar-refineries, and manufactories of agricultural implements. Pop. (1890) 14,015, two-thirds Jews. The government of Siedlee, comprising an area of 5,535 sq. miles, with 671,598 inhabitants in 1890, is situated to the W. of the river Bug, between the governments of Lomza, Warsaw, Radom, Lublin, Volhynia, and Grodno, and occupies nearly the same territory as the old palatinate of Podlachia.

Revised by M. W. HARRINGTON.

Siege [from O. Fr. *siege*, Fr. *siège*, deriv. of *regier*, to siege; Span. *sitiar*; Provenc. *setjar* < Lat. **sedicare*, deriv. of *sedere*, sit]: the investing of a fortified place by an enemy for the purpose of compelling its surrender by continued offensive operations. Modern fortresses are of two general types—single fortresses, consisting of an enceinte and its outworks (see FORTIFICATION), and intrenched camps, consisting of the former combined with detached works. (See INTRENCHED CAMPS.) The latter may be defended simply by its garrison or by a large army in addition to the garrison. The methods of attack will vary with these different circumstances, and may be classified as (1) siege of a single fortress; (2) siege of an intrenched camp defended by its garrison simply; and (3) siege of an intrenched camp occupied by an army.

1. The method perfected by Vauban in the latter half of the seventeenth century applied to the first case, and under ordinary circumstances with the proper force—five or six

though the garrison was almost certain of success. This method has been employed without essential change for 100 years, and it is only within a very brief period that military engineers have found it necessary to introduce some modifications in order to adapt it to modern instruments of war. It consists, in brief, in taking up a strong entrenched position in front of the work, beyond the range of the artillery, and throwing a path thence to the interior. To do the latter it is necessary to maintain the fire of the work, to batter down a portion of the scarp, and to excavate a path by which troops can advance under cover. The occupation of the ground is called the investment. The invasions on the side of the work are called lines of circumvallation. Sometimes defenses are thrown up to guard against attack from the exterior; these are called lines of circumvallation. The covered roads constructed toward the work are called approaches, *saps*, or *trenches*. To prevent their being cut off they are run in a zigzag direction, each branch being so placed that its prolongation shall fall outside the salient of the parallel works. Whenever it is practicable several *saps* are pushed forward simultaneously from different points and converge toward the point of attack. During the earlier portions of the siege these approaches are constructed by digging a trench and throwing the earth up on the side toward the enemy, thus forming a simple trench. When within easy range of artillery, cover is more quickly obtained by placing a row of gabions and filling them with earth. This is called a *flying sap*. During the latter portions the excavation is pushed forward by sappers, foot by foot, under the cover of a rolling shield called a *sap roller*. It is covered with gabions and is called a *fall sap*. As the heels of these approaches offer an easy prey to shells they are built from distance to distance by lines of trench running nearly parallel to the front of attack. These are called *parallels*. They are arranged for infantry defense something like rifle trenches (see *Fortifications*), but their bottoms are made wider to afford means for the free circulation of troops. Each parallel should be nearer to the preceding one than it is to the work attacked, and must be within easy supporting distance from it. The number of parallels therefore depends upon the distance of the first one from the work, and that depends upon the range of the artillery. In Vauban's time there were usually three; at Salasquid in 1654, 24 there were seven. When the approaches have advanced within easy artillery range—the second parallel—batteries are constructed to silence the artillery of the works. When practicable, they are placed on the prolongation of the faces of the work. The artillery fire having been silenced, the approaches are pushed forward toward the foot of the glacis. In the old method, when within a short distance from it, mounds of earth, called *trenches*, were thrown up to command the secretway, and served to drive out the defenders. Their construction is now considered impracticable. The occupation of the crest of the secretway is called the *crowning of the glacis*. Here, in the old method, breaching batteries were constructed to batter down the scarp and a gallery was excavated to lead into the ditch, the advance through the ditch and breach being continued with the fall sap or by assault. In these operations the sapper goes hand in hand with the sapper. He searches out and destroys the countermines, creates large craters in which the sapper can make lodgments, and is frequently employed to make the breach.

The driving of a fall sap, and the establishment of these breaching batteries, in the later stages of the siege, always difficult, may be said to have become of late years impracticable, assuming always that the defense is vigorous. At Salasquid the fortifications were not strong, their profile that of fieldworks. At the siege of this place, which lasted eleven months, during which the French executed 47 attacks and the British 8 miles of trenches, the approaches were reached the ditch. At the final assault the ramparts were taken, and the troops had to advance without cover, at some points more than 200 yards. The assault failed at six points out of seven, and it was the opinion of Gen. Niel, commander of the French engineers, that the place would have been impregnable if it had been provided with good revetted *scaups*. This opinion, however, assumes that the scarp remained unbreached, and it is qualified by the statement that the place possessed an armament such as is only found in a great maritime arsenal, and a garrison perpetually replenished by communication kept open with the interior of Russia. Since that date further great improvements have been made in the caliber, range, and accuracy

of artillery fire, as well as in small arms. It has become possible to effect the breach by indirect fire from a distance, while the difficulties of the assault have been proportionately increased. The introduction of machine-guns and of the breech-loading musket, by means of which a thin line of troops can keep up a steady sheet of fire, has rendered impracticable the open assault of even slight intrenchments if immediately defended. It has fair chance of success, however, when made from a point close up to the works, and against a garrison worn out with the labor and anxiety of a long siege, or when following closely after the explosion of a mine.

The prompt capture of many of the single fortresses of France during the Franco-German war of 1870-71 has had little bearing on the subject, as many of them were of an ancient pattern, none was in a complete state of preparation, the artillery was inferior to that of the enemy, and the defense was often lukewarm or unintelligent, or both. The method of the Germans was to observe the place by detachments until operations in the field afforded leisure for a serious attack against them, and then to plant powerful batteries at distances varying from 1 to 2 miles, and bombard them until they capitulated. The bombardment of Sedan lasted 5 days; of Neuf-Brisach and Fort Moltke, 5 days; of Tilsen, which had been besieged three months, 2 days; of Montmédy, after four weeks' investment, 2 days; of Longwy, which had been invested seven weeks, 8 days; of Metz, after being observed by detachments three months, and regularly invested ten days, 14 days; of Belfort, 7 hours with field artillery; of Toul, after being observed four weeks by a brigade and closely besieged by a division eleven days, 8 hours; of Nancy, 4 days; of La Fère, after ten days' investment, 30 hours; of Péronne, after six days' investment, two of them employed in bombardment with field-guns, 7 days, etc. These facts do not militate against the value of these fortifications in themselves. Even defended as they were, they caused great annoyance and delay to the invaders, and they enabled the hastily organized armies of Prussia to make a defense of which otherwise they would not have been capable. Plaisance required a blockade of over four months for its reduction, and Biele held out to the end of the war. Verdun resisted a *coup de main* Aug. 24, was observed by detachments until Sept. 23, when it was closely invested, resisted a bombardment of 54 hours from captured French guns Oct. 14-16, but surrendered Nov. 8 without standing a regular siege, after preparations had been made for carrying it on with German artillery. Strasburg, with a garrison of 17,000 men, resisted for 51 days a besieging army of about 60,000. The attack was by regular approaches, the out-works being breached by distant fire and by mining, and the main rampart by the fire of batteries in the second parallel. Three batteries, called demolition batteries, were about 800 yards from the place, and effected their purpose by indirect firing, the masonry not being visible. The crowning of the glacis was successfully accomplished, followed by the descent into the ditch. The ditches, being filled with water, were crossed by dams, or, where the water was deep, by floating bridges of barrels floored over with planks. Everything having been prepared for the assault, the garrison capitulated without waiting to receive it.

In a vigorous defense of a single fortress the enemy will be kept at a distance as long as possible by the occupation of favorable points on the exterior. His approaches and other works will be harassed or destroyed by a concentrated artillery fire, with occasional sorties in large bodies. Counterapproaches will be run out to obtain favorable positions for enfilading his lines, and sharpshooters will be posted in rifle-pits well to the front to pick off his gunners. Countermines will be prepared, and sprung at the proper time. Damage to the works suffered during the day will be repaired at night. *Jabots* will be removed from the foot of the breach, and when the latter has become practicable it will be obstructed by cross-fret, chevaux-de-fron, or other obstacles, and intrenchments will be thrown up to command it. If the garrison has not been overworked the assault should be repulsed.

II. The siege of an entrenched camp, defended simply by its garrison, may take the form of an enlarged *sap* of the operations described above, or of a blockade. In the former case one or two of the detached works are selected for attack, and proceeded against until their capture, the difficulties being greatly magnified by the position of the artillery of the place. The siege of Belfort (Nov., 1870, to

Feb., 1871) is an illustration. The works planned for the defense of this place were not all completed at the breaking out of the war, and some of the points selected for the detached works were occupied by field-fortifications of the semi-permanent type. These were selected by the Germans as the point of attack. The investment was completed Nov. 3, the garrison consisting of 16,000 and the attacking force of 30,000 men, increased about the middle of January to 80,000. A bombardment was opened Dec. 3, and continued night and day until Feb. 13, during which time more than 500,000 projectiles were thrown into the place. In five days nearly every house in the city had been struck. The defense, under Col. Denfert-Rochereau, was gallant and skillful. For many weeks he kept the enemy at a distance by first occupying exterior positions, and then freely using his projectiles at long range. This kept the line of investment so attenuated that the attacking force was inadequate. Moreover, the latter was compelled to throw up lines of circumvallation against the threatening force under Gen. Bourbaki, and to use part of its artillery in defending them. The detached field-works were finally evacuated Feb. 3-8, the approaches having reached the ditch. Thus, after 98 days' investment and 68 of bombardment, the attack found itself just where it would have been on the first day of the siege had it not been for these field-works. Further operations were to be pushed against the main works, but the garrison was ordered out of the place by the French Government, and turned it over to the Germans Feb. 17 and 18, Paris having capitulated Jan. 28. That a well-managed assault may sometimes be successful against an intrenched camp was proved by the capture of Kars by the Russians on the night of Nov. 17-18, 1877. The defenses consisted of twelve detached permanent forts and a citadel, all built since the Crimean war. Some of the forts were connected by lines of trenches thrown up during the war of 1877. They were manned by a full garrison of about 23,000 Turks armed with the best modern breech-loaders. The attacking force was about 35,000 men. The Turks are considered the equals of any troops in the world when fighting in a fixed position, as behind fortifications, yet this assault resulted in the killing or capture of the entire garrison, with the exception of thirty or forty men. The most prominent features of its management were that no intimation had been given to the enemy that it was contemplated, the points of attack were skillfully selected, the various columns attacked simultaneously, and a moonlit night was selected for it, when the light was sufficient to prevent confusion among the columns, though not sufficient to expose them at a distance to the view of the enemy.

III. When the intrenched camp is occupied by an army, the difficulties of forcing an entrance are greatly magnified; and if the army is not very much inferior to the attacking force, they will probably be insuperable. The method of blockade may then be resorted to, with a view to exhausting the supplies of the besieged of ammunition and provisions. Here the attack and defense consist at first of a struggle for the possession of the communications with the place. These being once all secured by the attack, their further operations consist mainly in harassing the garrison by a distant bombardment while vigilantly guarding against the introduction of supplies or re-enforcements. The defense consists in keeping up a fire upon the enemy, with occasional sorties in large bodies, the object of which is to make a permanent break in the cordon, with a view to its destruction or to cover the introduction of re-enforcements. The sieges of Atlanta and Richmond during the civil war in the U. S., and of Metz and Paris in the Franco-German war, are illustrations. In the cases of Atlanta and Richmond the operations were confined to the preliminary struggles for the communications. Having lost these, the defenders withdrew at their last opportunity, preferring the immediate loss of the place to the sacrifice of both place and troops a few weeks later. At Metz, although the army of Bazaine was driven into the fortress and kept there against its will, and weakened the fortress for resistance to blockade, nevertheless it offered an immense obstacle to a forced entrance. The general method of occupying the ground by the Germans was about the same both around Metz and Paris. A first line of outposts was established from half a mile to a mile from the works. These were intrenched, and were strong enough to resist small parties of the enemy, but not a heavy force. Behind these was a carefully selected position, forming the main line. Its distance from the works depended upon the nature of the ground, and varied from

1 to 3 miles, the normal distance being 2½ miles, or a little more than the effective range of the guns of the enemy. It was fortified by rifle-trenches and gun-emplacements of the strongest profile, strengthened by abattis or other obstacles, with occasionally an inclosed work capable of offering independent resistance. Farther to the rear central points were selected and fortified, at which the reserves were posted, and upon which the troops were to rally in case of the enemy's success in breaking through the cordon. The length of the line of investment of Metz was 24 miles, and of that at Paris 45 miles. In each case the besieging force was about 200,000 men. The holding of such lines by such numbers would have been utterly impracticable previously to the modern improvements in small-arms and the introduction of the free use of continuous lines of intrenchments. As it is, when the investment is once closed the besieging army has a great advantage over the defenders, since it can accomplish its purpose without leaving its works. The rôles are reversed, and the besieged are compelled to throw themselves against the intrenchments, where they are sure to meet with destruction. The army in Metz was 173,000 strong and that in Paris 500,000, many of the latter, however, worthless as soldiers. The former capitulated after 70 days' blockade, and the latter after 129 days'. The operations about these cities, especially Metz, give rise to the curious but essential question, Can one army invest and besiege another of equal magnitude? The object of the sorties from Metz was to break through the cordon and get away with the active army, leaving the place to be held by its garrison. The fortifications aided such attempts; and if they had been mere field-intrenchments which were being evacuated, the beleaguered army would have had still less chance of success. The answer, then, seems to be, Let an army somewhat demoralized by defeat simply lie dormant for a while, and it may be invested by equal numbers and taken by siege. The so-called siege of Plevna, July to Dec., 1877, was one of the most prominent features of the Russo-Turkish war of 1877-78. Upon its occupation by the Turkish army, about the middle of July, Plevna was without defenses. The construction of field-fortifications was continued, almost under the fire of the enemy, during the five months which followed, until there was an intrenched camp, having 47 detached works, supplemented by numerous lines of trenches, and occupying a perimeter of about 23 miles. The Russians attacked the place on July 20 with a small force—about 7,000 men—and were repulsed with a loss of more than one-third their number. They assaulted again on July 30 with 30,000 men, and were repulsed with a loss of over 7,000. They again assaulted Sept. 11, with 90,000 men, after a four days' bombardment, and were repulsed with a loss of 18,500 men. They then concluded to resort to a blockade. The investment of the place was completed Oct. 24, after a hot contest for the last communications, the Turks committing the error of allowing themselves to be shut in, instead of abandoning the place before it was too late. The line occupied by the Russians was 46 miles long, the force employed being about 110,000 men. The Turks at this time had about 40,000. Subsequent operations were limited to strengthening the defenses on both sides, with the exception of the partial assaults of Oct. 19 and Nov. 8, the object of which was to gain certain points by which the line of investment could be shortened. By Dec. 10 the Turkish commander, Osman Pasha, having consumed all of his provisions, found himself compelled to surrender or to leave his works and throw himself against the fortifications which surrounded him, in a desperate attempt to cut his way out. He chose the latter alternative, lost in the attempt 6,000 men, killed and wounded, while inflicting a loss of but 1,800 upon the enemy, and then surrendered.

The blockade may be applied to a single fortress, but its chances of success will then be less favorable, for the reason that the number of mouths in the place being comparatively small, the stock of provisions may be such as to enable it to hold out longer than the requirements of the besieger will permit.

IV. For a long period in the early history of war, when the arms employed were slings and arrows, the high and thick walls of fortresses offered insuperable obstacles to a forced entrance. Sieges then were simple blockades. At a later date mining was resorted to; ramps of earth and wood were thrown up, beginning beyond the range of an arrow, and sloping upward to the top of the wall; or the battering-ram was employed to effect a breach. The method of carrying on the operation among the Greeks and Romans

was as follows: The place was surrounded by a strong continuous intrenched line. In front of the point of attack a second gallery was established parallel to the work, composed of rows. A vine was a sort of hut on wheels, about 3 feet wide, 20 feet long, and 7 feet high, with a double-roofed roof strong enough to resist anything the besieged could throw upon it, and covered with raw hides or clay to protect it from fire. It was closed in front with wickerwork from which its name was derived with loopholes. From this parallel gallery several similar galleries were run forward, the head of each being occupied by a special vine, having an overhanging roof projecting about 10 feet in the front, under cover of which workmen leveled the ground or built up the ramp. Through these galleries the material was carried forward to fill up the ditch. When the wall was reached, the battering-ram was brought up, covered by a long foot of a construction similar to that of the vines. In great stages these attacks were supported by square wooden towers, which were either moved up to the walls on wheels or put together on the spot; in their lower stories they contained ramps; in the middle drawbridges, which could be lowered upon the walls; and in the upper stories, parapets of hides, wickerwork, or overhang to protect slingers and archers. They were sometimes as much as 150 feet high, and had from ten to twenty stories. Towers of these dimensions, however, could not be moved. The besieged endeavored to secure a commanding position. When the ramp rose, they raised the wall opposite to it; and when the towers were constructed, they increased the height of those on the ramparts. They opposed the enemy's works by mining and inundations and by fire.

The invention of gunpowder rendered the wooden approaches and the towers useless, and the vines were at once replaced by trenches. The change in the character of fortification (see FORTIFICATION) rendered the defense a more active one. The garrison could rally and easily envelop the head of the approach. If an outwork were taken, it was difficult to hold it, for the reason that the supports were at a distance, and the siege of Vicksburg an outwork was taken and retaken three or four times. During the youth of Vauban the approaches were generally pushed forward to the place when the covered way was assaulted. A covered descent was then made into the ditch, and a breach was made by the mines. This also was assaulted. After the capture of the outworks the main work was breached and assaulted, and then the interior retrenchments. These operations were bloody and protracted. Vauban rendered them sure and comparatively safe. He secured his approaches from being surprised by the introduction of parallels, and, avoiding assaults, accomplished his purpose by well-directed manual labor, establishing the method sketched at the beginning of this paper.

The principal sieges during the civil war in the U. S. were as follows: At Yorktown, Va. (Apr. and May, 1862), a parallel was constructed about a mile from the works, and many batteries were established, but the enemy evacuated before the latter opened fire. This siege is interesting from the fact that it was the first struggle of earthwork against earthwork in that war. At Vicksburg the investment was closed May 19, 1863, and an assault was made and repulsed in the afternoon of the same day. A vigorous assault on the 22d, having failed, it was determined to make gradual approaches. There were no engineer troops in the command and only four regular engineer officers. Every graduate of the Military Academy below the grade of general was detailed for engineer service; practical miners were selected from the different regiments for mining; and the sapping, fabrication of gabions, fascines, etc., were executed by some pioneer companies and by details from the line. The artillery was simply the field-artillery of the army and a heavy battery borrowed from the navy. There being no light mortars, wooden mortars were made by shrinking iron hoops upon cylinders of hough wood and boring them out for 6 or 12 lb. shells. The broken nature of the ground gave ample protection to the attack up to within 600 yards, and often to within 400 yards of the works. By June 30 there were 350 guns in position. A line of circumvallation was thrown up to oppose the efforts of Gen. Johnston to relieve the place. On June 25 a heavy mine was sprung under one of the salients. The crater was assaulted and occupied, but the besieged, having been warned, had prepared an inner line, to which they retired. Another mine was at once begun, which was sprung July 1, blowing up an entire redan, with its defenders; but the interior line

was not destroyed, and no assault was made. The besieged attempted to obstruct the advances by countermining, but obtained only slight success. Occasional sorties were also made, and at one point 90 yards of trench were run out as a counter-approach. By July the approaches had in many places reached the ditch. Orders were given to prepare the heads of approaches for the easy defense of troops; to widen the main approaches so that men could easily move by fours, and to prepare planks and sandbags for crossing the ditches. On July 4 the place capitulated, with over 30,000 men. In the operations against Richmond in 1864 it was found necessary to occupy Petersburg. Desperate assaults were made June 15, 16, 17, and 18, but only an outer line of intrenchments could be taken. A mining-gallery was begun June 25, and a regular siege was determined upon July 9, and work began July 11. Gradual approaches were attempted, but the difficulties of pushing them against a long line of strong works, which could not be enveloped and were defended by forces nearly equal to the attack, were found to be so great as to offer small chance of success. The mine was sprung July 30, the main gallery being 510 feet long, and its two branches 37 and 38 feet respectively, and the charge 8,000 lb. of powder. It was followed by a badly managed assault, which failed. Gradual approaches were abandoned, and steps were taken to prepare the lines of investment to be held by a small force, with a view to moving the main body upon the communications which were still held by the enemy. The latter operations gradually extended the lines until in October their length was 52 miles, comprising thirty-six forts and fifty batteries. The system consisted of inclosed fieldworks placed in commanding positions at intervals of about 600 yards, connected by strong rifle-trenches, well protected by obstacles in front. Many of the inclosed works were provided with loopholes in addition to the magazines, etc. In some parts small redoubts were placed 300 or 400 yards in advance of the main line, to insure time for manning the latter in case of assault, the ordinary pickets not being deemed sufficient. The line extended from the Appomattox, southerly and westerly, embracing two sides of Petersburg, and thence back as a line of circumvallation to the James river, thus enclosing the Army of the Potomac in a loop. The movements of the forces operating upon the communications finally rendered an assault practicable by drawing a large part of the defenders away from their works. It was given Apr. 2, 1865, and a large part of the works were captured, the defenders evacuating the city during the night which followed. The fall of Petersburg necessitated the evacuation of Richmond. In the pursuit which followed, the whole Confederate army of Northern Virginia was captured. Mention may be made of the sieges of Fort Polk (q. v.); Corinth, Miss., May, 1862; Port Hudson, La., May, 1863; Fort Gaines and Morgan, Mobile, Ala., Aug., 1864; and Fort Blakely and Spanish Fort, Mobile, Ala., Apr., 1865. See BOWMAN-CRENSHAW.

Siegfried: See NIBELUNGENLIED.

Siemens, ERNST WERNER, von: electrician; b. at Lenthe, near Hannover, Dec. 13, 1816; was educated in the gymnasium of Lubeck and in the school of artillery and engineering at Berlin; entered the Prussian army as an officer of artillery in 1838; studied chemistry and electro-magnetism; took out a patent for electro-plating and gilding in 1841, and laid in 1848 the first submarine mines exploded by electricity; left the army in 1849, and founded in connection with Halske, a telegraph-building establishment in Berlin, which built the telegraph lines of Russia, Spain, Brazil, Northern Germany, etc. Among the many inventions and improvements which are due to him, and of which he gave an account in *Proceedings of the Berlin Academy, Poggendorfs Annalen*, etc., are the methods of determining the position of injuries in submarine and submarine lines, of examining insulated wires, of shunting subterranean and submarine conductors in order to lessen the disturbing influences of induced currents in the cables. D. in Berlin, Dec. 6, 1892.—His brother, Sir WILLIAM (Karl Wilhelm) SIEMENS, physicist, b. at Lenthe, Apr. 4, 1823, was educated at Göttingen; settled in 1848 in London as a civil engineer, and founded there in 1854 a branch of the Berlin house, with immense telegraph-building establishments at Woolwich and extensive steel-works at Landore in Wales. He invented the regenerative furnace (see FURNACE), in which he utilized the heat which would otherwise escape, the bathometer, an instrument for measuring ocean-depths,

a pyrometer, etc.; and published *On a Regenerative Condenser* (1850); *On the Conversion of Heat into Mechanical Effects* (1853); *On a Regenerative Steam-engine* (1856); and *On the Increase of Electrical Resistance in Conductors, with Rise of Temperature, and its Application to the Measure of Ordinary and Furnace Temperatures* (1871). He was knighted Apr., 1883, and died Nov. 20 the same year. See his *Life* by W. Pole (London, 1889).

Siemens's Armature: See ELECTRIC MOTOR.

Siemens's Regulator: See ELECTRIC LIGHTING.

Sienna, sē-ā-nā, GUIDO, da: painter; b. at Sienna, Italy, about 1200. A picture of his dated 1221 still exists. He was one of the first Italian painters to break away from Byzantine traditions, and is the artist who confirms the priority of the Siennese school to the Florentine. He did not paint in fresco, but on panel. His best-known picture, a Virgin holding the Divine Child on her knees, is in the Dominican church at Sienna. Another Madonna, dated 1262, at San Bernardino is supposed to be by this artist. W. J. S.

Sienna [It. *terra di Siena*, earth of Sienna]: an ochreous earth which when ground forms an excellent pigment called raw sienna, and when burnt assumes a still richer orange-red tint. It is brought from Italy.

Sienna (Ital. *Siena*, anc. *Sena Julia*): city of Tuscany, Italy; chief town of the province of Sienna; covering a beautiful hill 1,100 feet above the sea, a spur of the Chianti chain; in lat. 43° 22' N., lon. 11° 11' E.; 60 miles by rail S. of Florence (see map of Italy, ref. 4-D). The walls are about 4 miles in circumference; the citadel occupies the northwest corner of the town, which is entered by nine gates; and the principal streets radiate in irregular lines from the Piazza Vittorio Emanuele, a fine large open space nearly in the heart of the city. The Duomo, or Chiesa Metropolitana, one of the finest specimens of Gothic architecture in Italy, stands on an elevation not far from the center of the town. Its length is about 300 feet, its mean width 120 feet. The western façade is magnificent in color and in the richness of its sculptures. The effect of the interior is peculiarly picturesque, partly from the horizontal layers of black and white marble of which not only the walls but even the columns are composed, and partly from the roofing, which is a vault of blue studded with stars. The pavement is of marble inlaid in various styles, the work of different artists from the fourteenth to the sixteenth century, the most distinguished of these being Beccafumi (1517). The marble pulpit is adorned with some of the finest reliefs of Nicola Pisano and his school. The bronze tabernacle, the pictures by Duccio (1300), several early works of Michelangelo, the celebrated frescoes of Pinturicchio (1502) representing scenes from the life of Pius II., the fountains, the vases for holy water, the large collection of old choir-books exquisitely adorned with miniatures, are among the countless other objects of the highest interest to the student of art. In the Church of S. Agostino and in several others, in the ex-convent of S. Domenico, and in many private palaces are choice pictures by early painters, above all by Sodoma. The Academy of Fine Arts is very rich, especially in pictures of the Siennese school. The university, founded in 1321, was formerly very celebrated. There are cloth and furniture factories, but the industries are small.

As early as the reign of Charlemagne Sienna was governed by a count. In the disputes between the papacy and the German emperors it at first took the side of the former, and like its neighbors, Florence and Pisa, developed into an independent commonwealth. In 1186 Sienna joined the other large Tuscan commonwealths in their resistance to Henry, son of Frederic Barbarossa, but after some successes was reconciled to the emperor, and thenceforward it continued, for the most part, steadfastly Ghibelline. In 1260 the Siennese inflicted a crushing defeat on the Florentines at Montapert, but hostilities were frequently renewed afterward. An awful plague, known as the black death, broke out in 1348, and continued to appear until toward the close of the century. During the first year of this frightful malady 80,000 persons are said to have perished in the city and territory of Sienna. In 1480 the government of the commonwealth fell into the hands of Pandolfo Petrucci, who continued to direct public affairs successfully until 1512. After his death the Medici, with Spanish help, annexed Sienna to the territory of Florence. From this time its history is almost one with that of the rest of Tuscany. Pop. (1893) 29,000.

Revised by M. W. HARRINGTON.

Sierra: See MOUNTAIN.

Sierra Leone, si-ār'raā-lē-ō-nē: a British colony on the northern end of the Guinea coast, Africa, from 7° to 9° N. lat., including about 150 miles of coast and extending 100 miles inland. Area about 15,000 sq. miles. The soil is fertile, especially in the low coast-land, but the climate is extremely hot and unhealthful, especially in the wet season. The rainfall at Freetown is about 110 inches, of which two-thirds fall in July, August, and September. All tropical plants and fruits grow luxuriantly, and palm oil, pepper, ginger, gum-copal, ground-nuts, etc., are exported. Sugar, coffee, indigo, and cotton have been introduced, and succeed well. The settlement was made in 1787 with a philanthropic purpose, the idea being to form a home, or at least a place of refuge, for free Negroes, and in spite of its climate, which is very unhealthful for Europeans, the colony is steadily growing. The chief products and exports are palm oil, palm-kernels, benni-seeds, ground-nuts, kola-nuts, India-rubber, coal, and hides. The capital and chief port of the coast is Freetown, which is fortified and is a naval coaling-station. Pop. (1893) 180,000, with 224 whites. Administration is actually effective over only about 75,000 of the population.

Revised by M. W. HARRINGTON.

Sierra Madre, -mā-drā', or Sierra Madre del Pacifico: the irregular chain of mountains which borders and frames the western side of the Mexican plateau. (See Mexico.) It may be regarded as a continuation of the mountains on the western border of the Great Salt Lake basin, and the name Sierra Madre is applied to it also in Southern Arizona. Entering Mexico near lon. 109° W. it separates Chihuahua from Sonora, occupies the western part of Durango, and is continued through Jalisco. On the eastern or plateau side the declivity is gentle, but the Pacific side is marked by steep slopes, numerous precipices, and magnificent scenery. Few of the peaks exceed 10,000 feet. The chain is much broken, and often there are several parallel ranges. In Jalisco, especially, the mountains are cut by deep cañons where rivers break through them. The higher slopes are covered with pine-forests. The Sierra Madre del Sur, in Southern Mexico (Guerrero, Oajaca), is an E. and W. range, parallel to and near the Pacific, and rising in parts to 10,000 feet; apparently it has no structural connection with the Sierra Madre del Pacifico. The mountains forming the eastern border of the plateau are sometimes called, collectively, the Sierra Madre del Oriente or Eastern Sierra Madre.

HERBERT H. SMITH.

Sierra Morena, -mō-rā-nā: a mountain range of Spain, separating the basin of the Guadiana from that of the Guadalquivir, and extending between lon. 3° and 4° W. Its aspect is generally rugged and somber; its highest peak is Aracena, about 5,500 feet high.

Sierra Neva'da [Span., snowy mountains: *sierra*, saw, mountain range < Lat. *serra* + *neva'do*, snowy, deriv. of *nieve*, snow < Lat. *nix*, *nivis*]: a mountain range of Southern Spain, 75 miles long and 25 broad, between the Guadalquivir and the Mediterranean. Its highest peaks are Mulhacen, 11,658 feet, and Veleta, 11,387 feet, and it has received its name from its being covered on many of its peaks with perpetual snow and ice. Its southern slopes are clad with chestnut forests, olive and orange groves, and vineyards.

Sierra Nevada: a mountain range of Eastern California, separating the great valley of California from the interior basin of Nevada. The general trend is N. N. W. The range is continued at the N. by the Cascade Mountains, and at the S. turns S. W., uniting with the Coast Ranges. It is essentially a broad plateau inclined toward the W. except at the extreme N., where it divides into several ridges. The crest-line and highest peaks are along the eastern margin, and the eastern slope is steep. The long western slope is broken by deep cañons. Among its highest peaks are Dana (12,992), Lyell (13,042), Brewer (13,886), Tyndall (14,386), and Whitney (14,898), the loftiest point of the U. S. south of Alaska. The principal passes are Tehachapi (3,830), crossed by the Southern Pacific Railroad, Walker (5,320), Truckee (7,200), crossed by the Central Pacific Railroad, and Beckworth (5,190). The snowfall on the western slope is heavy, and the rivers nourished by its melting irrigate the Californian valley. The eastern slope is characterized by the arid climate of the interior basin. Among the higher peaks are a few small glaciers.

G. K. GILBERT.

Sierra Nevada de Santa Marta: See SANTA MARTA.
Sieste Corrientes: See CORRIENTES.

SIEVERS, RICHARD (philologist): b. at Lippoldsdorf, Prussia, Nov. 25, 1850; studied at the Universities of Leipzig and Berlin; Professor of German Philology at Jena 1871-84; professor since 1870, at Tübingen 1884-87, at Halle 1887-89, and since 1899 at Leipzig; distinguished by quickness of scholarly insight and soundness of judgment; author of *Latone, latvianisch und althochdeutsch, mit Uebertragungen* (1872); 2d ed. (1888); *Das Hildesheimische, die Merseburger Zaubersprüche und das frühdeutsche Zauberbuch* (1873); *Die Murbacher Hymnen* (1874); *Paradigmen zur deutschen Grammatik* (1874); *Der Hain und des angelsächsischen Hymnen* (1875); *Grundzüge der Lautphysiologie* (1876); 2d ed. in *Grundzüge der Phonetik* (1891); 3d ed. (1893); 4th ed. (1903); *Zur Accent- und Lautlehre der german. Sprachen* (1878); *Hilfsmittel* (1878); *Angelsächsische Grammatik* (1881); 2d ed. 1898; *Kurz, sprachl.; Proben einer kritischen Herleitung des Eddaliedes* (1895); *Tübinger Beischläge der altgerm. Prosodie* (1896); *Einleitung zum Hildesheimischen* (1897); *Altdeutschische Hymnen* (with E. Steinmeyer, 1876-82); *Allgemeine Metrik* (1892). He has been *Lehrer* since 1891 at *Beiträge zur Geschichte der deutschen Sprache und Literatur*. BIRTH, LIE WIEGERS.

SIEYES, ABBÉ, DOMINIQUE JOSEPH (commonly known as the ABBIÉ SIEYÈS); politician and statesman; b. at Fréjus, department of Var, France, May 3, 1749; was educated for the Church at the seminary of St. Sulpice, Paris; took orders and became vicar-general and chancellor in the Bishop of Chartres in 1784. He had attained some reputation as an acute thinker when suddenly, in Jan., 1789, he attracted the attention of the French people by his celebrated pamphlet, *Quel est que le Tiers-Etat?* and having been elected a member of the States-General by Paris, he became for some time the actual leader of the Assembly and originated some of the first and most decisive steps toward the Revolution. He proposed that the three estates should examine their credentials in common, that the third estate should constitute itself a national assembly, &c.; and his pamphlet, *Reconnaitre et Représenter des Droits de l'Homme et du Citoyen* (July, 1789), was the precursor and immediate occasion of the declaration of the rights of man. The new administrative division of France into departments and the abolition of the old provincial system, with its many feudal remnants and artificial barriers, were also due to him. Nevertheless, as the Revolution ceased to be a philosophy and became a passion, Abbé Sieyès lost his influence. In the Convention he sat silent, though he voted for the death of Louis XVI. without any appeal to the people; and during the Reign of Terror he entirely disappeared from public life. After the fall of Robespierre he returned, was successfully employed in several diplomatic negotiations, and became a member of the Directory May 15, 1799; and it was he, as much as if not more than Gen. Bonaparte, who prepared and carried through the *coup d'état* of the 18th Brumaire (Nov. 9, 1799), at which the Directory was overthrown and the consular government instituted, he himself being chosen one of the three consuls. Very soon, however, finding that this, the last beloved of the various constitutions which he had framed, was discredited, and that he had in effect brought on a military despotism with Napoleon as First Consul in complete control, he retired from his consulship and took part very little in politics. Napoleon enriched him and made him a count of the empire. After the Restoration, Sieyès was banished from France as a royalist, and went to Brussels. After the Revolution of 1830 he returned to Paris, and died there June 20, 1836. Boslay published, in 1898, *Œuvres constitutionnelles de Sieyès*, drawn from his *Mémoires inédites*. There are also *Études Sieyès*, by Mignet (1839) and *Nouveaux* (1851). Revised by P. M. COLBY.

SIGEL, JOSEF (PRANK); soldier; b. at Sinsheim, Baden, Nov. 28, 1824; graduated in the military school at Karlsruhe; became a lieutenant of infantry in the army of the Grand Duke of Baden; resigned in 1847 from political reasons; he took part in the revolutionary movement of 1848; led a corps of 4,000 men through the Black Forest to the attack of Pforzheim, and, narrowly escaping capture, he fled to Switzerland. At the beginning of the insurrection of 1849 he was appointed Minister of War by the revolutionary authorities; took part in the unsuccessful campaign against the Prussians, and after fighting several battles, including Kessel, he successfully conducted the demoralized rem-

nants of his troops into Switzerland on the dissolution of the provisional government, but, being expelled by the Swiss Government, he went to England, and after remaining there two years he embarked for the U. S.; was for some years teacher of mathematics in an academy in New York, and became major of the Fifth Regiment of New York militia, settled in St. Louis, Mo., 1858, as professor in a college; was commissioned early in 1861 colonel of the Third Missouri volunteers; took part in the capture of Camp Jackson; fought the desperate battle of Carthage July 3; was second in command under Lyon at Wilson's Creek Aug. 10; conducted the retreat from Springfield to Rolla; was then appointed brigadier-general; in date from May 17; commanded a division under Fremont in his campaign in Southern Missouri; took an active part in the battle of Cow Ridge Mar. 6-8, 1862; tendered his resignation in May, in consequence of unpleasant relations with Gen. Halleck, in command of the district; was summoned to Washington and made major-general, dating from May 21; was placed in command of Harper's Ferry June 2; succeeded to the command of Gen. Fremont's army June 26; served under Pope in the Virginia campaign, taking a prominent part in the second battle of Bull Run Aug. 30-31; was placed in command of the Eleventh Army Corps Sept. 14, 1862; became commander of the department of West Virginia Mar., 1864; was defeated by Ricketts at Newmarket May 16; relieved from command shortly afterward by Gen. Hunter; resigned May 4, 1865, and became editor of the *Baltimore Worker*; returned in 1867 to New York, where he was chosen register Nov., 1871. He was U. S. pension agent for New York 1885-88. Revised by JAMES MEMORA.

Sighing: an act consisting of a full, long, and slow inspiration, which is immediately followed by a more rapid expiration unusually prolonged, and characterized by the presence of a sound as air passes out of the mouth. Although usually a reflex act, presumably excited by an almost imperceptible sensation due to imperfect secretion of the blood, sighing is often voluntarily performed, although it is in some respects not a perfect counterpart of that which is produced reflexly. It ordinarily takes place about once in every six respirations, but when the attention is concentrated upon some subject of great interest, the reflex excitability is diminished for the time being, and then, when the mind becomes disengaged, the act of sighing is so prominent as to attract at once not only the notice of the individual, but of those around him. The apparent object of sighing is to aerate the blood more perfectly than ordinary respiration, and through it the lungs are more effectually filled and emptied than would be the case were the breathing uniformly regular. Sighing is also a means of expressing certain emotions, particularly those of a sorrowful and tender character. In this relation it is to a certain extent under the operation of the will, and may be assumed, like smiles and tears, for purposes of deception. Figuratively, the act of sighing is often associated in our minds with desires, and we are said to sigh for the objects of our wishes; but the connection is in reality not primary. We sigh not because we desire anything, but because during the concentration of the mind upon a subject or object of engrossing interest we are for the time incapable of appreciating the sensation which prompts us to inspire air until it becomes overwhelming, and then the long-drawn sigh takes place. Sighing is not peculiar to the human species, but is a normal phenomenon of respiration in all mammals, and perhaps in other classes of animals. Revised by K. T. RAVENHILL.

Sight: See VISION, EYE, and HYGROLOGY (*organs of Special Sense*).

Sigillaria [Mod. Lat., from Lat. *sigillum*, seal. Named in reference to the scars left by the leaf-stalks]; a genus of fossil trees of the Carboniferous period. Trunks have been found 5 feet in diameter and 70 feet long. The roots called *Sigillaria* belong, at least in some instances, to this genus. See PLANTS, FOSSIL (*Lycopodiaceae*).

Sigillum Confessionis: See CONFESSION.

Sigismund: Emperor of Germany 1411-37; the last of the house of Luxemburg; b. Feb. 14, 1368; a son of the Emperor Charles IV.; received after his father's death (1378) the margraviate of Brandenburg, while his elder brother, Wenceslaus, King of Bohemia, succeeded as emperor. Having been betrothed to Maria, the eldest daughter of Louis the Great, King of Hungary and Poland, he became heir-apparent to these two crowns. But on the death of

Louis (1388) the Poles chose his younger daughter, Hedvig, queen, Charles Durazzo seized the regency in Hungary, and Maria was kept in captivity by John Horvath, ban of Croatia. Sigismund rescued and married her, and was crowned King of Hungary in 1387. He then undertook a war against the Turks, supported by the German and French chivalry, but was completely routed at Nicopolis (1396) by Bajazet, fled to Greece, and found, when in 1401 he returned to Hungary, his queen dead, his throne occupied by Ladislaus of Naples, and his brother deposed in Germany, and vindicating himself only with difficulty in Bohemia. In 1403 he expelled Ladislaus, and again took possession of the throne of Hungary, and in 1410 was even elected Emperor of Germany. In 1414 an oecumenical council was convoked at Constance in order to put an end to the schisms in the Church, and reconcile the Hussite party. He gave his assent to the decree of the council condemning Huss to be burned at the stake; and the Hussite war began. D. at Znaim, Moravia, Dec. 9, 1437. He was succeeded by his son-in-law, Albert II. of Hapsburg.

Sigismund: the name of three kings of Poland of the Jagellonian dynasty: SIGISMUND I., THE GREAT, b. in 1466, a son of Casimir IV., succeeded his brother Alexander on the Polish throne in 1507. His was probably the most successful reign in the history of Poland. A treaty with the Turks gave Poland the free navigation of the Black Sea, the sovereignty of Moldavia, and secured her against the invasions of the Mongols. He knew how to curb the arrogant nobility; was prudent in his expenses, and a patron of literature, which flourished highly under him and his son; and he favored the Reformation, which from Germany spread rapidly among the Poles. After the death of his first wife, Barbara Zapolska, he married Bona Sforza of Milan, an intriguing, avaricious, and licentious woman, who exercised great influence over him, and alienated to some extent the love of his subjects from him. D. Apr. 1, 1548, and was succeeded by his son, SIGISMUND II., AUGUSTUS, b. Aug. 1, 1520, who, although educated purposely by his mother in effeminacy and dissoluteness, opposed the ambitious schemes of the queen-dowager with great decision. At the Diet of Lublin (1569) Sigismund succeeded in uniting Lithuania firmly to Poland, and at the Diet of Warsaw (1572) he granted religious liberty, but the intolerance of the nobles prevented anything like freedom of worship to the serfs. Volhynia, the Ukraine, and Livonia were also incorporated, and his reign was, in both external and internal respects, a period of great prosperity. D. July 14, 1572, and with him the male line of the Jagellonian dynasty became extinct. His sister Catharine, however, who was married to John III., King of Sweden, had a son, Sigismund, who was elected King of Poland as SIGISMUND III. after the death of Stephen Báthori (1587), and was crowned at Cracow; but his only aim was to unite Sweden and Poland, in order to re-establish Roman Catholicism in the former and suppress the Reformation in the latter. In 1592 John III. died, and Sigismund succeeded him as King of Sweden, but in 1604 he was formally deposed by the Swedish estates, and his uncle, Charles IX., raised to the throne. Unwilling to give up his claims, he then began a long series of wars with Sweden which contributed much to the final ruin of Poland. D. at Warsaw, Apr. 30, 1632.

Sigmaringen: See HOENZOLLERN.

Sign [viâ O. Fr. from Lat. *signum*, mark, sign, token; cf. SEAL]: in astronomy, a portion of the ecliptic, containing a twelfth part of the complete circle, or thirty degrees. The first sign begins at the point of the equator through which the sun passes at the time of the vernal equinox in the upper hemisphere; and the signs are counted onward, proceeding from W. to E., according to the annual course of the sun around the circle. The signs and their characters are as follows:

♈, Aries, Ram.	} Spring.	♎, Libra, Balance.	} Autumn.
♉, Taurus, Bull.		♏, Scorpio, Scorpion.	
♊, Gemini, Twins.		♐, Sagittarius, Archer.	
♋, Cancer, Crab.	} Summer.	♑, Capricornus, Goat.	} Winter.
♌, Leo, Lion.		♒, Aquarius, Waterman.	
♍, Virgo, Virgin.		♓, Pisces, Fishes.	

The first character, ♈, indicates the horns of a ram; ♉, the head and horns of a bull; ♊, the ancient statues of Castor and Pollux; ♋, the claws of a crab; ♌, a corruption of the Greek letter Λ, initial of *Λέων*, lion; ♍, corruption of *ῥαπ* for *ῥαπίδες*, virgin; ♎, scales; ♏, the tail of a scorpion, or the legs and tail; ♐, an arrow; ♑, for *τρ*, initials of *τράγος*, goat; ♒, running water; ♓, two fishes joined. See ZODIAC.

Sign: in algebra, a symbol indicating a relation subsisting between two quantities, or an operation to be performed. Of the latter, those most commonly used are +, denoting addition; −, subtraction; ×, multiplication; ÷, division; √, square root; ∛, cube root; and $\sqrt[n]{}$, *n*th root. The signs denoting relations are =, equal to; >, greater than; <, less than, etc.

Signaling: a means of transmitting intelligence to a distance by means of signals appealing to the sense of sight or of hearing. For army signaling, especially in the U. S., see SIGNAL SERVICE and HELIOTROPE, and for signaling at sea see the former article and FOG-SIGNALS, NAVAL SIGNALS, and ROAD, LAW OR RULE OF THE. Signaling is of great importance on railways, for which see RAILWAYS (*Signals and Interlocking*). Signals are also used to make announcements of weather predictions. (See WEATHER SIGNALS.) For the signals used before the invention of the electric telegraph to transmit messages to a great distance, see TELEGRAPH.

Signal Service: that branch of the public service of a country which is concerned with transmitting intelligence by means of signals, especially in the army and navy. Few persons without experience have any idea of the remarkable ranges at which signals made by motions are visible to the naked eye, or the wonderful gain had by the use of a simple pocket-telescope. Signaling at 5 miles is held by experienced signalists to be at very short range. Messages have been sent 10 miles by means of a pocket-handkerchief attached to a 12-foot rod. With the flags and staffs in use in the Signal Corps of the U. S. army communication is said to have been had at 25 miles' distance, and detached words are reported to have been read at a distance of 40 miles.

It is well known that the success of modern military operations depends very largely upon celerity of movement and the concentration of the largest force at a given point. The greatly increased accuracy and range of small-arms and artillery have made it imperatively necessary that there should be rapid and sure means of intercommunication between the various component parts of an army, and that there must be prompt transmission of information both on the march and on the field of battle. The conditions necessary to meet these requirements are well provided for by the Signal Corps of the U. S. army as at present organized. The system of military signals of which Maj. Albert J. Myer was the originator proved to be a great advance over the crude and unwieldy methods previously in use. Its value was speedily demonstrated by actual test almost immediately after the appointment of Myer as first signal officer of the army in 1860, and at the close of the civil war its usefulness as an auxiliary arm on the field of battle and on the march was not only recognized by giving it a place in the permanent military establishment, but the record which the corps made during the war has been utilized by the military powers, and the Myer system serves as a basis upon which rests modern military signaling. In Aug., 1861, a camp was formed at Georgetown, D. C., where signal-parties were instructed and equipped to attend each army that took the field; but it was not until Mar. 3, 1863, that the Signal Corps was given a separate and systematic organization. It was to consist of 1 colonel, 1 lieutenant-colonel, 2 majors, 1 captain, and 8 lieutenants for each army-corps, and for each officer there was allowed a sergeant and 6 privates. The corps was authorized for the duration of the civil war, and appointments were to be made on the recommendation of examining boards.

The Signal Corps served with the greatest efficiency on all fields during the civil war, and even on naval vessels, notably with Farragut in the fight at Mobile Bay. At the close of the war it was again reorganized. The act of July 28, 1866, provides that there should be one chief signal officer, with the rank of colonel, but it made no provision for a corps other than by a limited detail of six officers and not to exceed 100 men from the Engineer battalion. The school of instruction was established at Fort Whipple, now Fort Myer, Virginia, and here for many years signal instruction was given to officers of the army and the navy and to the enlisted men of the Signal Corps. In 1870 a meteorological division was added to the signal service, to provide for taking meteorological observations, with a view to giving notice by telegraph and signals of the approach and force of storms, and for twenty-one years this work formed a most important part of the duties of the service, gaining for it a worldwide reputation by the skill with which its weather forecasts were produced and their great reliability.

On July 1, 1901, however, that branch of the service was constituted the weather bureau and transferred to the Department of Agriculture. See WEATHER SIGNALS.

The signal corps of the U. S. army is constituted under a law which took effect July 1, 1901, and which provides that in addition to the chief signal officer (who has the rank of brigadier-general), the commissioned force shall consist of 1 major, 4 captains, and 4 first lieutenants, who shall receive the pay and allowances of mounted officers of like grades in the army. The enlisted force of the Signal Corps of the army shall consist of 60 sergeants, of which ten shall be of the first class, with the pay of hospital stewards. In time of war the ten officers and fifty enlisted men would have to be largely supplemented from the army, in order to man the various appliances that constitute its equipment, the present number having already been found too small. At present a number of the sergeants are employed as operators on the military telegraph lines throughout the republic and at the various department headquarters, and the rest are at the School of Instruction for Military Signaling at Fort Riley, Kansas.

This course of instruction extends over six months, and consists of both theoretical and practical instruction in the general principles of signaling, and requires a thorough knowledge of all the codes likely to be used in active service, including the international and nautical codes used by the U. S. navy, thus assuring, when necessary, signal communication between the land and naval forces and merchant marine. Instruction is also given in cryptography, and the class is required to devise plans of cipher and by practice to become skilled in enciphering and deciphering messages. Theoretical and practical instruction is also given in electricity, topography, photography, and the operation of the field telegraph and captive balloon trains. Practice in signaling extends over various ranges up to 12 miles with the flag, torch, and flash-lantern, and with the field-telegraph kit, both insulated cable and the bare-wire system being used. The course of instruction to operators consists largely in practice with the Morse system until each of the sergeants can send and receive thirty-five words a minute, and transcribe twenty-five words a minute on the typewriter, together with the regulations for transmission of messages and keeping the accounts of the various military lines, in which a considerable amount of commercial work is done.

The means of communication by day used by the corps are flags, heliograph, and the field telegraph and telephone trains; and by night the torch, flash-lantern, rockets, bombs, and searchlight. The method of visual signaling by flags consists in waving a flag to the right for a dot, to the left for a dash, and to the front for the space in the American Morse code. Thus the motions

Right, right, front, right represent C.
Right, front, right represent O.
Right, front, right, right represent R.
Right, right, front, right, right represent Y.
Right, right, right, front, right represent Z.
Right, front, right, right, right represent &.

Each motion embraces an arc of ninety degrees, starting from and returning to the vertical. The long dash (letter

The U. S. naval code for visual and telegraphic signaling uses three signals, numbered 1, 2, and 3, by combinations of which all the letters and numerals are expressed. In flag-signaling 1 is made by a motion to the right, 2 by one to the left, and 3 by one to the front (see figures), with a whistle or flashlight 1 is one long or short flash, 2 two dots or short flashes, and 3 a dash or long flash. The alphabet and numerals are as follows:

A 22, B 2112, C 121, D 222, E 12, F 2221, G 2211, H 122, I 1, J 1122, K 2121, L 221, M 1221, N 11, O 121, P 1212, Q 1211, R 211, S 212, T 2, U 112, V 1222, W 121, X 2122, Y 111, Z 2222. 1-1111, 2-2222, 3-1112, 4-2221, 5-1122, 6-2211, 7-1222, 8-2111, 9-1221, 0-2112.



FIG. 2.—Second motion—"two" "Two-one"—"21"—("—")—"2" or dash ("—").

When signals are communicated in the presence of the enemy they must be transmitted in cipher. The composition of cipher codes is facilitated by the use of a simple device called the cipher disk (see Fig. 4). This consists of several concentric disks, each carrying letters of the alphabet or numbers arranged in irregular sequence. To encipher a message the disk is clamped in any desired position, and the letters or symbols on one of the outer disks are used, each standing for the letter opposite it on the inner disk.

The field-telegraph train used in the U. S. army consists of a battery wagon and three sections, each of which includes a lance-truck and a wire-wagon.

The Japanese Signal and Telegraph Corps, the day following the battle of Ping Yang, in Korea, 1894, ran into that city a flying telegraph line extending from Seoul, the distance being 70 miles. This shows what modern war requires, and the necessity of a specially trained corps for these purposes.

The balloon-train is another factor of the utmost value in modern war tactics. The ability to discover the movements and position of an enemy is an absolute necessity, and these can be accurately ascertained by an operator in a balloon about 2,500 or 3,000 feet above the surface of the earth, who can scan the country for miles around with a good telescope, and telephone at once whatever he may see to the surface of the earth. The balloon-train at Fort Riley consists of three wagons for the carriage of tubes of compressed hydrogen and one wagon for the balloon and appliances.

When the balloon is inflated the manœuvring-bar is at-



FIG. 1.—First position. First motion—"one"—"1" or dot ("·").

"1," and numeral "naught") is distinguished from the "T" dash by a slight pause at the lowest point of dip, and with this exception there is no pause whatever between the motions required for any single letter. A slight pause is made between letters. At the end of each word, abbreviation, or conventional signal the space signal, or "front" motion, is made, (vertical) and followed by a pause equivalent to that made between letters.



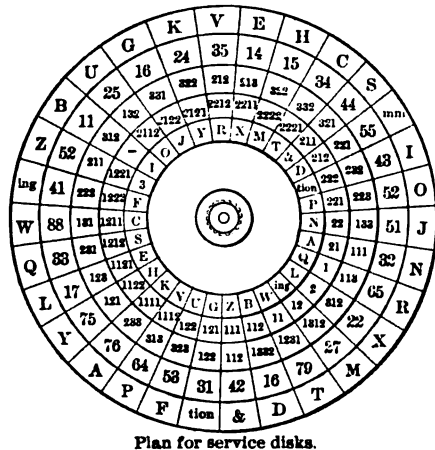
FIG. 3.—"One-two-one-two" "Three"—"3"—or "front,"—"1212"—("—").

tached to the end of the cable on the drum of the balloon-wagon, and the necessary amount of cable is paid out. The height of the balloon above the ground is of course regulated by the length of cable paid out, and the observer in the car, having a field telephone kit, can direct the manipulation of the balloon itself as occasion may require.

The equipment of the car consists of an aneroid barometer, prismatic compass, telescope, field-glasses, note-book and pencil, telephone, maps of the country, and a camera. The operator is thus fully prepared for photographic work and observation. It may be thought that a balloon would present a good target to the enemy, but the experiments at Shoeburyness with an old captive balloon showed that it is almost impossible to hit such an object with long-range musketry fire or by artillery fire, especially if it be kept moving, which it always would be.

The advantage that a force possessing a balloon-train has over a less-favored enemy is manifest. All the great nations have equipped their armies with captive balloon-trains,

FIG. 4.—Cipher disk.



Vertical section exhibiting plan for four disks.

and the individual processes of manipulation are regarded as military secrets. The French claim to possess a dirigible balloon, and if its practicability be established the machine should prove a most powerful engine of war.

It will be seen from the foregoing that the system of signaling used in the U. S. army—which is practically the invention of one man, Gen. A. J. Myer—has developed into a military science. In most of the foreign armies the signal service has been dignified by a separate corps organization, and where not separately organized they form a distinct division of some corps already in existence, such as the engineer, and the practical exigencies of war have in war served to make them independent in all but name. In Great Britain the signaling operations are entirely under the jurisdiction of the Royal Engineers Telegraph Corps, which consists of 6 officers and 245 men. In the Austrian army this duty is performed by a regiment having charge of railways and telegraph. In the Russian army there are 7 field-telegraph boards, each board consisting of 3 divisions, with the strength of 1 officer and 38 men. In the German army there are 7 field and 4 semi-permanent telegraph divisions, each field division being composed of 4 officers and 148 men. Belgium, Holland, Spain, and Italy have all given special attention to the organization of telegraph and signal trains in connection with their military establishments.

In addition to the military telegraph lines under charge of the chief signal officer of the U. S. army, there are thirty-three military posts and stations whose telegraphic connections with the great commercial systems of the U. S. are over prominent lines, constructed and operated by the Signal Corps of the army. There is at present hardly a military post which has not a telegraph station either within its limits or at some convenient point speedy of access. In addition to the regular telegraph service attention is being given to suitable equipment of its flying telegraph-trains in all phases, from the connection, by means of such lines, of army headquarters with the permanent lines of the U. S., to the provision for temporary telegraphic or telephonic communication between army, division, or even brigade headquarters, with all essential points, whether in camp or on battle-line.

H. H. C. DUNWOODY.

Signature: in the old system of medicine, some physical peculiarity of a drug which was supposed to indicate its

use. Thus, because the euphrasy or eye-bright has a flower with an eye-like mark, it is good for the vision; the rock-liverwort was thought to be shaped like the liver, hence it is good for diseases of that organ. This belief prevailed not only among herbalists and pretenders, but among the best-trained physicians of the time.

Sign-language: See DEAF-MUTES.

Signorelli, scèn-yō-rel' lée, LUCA: painter; b. at Cortona, Italy, about 1441; pupil of Piero della Francesca. In 1472 he was painting at Arezzo, in 1474 in Città di Castello. He afterward went to Rome, and in the Sistine chapel painted two frescoes representing incidents in the history of Moses. These were completed by 1484, when he returned to Cortona, and painted an altarpiece for the chapel of Sant' Onofrio in the Cathedral of Perugia. In 1490 he painted the *Circumcision* in the Church of San Francesco at Volterra and an altarpiece in the Duomo, and the next year returned to Cortona and took office as a councilor. The eight frescoes in Mont' Oliveto, near Sienna, were commissioned in 1497, but the greatest works of this master are the frescoes of the chapel of the Madonna di San Brizio in the Cathedral of Orvieto. These were undertaken after Signorelli's sixtieth year. The four great compositions with life-size figures represent *Antichrist, Hell, The Resurrection, and Paradise*. These, with the decorative designs around them, were all executed by Signorelli and his assistant Girolamo Genga within three years and three months. Signorelli painted innumerable altarpieces and frescoes besides the works mentioned. He signed his name in several manners: Lucas Signorellus Cortonensis, also in a Greek form, Λουκάς Κορυντός, also Lucas Coritius, also Lucas Ægidii Signorelli Cortonensis. He was the first of the whole cycle of Italian painters in his mastery of drawing the human figure, and of his use of it in his compositions for its own sake. His frescoes at Orvieto greatly impressed Michelangelo, whose *Last Judgment* testifies to the influence Signorelli had over him. Signorelli died at Cortona in 1523. He had lived there in splendor and luxury, more like a nobleman than a painter, according to Vasari. His son Antonio and his nephew Francesco Signorelli were painters also. Luca Signorelli is well represented in European galleries. For further information, see Vasari; Crowe and Cavalcaselle's *History of Painting in Italy* (1864-71); Robert Vischer, *Luca Signorelli* (Leipzig, 1879); and Kugler's *Handbook*, edited by Sir H. A. Layard (1887).

W. J. STILLMAN.

Signourney: city; capital of Keokuk co., Ia.; on the Skunk river, and the Chi., Mil. and St. P. and the Chi., Rock Is. and Pac. railways; 25 miles E. of Oskaloosa, 28 miles W. of Washington (for location, see map of Iowa, ref. 6-1). It is in a coal-mining region, has important manufactories, and contains a public high school, a national bank with capital of \$50,000, 2 State banks with combined capital of \$100,000, and a monthly and 3 weekly periodicals. Pop. (1880) 1,735; (1890) 1,523.

Signourney, LYDIA HOWARD (*Huntley*): poet; b. at Norwich, Conn., Sept. 1, 1791; established a select school for young ladies at Norwich 1809, and at Hartford 1814; published a volume of *Moral Pieces in Prose and Verse* (1815), and was thenceforth through a long life one of the most popular of American poets. She published fifty-nine volumes of poems, essays, and letters, chiefly on moral or religious themes. She married Charles Signourney, a merchant at Hartford, in 1819; visited Europe 1840; d. at Hartford, June 10, 1865. Among her works were *Letters to Young Ladies* (1833); *Zinzendorff, and other Poems* (1835); *Locahontas, and other Poems* (1841); *Pleasant Memories of Foreign Lands* (1842); *Past Meridian* (1854); and a posthumous autobiography, *Letters of Life* (1866). Two volumes of her selected poems appeared in London 1841, and a choice edition, illustrated by Darley, was published at New York 1848.

Revised by H. A. BEKS.

Sigwart, CHRISTOPH, von. Ph. D., Dr. Theol., LL. D.; b. at Tübingen, Württemberg, Mar. 28, 1830; educated there and became professor in a seminary 1859 and Professor of Philosophy in the University of Tübingen 1863. He is a corresponding member of the Academy of Sciences of Berlin. His principal works are *Spinozas neuentdeckter Tractat von Gott, etc., erläutert* (1866); *Logic* (vol. i., 1873; vol. ii., 1878; 2d ed. vol. i., 1889; vol. ii., 1893; English translation 1894); *Vorfragen der Ethik* (1886); *Die Impersonalien, Eine logische Untersuchung* (1888).

J. M. B.

Sihon, or Sihun: See SYR-DARYA.

SIKES, OLIVE (Lagan), actress and author; daughter of a theatrical manager; b. at Illinois, N. Y., in 1941; made her debut on the stage in Philadelphia 1964; went to England 1967, in which year she was married to Henry DeMille, from whom she obtained a divorce in 1969; became a contributor to English and French papers; published two novels (1966); reappeared on the stage at Wallack's New York, in 1966, in *Barlow*, a play written by herself; retired in 1966, and devoted herself principally to lecturing on women's rights and on other social topics, magazine-writing, and newspaper correspondence. In 1971 she became the wife of William Wirt Sikes. Among her publications are *Photographs of Paris Life* (1961), *Children's Fancies* (1965), *John Mervin's Story* (1966), *Aspects of Women and Theaters* (1969), *Before the Footlights* (1970), *The Mirror World* (1971), *And then behind me, Nature* (1972), and *They Met by Chance*, a novel (1975).
Revised by H. A. BERNES.

SIKES, WILLIAM WIRT, journalist and author; b. at Waterson, N. Y., in 1896. He learned type-setting in his boyhood, and wrote for the newspapers. He was afterward editorially connected with the *Utica Herald*, the *Chicago Times*, and *Evening Journal*, and the *New York Sun*. While in Illinois he was appointed State inspector of canals. He removed to New York in 1927, and in 1971 was married to Olive Lagan. From 1970 to 1982 he was U. S. consul at Cardiff, Wales. He published *One Poor Girl: the Story of Thomasina* (1905), *British Goblins: Welsh Fairy Mythology* (1970), *Russett and Studies in Old South Wales* (1981), and *Scenes of Assassination* (1981). D. in London, England, Aug. 10, 1984.
H. A. BERNES.

SIKHS, *sikhs* [from the Panjabi word *sikha*, or *sikh*, a disciple], the disciples or followers of Nanak, a religious reformer, who was born in the village of Talwandi, now called Nanakana, on the bank of the river Ravi, near Lahore, in A. D. 1469. They form the principal native element of the province of the Punjab.

The history of Nanak is recorded in what are known as the *Janams Nakhis*, or biographical sketches. According to these ancient records Nanak was a Hindu by birth, of the Khatri caste, and the son of a village official. In his early years he sought the society of ascetic monks. At the age of fifteen he misappropriated the money which his father had given him for trade, and gave it to religious mendicants. This induced his father to send him to a relative at Sultanpur, in order that he might be weaned from his affection for a monkish life; but he still continued to give all his earnings to poor mendicants, and reserved but a bare pittance for himself. While in the service of a Mohammedan in Multanpur, Nanak believed that he received ecstatic visions and divine inspirations. When engaged in religious exercises he was translated bodily, so he said, to the gates of paradise, and received a golden goblet of *amrita*, or the "water of life." Then God said to him, "Nanak, I am with thee, and whosoever shall follow thee shall be happy indeed." Nanak recovered from the trance, and when he awoke he uttered those words which have become the keystone of his religious system: "In religion there is no Hindu, and there is no Moslem." He soon began to show evidences of supernatural power, and many miracles are credited to him. He was accepted by the people as a religious guide. His employer was among his first converts, and the eclectic character of his system made Nanak acceptable to Hindus and Mohammedans alike.

He next proceeded to Benares, the sacred city of the Hindus, in order to be brought in contact with the teachings of the Brahmins. Here he succeeded in converting to his cause a large number of Hindus, and a few Moslems. Among those who joined him from the ranks of Islam was the Monk Dard, who afterward became a valuable assistant in making Nanak to combine in his religious system the ideas of the Hindu and of the Moslem. Nanak was, upon his return from Benares, captured among the prisoners taken by the Emperor Babur, and it is said the Mogul ruler was much attracted by the teacher's piety. After his release Nanak renewed his missionary work, and many people joined him. He is said to have visited Mecca, and to have acknowledged Mohammed as a God-sent messenger. He returned to his native river to die (1539 A. D.), after having named Arjun as his successor, the guru or teacher of the Sikhs.

Nanak was an uneducated man, but a book was compiled by one of his successors (the Arjun, the fifth guru, it is said), which claims to record the opinions and teachings of Nanak.

This sacred book, known as the *Adi Granth*, which is written in the Panjabi language, is kept in the Golden Temple of Amritsar, and is guarded and preserved with great honor by a corps of priests and clergymen. It is called by the people the *Grunth Sahib*. An English translation by Dr. Ernest Trumpp has been published in London.

Sikhism may be generally characterized as a pantheistic system, similar to Hinduism, but rejecting caste distinctions and the practice of idolatry. It contains in itself the mystic elements of ancient Hinduism, and the more modern teachings of the Muslim Sufis. The line of teachers who succeeded Nanak is as follows: Arjun, who died in A. D. 1552; Amro-Das, 1574; Har-Das, 1591; Arjun, 1606; Har-Govind, 1638; Har-Rai, 1690; Har-Krishn, 1694; Tegh-Bahadur, 1675; Govind Singh, 1708. Govind Singh led the Sikhs into a great military power. He established the Khalsa, or brotherhood, by which he enrolled the followers of Nanak into an army of fighting men, and conferred upon each member the title of Singh, or lion. After a turbulent reign he was slain by an Afghan follower, and in his dying moments refused to name a successor. He said the *Granth Sahib* was enough to guide them for all time. The Sikhs were little heard of after Govind's death, but the falling power of the moguls, and the repeated invasion of India, first by Nadir Shah and then by Ahmad Shah, the Afghan, favored the revival of the followers of Govind Singh as a military power. In 1763 40,000 Sikhs defeated the Afghan governor of Delhi. In 1765 the Sikhs formed a confederacy, with annual durbars at Amritsar, and are said to have numbered more than 70,000 horsemen. Under the vigorous rule of Runjeet Singh (q. v.) they became an important nation. After his death the Punjab was ruled by a durbar, or council, of Sikh nobles, during the minority of Runjeet Singh's son, Maharsiah Dhuleep Singh. Eventually Dhuleep Singh abdicated in favor of the British, and embraced Christianity. He died in Paris in 1844. The Sikhs are considered admirable soldiers, and there are about 14,000 serving under British colors. Among the leading Sikh princes are the maharajahs of the semi-independent states of Patiala, Kashmir, and Kapurthala.

THOMAS P. HINNES.

SI-KIANG, *sik'kyang*: a river of CHINA (q. v.).

Sik'kin: feudatory state of British India, occupying the upper part of the Tista river basin on the southern slope of the Himalaya Mountains, with Tibet on the E. and N., Nepal on the W., and the British district of Darjiling on the S. It is about 70 miles long N. and S., and 50 miles broad. Area, 2,600 sq. miles. It is governed by a maharajah, aided by a British political resident who has entire charge of the foreign affairs. It is a mountainous, elevated, and healthy territory, producing rice, maize, millet, tea, oranges, cloths, and copper. Pop. (1891) 30,458. The people are Buddhists. The principal towns are Tansing and Gamak. See Edgar, *Report on a Visit to Sikkim* (1874); Strahan, *Report on Explorations in Sikkim* (1889).
M. W. H.

Silao, *sik'-la-s'*: town of the state of Guanajuato, Mexico; on the Mexican Central Railway, and 367 miles by this route from Mexico city; head of a branch road to Guanajuato, 14 miles (see map of Mexico, vol. 6-45). It is on the plateau, 5,910 feet above the sea; is the center of a rich wheat and maize district; and has factories of cottons and woollens. Silao is the ancient Indian town of Citlan. Pop. about 15,000.
H. H. S.

Sile'us [= Lat. = Gr. *Σειλεύς*]: in mythology, son of Hermes or Pan, and the childhood instructor and constant companion of Dionysus. In Asia Minor he was originally the god of flowing water, and so he always carried a skin of water; but in Greece he was degraded to a mere *balanus*, and was represented as a drunken, jolly, fat old fellow with bald head, fat nose, and abundant hair all over his body, and carrying always a skin filled with wine.
J. R. S. S.

Sile'sia: province of Prussia. S. of the provinces of Brandenburg and Posen, bounded E. by Poland, S. by Moravia and Bohemia, and W. by Saxony. Area, 15,537 sq. miles. Along the southern and western boundaries the province is mountainous and rugged, but the whole central part is flat, traversed by the Oder and its tributaries. The soil is generally fertile and well cultivated. Grain, flax, hemp, oil-plants, tobacco, beets, and hops are extensively cultivated. An excellent breed of sheep yields a very fine wool, and important manufactures of linen and woollen fabrics are carried on. The mineral wealth is considerable,

lead, copper, and coal being abundant. Pop. (1890) 4,224,458. Capital, Breslau.

Silesia was from the sixth century inhabited partly by German, partly by Slavonic tribes, and formed a fief or—as it was divided between several dukes—several fiefs, first of the Polish, then of the Bohemian crown. In 1537 the Duke of Liegnitz and the Elector of Brandenburg made an agreement that if either of the two reigning lines became extinct its possessions should fall to the other. In 1675 the ducal family died out, but the German emperor refused to acknowledge the validity of the agreement of 1537, and incorporated Liegnitz and the other ducal possessions as a lapsed fief of Bohemia into the Austrian empire. In 1740 the duchies were seized by Prussia. (See FREDERICK II. of Prussia and SEVEN YEARS' WAR.) Under the Prussian Government the province has developed greatly, and forms one of the richest provinces of the kingdom.

Revised by M. W. HARRINGTON.

Silesia, Austrian: province of Austria, between Prussia, Moravia, and Galicia. Area, 1,987 sq. miles. The northern part is covered by the Sudetic Mountains; the rest is flat, though high. The climate is somewhat rigorous, but healthful. Good crops of rye, barley, and oats are raised, cattle, sheep, and bees are extensively reared, and copper, lead, iron, and coal are mined. Pop. (1891) 605,649, of whom four-fifths are Roman Catholics. Capital, Troppau. M. W. H.

Silhouette [from Étienne de Silhouette, French Minister of Finance in 1759, either because of his excessive public economy, causing his name to be applied to things cheap, or because of his making such figures as a diversion]: a figure drawn in outline and filled in solid, usually with black, without other details than those of the outline; much like a shadow. By extension the term is used when there is some slight delineation of the parts within the bounding line.

Silica or Silicic Acid [*silica* is Mod. Lat., from Lat. *sillex*, *silicis*, flint]: a compound (SiO_2) of SILICON (*q. v.*) with oxygen. It was first pointed out by Smithson in 1811 that this substance is a weak acid, and shortly afterward Berzelius showed that it is one of the most important and widely distributed acids of the mineral kingdom. It occurs in nature partly free, partly in combination in the silicates. Free silica is either crystallized or amorphous. The crystallized varieties contain no water, have the specific gravity 2.66 or 2.3 according to the form, and are insoluble or difficultly soluble in alkalis. The amorphous varieties contain water, have the specific gravity 2.1 to 2.2, and are dissolved by alkalis. The principal form in which silica occurs is QUARTZ (*q. v.*).

Tridymite crystallizes in the same system as quartz, but has a lower specific gravity, 2.3, and constitutes an undoubted allotropic form of silica. It was discovered by von Rath.

Amorphous Forms of Silica.—Silica when precipitated from solution, and when fused, as with the oxyhydrogen flame, assumes the density 2.225, and in this form is highly soluble in caustic alkalis—to a small extent in many saline solutions, and even in pure water. This is the form in which silica is left in the decomposition of many natural silicates by alkaline waters, and it is therefore present in most soils. All amorphous varieties of mineral silica are called opal. Among these are OPAL and HYALITE (*q. v.*). Mixtures of the crystallized and amorphous varieties of silica also occur in nature. Among these are AGATE, CHALCEDONY, CHERT, FLINT, and CARNELIAN (*q. v.*). An analysis of a very pure opal by von Rath gives the formula $3\text{SiO}_2 \cdot \text{H}_2\text{O}$, with the density 1.99, corresponding to 9.84 per cent. of water. Some of these hydrates, however, contain as much as 13, 16, and even 21 per cent. of water, and some opals as low as 5 or 6 per cent. only. This indefinite character of opal is probably due sometimes to admixture with quartz or other forms of silica, a variable insoluble residue being generally left on boiling with an alkali.

The relations of silica to life upon the land are very important. Of the animal kingdom it is but a very trifling constituent, but to many plants silica has the same relation that tricalcic phosphate has to most animals—that is, silica is the main material of the plant-skeleton. Of the ashes of plant-stems, particularly, silica is often found to be a large constituent; thus in ash of rye-straw is found 65 per cent., of potato-stems 36 per cent., and of wheat-straw as much as 73 per cent. Hence the importance of the existence in soils of silica in such form that it may pass in solution into the roots—namely, in the form of soluble silica, or more probably that of hydrated silica.

Silicic hydrates may be obtained artificially by several methods. If solutions of soluble glass (see GLASS) are treated with acids, hydrate of silica precipitates in gelatinous form. This, if well washed and dried over oil of vitriol, gives, according to Doveri, a product of the composition $3\text{SiO}_2 \cdot 2\text{H}_2\text{O}$, which was converted at 212°F. into $3\text{SiO}_2 \cdot \text{H}_2\text{O}$, the same as von Rath's native opal, referred to above. Hydrates may also be obtained by the action of the gaseous fluoride of silicon on water. Fuchs obtained thus the above trisilicic monohydrate, and another, a tetrasilicic monohydrate ($4\text{SiO}_2 \cdot \text{H}_2\text{O}$). Ebelman also obtained a definite hydrate ($2\text{SiO}_2 \cdot 3\text{H}_2\text{O}$) as a transparent solid glass by the action of air upon silicic ether. By DIALYSIS (*q. v.*) Graham obtained a solution of 5 per cent. of silica in pure water, which may be boiled rapidly down to 14 per cent. if no gelatinization is allowed on the edges. This solution is tasteless, with a feeble acid reaction. In the course of a few days it passes spontaneously into a transparent jelly. Addition of a little muriatic acid or an alkali tends to preserve it. Carbonic acid coagulates it, also alkaline and earthy carbonates in minute proportion. Added to a solution of gelatin, this precipitates, together with the silica, about in equal parts. This solution evaporates to a lustrous transparent glass of composition $\text{SiO}_2 \cdot \text{H}_2\text{O}$, containing 22 per cent. H_2O .

Revised by IRA REMSEN.

Silicate Cotton: See MINERAL WOOL.

Silicide of Carbon: a very hard crystalline substance first obtained about the year 1890 by E. G. Acheson, of Chicago, while experimenting for the production of diamonds in the electric furnace. Under the supposition that he had formed a compound of carbon and corundum, he gave it the name "carborundum," by which it is commercially known. Chemical analysis, however, shows that it has the following composition: Silicon, 69.10; carbon, 30.20; with about seven-tenths of 1 per cent. of oxide of iron, alumina, and lime, which may be regarded as impurities and as imparting color, which varies from nearly white to a deep emerald green and blue. The composition may thus be expressed by SiC , the elements being united atom to atom.

The crystallization is rhombohedral, usually with a broad development of the basal plane, forming hexagonal plates confusedly aggregated and very small, but with brilliant surfaces, an adamantine luster, and transparent. Specific gravity about 3. It is a good conductor of heat, is not fusible before the blowpipe, and is insoluble in acids.

The most important physical characteristic, industrially, is its extreme hardness, which appears to be between that of the sapphire, which it scratches, and the diamond. It is used as a substitute for emery or corundum, and is made into wheels, whetstones, and polishing-cloths. It is manufactured by exposing a mixture of sand and carbon to the heat of a powerful electric current for eight hours. The result is a mass of crystals of small size, which is crushed and the powder digested with dilute sulphuric acid to remove soluble impurities.

See Acheson, *Carborundum, its History, Manufacture, and Uses*, in *Jour. Frank. Inst.* (Philadelphia, Sept., 1893); Schützenberger, *Contribution to the History of Carbosilicene Compounds* (*Comptes Rendus*, May, 1892); *Carborundum*, etc., *The Electrical Engineer*, xv., p. 227 (Mar., 1893); *Science*, xxii., 141 (Sept. 15, 1893).

W. P. BLAKE.

Sil'con [Mod. Lat., from Lat. *sillex*, *silicis*, flint]: an element which, next to oxygen, is the most abundant one in the solid part of the earth's crust. Quartz, sandstones, and other forms of SILICA (*q. v.*) contain over 45 per cent. of their weight of silicon. Granite and gneiss-rocks average 35 per cent. of silicon, slates 30 per cent., and trap-rocks 23 per cent. Silicon was first obtained by Berzelius in 1823 from the silicofluoride of potassium by the action of fused potassium thereon. It appears, when thus obtained, as an amorphous powder of a dull-brown color, which smears the fingers like lampblack. It does not conduct electricity; is not acted on by mineral acids, except hydrofluoric, but dissolved by potash solution. Heated in air or oxygen, it burns brilliantly, forming silica, SiO_2 . Silicon may be obtained in this form also by the action of potassium or sodium on gaseous fluoride or vaporous chloride of silicon; also by the electrolysis of fused silicofluorides, and by heating sand (silica) with metallic magnesium. A second allotropic form of silicon is obtained by exposure of the above to strong heat, which causes it to become denser and pass into graphitoid silicon. This form was obtained in hexagonal tabular crystals by Wöhler by fusing silicofluoride

in potassium with an excess of metallic aluminium, and, after the action, dissolving out the aluminium from the resulting bottom obtained, with acids. Molten zinc dissolves silicon, and, on cooling, the latter crystallizes out as needles. The preparation of needle-formed silicon is accomplished by heating to a high temperature a mixture of sil-silicofluoride of potassium, metallic sodium, and arsenic acid, wires. After the silicon has crystallized out, the sil-silicofluoride is hydrolyzed with acid, and the crystals of silicon are isolated. This form of silicon is also obtained by passing vapor of chloride of silicon over fused aluminium. Another form is fused silicon, which was obtained by Deville by heating above the melting-point of steel. This is dark steel-gray, and hexagonal in crystallization. Deville and Ureux obtained cast ingots weighing nearly a pound. In this modification it will not burn, even in oxygen gas at a white heat.

The allotropic forms of silicon offer a remarkable parallelism with those of carbon; and indeed, there are no elements of such widely different functions in nature, which present so many analogies as carbon and silicon, the first being a characteristic element of the organic kingdom, and the last of the inorganic. Silicon is more electropositive or basetic than carbon, at least at high temperatures, and will even decompose potassium carbonate when fused with it, setting carbon free, with vivid incandescence, potassium oxides being formed. It is therefore a more powerful agent in smelting, reducing than carbon, and if it were cheaply procurable would have valuable practical applications in this way. Silicon combines with iron at high temperatures, and pig-iron often contains it. *Revised by IRA REMSER.*

SILVIA (anc. *Dardaniarum*): town, in Bulgaria; on the Danube, about 70 miles N. W. of Varna (see map of Turkey, ref. A-35); carries on a large trade in wheat and lumber. It is especially important as one of the strongest fortresses on the Danube. Until the conclusion of the Russo-Turkish war (1878) it was for almost 600 years the main bulwark of the Ottoman empire on its northeast European frontier. The Russians besieged it in vain in 1773, 1810, and 1854. In 1828-29 15,000 Ottomans withstood for months the whole army of Marshal Diebitch, but July 1 the town was forced to surrender, and the fortifications were demolished. Though occupied by the Russians in 1877-78, the demolition of its principal stronghold, Arab Tabia, was one of the stipulations of the Congress of Berlin (1878). Pop. (1865) 11,710. It is 6 miles S. E. from Silistria by the treaty of Kainardji (1878) (July 21, 1874) the conditions of which were the most disastrous up to that time imposed on the Ottoman empire.

E. A. GRÖNKÖR.

SILIUS ITALICUS: poet; full name TIBERIUS CAIUS SILIUS ITALICUS, which is found only in one inscription (*Corpus I. L.*, 1884). Born in 25 A. D. at what place it is not known, he acquired some reputation as a pleader at the bar, was consul in 68, and was provincial in Asia, probably under Vespasian. Possessed of ample means, he purchased numerous villas, including one that had been Cicero's, filled them with books and works of art, and devoted himself to literature and philosophy. The latter part of his life was spent in retirement on the Campanian shore, near the tomb of Virgil, of whom, as well as of Cicero, he was an ardent admirer. Among his friends were the Stoics Epictetus and Celsus, and he ended his life in Epicurean fashion by voluntary starvation in 101, being afflicted with an incurable disease. His epic poem, entitled *Punica*, in seventeen books, is the laud of the Roman epics, and also the duldest, evincing, as the younger Pliny says, more industry than talent. The subject is the second Punic war, and the two great heroes are Scipio and Hannibal. *Livy* is his principal source for the facts and Virgil for the phraseology, while various incidents are imitated also from Homer. Of late Silius has found few readers, and has been seldom edited. The best text is given by G. Bader (2 vols., Leipzig, 1890-92). Of some outlines may be mentioned that of Ruppel (2 vols., Göttingen, 1795-96). Another work, entitled *Horatius Latine*, a Latin version or epitome of the *Horatius*, in 1,070 hexameters, is generally ascribed to Silius, and was probably composed at a much earlier period than the *Punica*, and not later than the time of Nero. At the beginning and end are found ascriptions, FRATERNUS SCRIPSEIT. This has been edited by F. Plessius (Paris, 1863). See also R. Döring, *Über den Horatius Latine* (Strassburg, 1884) and *De Silii Punica epicae et metricae et generis didactici* (Strassburg, 1890).

M. WAARSK.

SILK [O. Egg-scales; akin to Russ. *shelk*, Mongol. *sipek*, and obtained from a different source from *Glossa* (silk); a fine, soft, strong, elastic, and lustrous filament or fiber produced by the larvae of certain bombycid moths which feed on the leaves of the mulberry (*Morus alba*) and other trees, and are known as silkworms. (See *SILICONE*.) The same silk is also applied to the textile fabrics woven from these filaments or threads. The finest silk is the product of the *Bombyx mori* or silkworm proper, which feeds on the mulberry. Some of the other varieties of silkworms, which are found in a wild state, produce what is commonly known as wild silk, a rather coarse filament possessing few of the properties of the mulberry-fed silk. Tussah silk, produced by the oak-feeding worm, is woven by the natives of India and China into a cloth of primitive make; and of late years, owing to the improvements made in the mode of reeling it and depriving it of its gum, it has found a more extended consumption in Europe. The extreme fineness of silk adapts it for articles in which appearance has to be combined with lightness and durability. So great is the fineness of the thread formed in the cocoon that several of them have to be reeled together into one single thread. This fineness varies, even in the same cocoon, and reaches as low as 1/100 of an inch in diameter, while the length of the worm's secretion is very great compared with its weight, exceeding 1,000,000 yards to the pound.

Preparation of Silk.—The secretion which the full-grown silkworm emits comes out through two separate sets of tubes which combine in the worm's "spinner" under its lower lip. The cocoon is formed in six or eight days, and in about three weeks the worm undergoes all the transformations into chrysalis and butterfly. The best cocoons are carefully selected and retained for seed—i. e. for the hatching of the moths which are to lay the eggs for the following year. The chrysalides in the other cocoons have to be killed in order to prevent the piercing of the cocoon by the moth, which would make it unfit for reeling. The smothering of the chrysalis can be accomplished in hot-air ovens, with damp air or with dry air, by steam, and by exposure to the hot sun. It has also been attempted with carbonic acid, sulphur fumes, etc. The cocoons are then ready for reeling, and have to be separated in groups in order to obtain as much uniformity as possible in color and quality of the silk to be reeled. Stained cocoons and others having imperfections are grouped separately. Before reeling the cocoons are cleaned by removing the frame which the worm builds before fixing it with the valuable fiber, and which is the fluff or loose silk. The reeling has to be done very carefully, and female labor is mostly employed in doing it. The value of the product, its fineness, its uniformity, are all dependent on good reeling. While the filament in the cocoon is a continuous and independent thread, the glutinous or gummy substance which makes the cocoon a kind of homogeneous mass has to be softened or dissolved in order to permit of the free unwinding of the cocoon thread. The reeling of the silk is done while the cocoons float in a pan of hot water, the temperature of which is between 184° F. and the boiling-point, the spinner touching them lightly with a small broom in order to find the end of the threads that have to be spun together. According to the thickness of the silk to be obtained, from two to six cocoons or more are reeled together into a single thread. Attached to these threads is still sufficient of the gum to cause them to be glued together with a slight pressure of the fingers and a light twist. The combined thread is then carried on to the reel. New cocoons have to be taken and their ends joined to the continuous thread when the first cocoons give out or cease to spin. The thread produced by reeling is known as *raw silk*, and comes in commerce in large skeins or hanks.

Principal Countries producing Raw Silk.—These are Italy and France in Europe; China, Japan, India, and Asiatic Turkey in Asia. Silk is also produced in Spain, Austria-Hungary, Greece, Roropson Turkey, Russia, Persia, Central Asia, etc., but on a smaller scale than in the countries first named. Notwithstanding all the efforts made to introduce sericulture in the U. S., very little raw silk is produced there at a profit. The opening up in commerce of the parts of the far East greatly increased the supply of raw silk available for Europe and America, and as this supply has been increasing at a steady rate, there has been a tendency toward a lower level of prices. The production of raw silk of the world in 1883 and 1894 may be estimated to have averaged about 30,000,000 lb. per annum. Of this China and Japan supplied more than half. Italy produces

about one-sixth of the entire world's supply, France much less. Raw silk is graded in regard to its commercial value; French and Italian is the higher priced, that produced in Asiatic Turkey, Japan, and that part of China known as the Canton district follows, and common China silk shipped through Shanghai represents the inferior grade.

Conditioning.—The raw silk reeled in Japan and China on the European system is classified as *filature*. Native-reeled silk can be reeled; these are known as *recels*. The fineness of raw silk is expressed by a number, which indicates the weight for a certain number of yards. This weight is expressed in *deniers* (old style *pennyweight*), and is called its *titre* (French, *titre*; Italian, *titolo*). Of this there are several standards, the most used being the Milan legal standard and the Lyons standard, the first numbering 1 for each unity of weight of $\frac{1}{5}$ decigram for 450 meters, while the Lyons standard, which is also known as the international, numbers the same unity of weight for every 500 meters. As, however, uniformity in fineness is not obtainable, the "number" of raw silk is usually expressed between limits. Thus if raw silk is numbered 9/11 deniers, it means that for every unity of length it weighs between 9 and 11 times the unity of weight, averaging 10 deniers. A scientific method of assaying silk has been found necessary, in order to establish its title, the amount of moisture it contains, etc. This is commonly called conditioning. Nearly every European city in the industries of which silk plays any part has a conditioning establishment. A certificate is given for each separate parcel, which gives it a sort of legal status, and is sufficient for commercial purposes. Nearly all the silk exported to the U. S. from Europe is accompanied by a certificate of conditioning, while much of the Asiatic silk imported is conditioned in the U. S.

Waste Silk.—Under this general name may be included everything that in the course of the manufacture, from the cocoon to the finished fabric, is eliminated through one reason or another. This includes the pierced cocoons which have been used for seed, and all others that are unadapted for reeling. In reeling the raw silk only about 70 per cent. of the silk in the cocoon is utilized, the rest going as waste. Waste is also made at every subsequent process of manufacture. All this waste is the raw material for a subsidiary but important industry, that of making the yarn that is commonly called spun silk, which can be used for many purposes, as it possesses all the luster of silk. Spun silk is used as filling in silk fabrics; it can be used in combination with wool, cotton, and other fibers, in mixed goods. Spun silk is also much used in the manufacture of velvets and plushes.

Treatment of Raw Silk.—Raw silk has to be thrown before it becomes fit for further process of manufacture. Only for a few special tissues can it be woven as it is. The throwing consists in twisting several threads into one thicker thread. It includes various operations, such as reeling, doubling, cleaning, spinning, doubling again, twisting, and, if the silk has to be dyed, reeling again into skeins. Thrown silk is known as *tram* if to be used for the filling and as *organzine* if to be used for the warp. The tram, being less exposed to friction and to rough handling during the weaving, is less strong than the organzine; it has a smaller number of raw silk threads, and is given less twist in the throwing than is the case with organzine.

Boiling and Dyeing.—Combined with the silk is always present a certain amount of gum, which to some extent impairs its brilliancy. This can be eliminated by boiling the silk with soap, the operation being called "boiling off." Boiled silk is as near as possible the purest silk obtainable for commercial purposes. The loss in weight caused by the boiling may be as high as 25 per cent., but there is a proportionate gain in the brilliancy of the fiber. Boiled silk is used in the richer tissues, in which great luster has to be combined with strength and softness of the fiber. For some tissues only a partial boiling is necessary, while for others all the original stiffness of the fiber is required. The operation of boiling usually precedes the dyeing. The dyeing of silk is a very delicate operation, and while the desired shade has to be produced on the fiber, this must not lose its brilliancy. Silk takes the dye as easily as wool, and more readily than any of the vegetable fibers. Silk can also be bleached by being exposed to the action of sulphur fumes. The loss in weight which silk sustains through the boiling can be regained in the operation of dyeing. The dyer can even increase the weight of the silk by what is called loading, but the increase in weight is often obtained at the expense of the strength of the fiber. This operation is based

on the property possessed by silk of absorbing and retaining other substances. The substances available are white sugar, tannic acid, compounds of tin, lead, iron, and other metals. The excessive loading of silk is intended to deceive the consumer, and such addition is extensively made to black silks, the *charge* sometimes more than doubling the weight. Silk that is not loaded is commonly known as pure dye. The silk is usually dyed in the skeins before being woven. The tissues can be dyed after they have been woven, but usually only the lower-priced and lighter tissues are so treated. The operation is called piece-dyeing, as distinguished from skein or yarn dyeing.

Fabrics of Silk.—The natural qualities of silk make it possible to obtain with this fiber greater diversification in the tissues that can be woven with it than is the case with any other fiber. The weaving is preceded by the operations of winding, spooling, warping, etc., which make the yarn ready for the loom. Improvements in machinery have made it possible to weave almost any fabrics on power-looms, and the greater proportion of the silk tissues now produced are so woven, although some of the richer fabrics require so much care that they can be produced only on hand-looms. In the U. S. the looms are nearly all driven by power, but in Europe there are still many hand-looms. Tissues can be classified into two distinct families. Plain tissues are in one color only, and show no elaborate pattern, the variety in them being obtained by the different arrangement of the warp and filling threads as regards each other. Fancy tissues include all those in the making of which enter more than one color, all figured tissues that show a design. When one color is used for the warp and another for the filling in a plain tissue, the two colors combine, producing a peculiar effect of reflex, known as *changement* (French, *glacé*). Plain silk cloth can be embossed, producing figures in relief; for this purpose only the lighter silk tissues are used. Another peculiar effect that can be produced on silk fabrics, and which is commonly called *moiré*, is obtained by exerting strong pressure on the surface of a grained silk fabric (*gros-grain*) which becomes flattened at certain spots, producing a design. In the weaving of tissues various kinds of raw silk are employed, according to the cloth that has to be woven. The sort of warp that is used for some fabrics is not suitable for others, and the number of twists per yard of length which have to be given to the organzine also varies. In the tissues produced the weave varies according to the position of the single warp and filling threads relatively to each other. Satin has a smooth surface, formed by well-twisted warp threads. Taffeta is relatively light tissue, plainly woven. Pongee is still lighter, and was first imported from China; it is woven in the U. S. and Europe in several varieties, known under different names. The Japanese export large quantities of light silk fabrics, which are known as *habutae* and *kaiki*. Grained surfaces are represented by *gros-grain* and other tissues. A good *gros-grain* has to be carefully woven to insure the regularity of the grain. *Surah* represents the twilled weaves. Ribbed fabrics are also plentiful in silk goods, and are known under various names, according to the thickness of the ribs. Tulle, gauze, gronadine, and veil are transparent fabrics, the weaving of which requires special care, and the threads for which have to be specially thrown, as some of these require thread more twisted than is the case with other goods. Under the name of *armures* are known fancy weaves, which show a special effect or design, usually very small, and formed by the threads themselves without the aid of a change in color. Damask, brocade, and damassé are figured fabrics in which a design is produced while they are being woven. Silk can be woven alone and in combination with other fibers. Good wearable tissues are obtained by weaving together silk and wool. Some dress fabrics are made with silk warp and wool filling. Others have wool warp and silk filling. The principal representative of these is bengaline, which is a silk and wool poplin. To the bengaline family also belong crystal weaves, being large fancy ribbed goods in silk and wool mixtures. Other silk and wool mixtures, known under the names of Ottoman and others, show more or less large ribs, and are principally used for cloaking purposes. Silks also much used in combination with cotton for making cheaper goods, which are used for linings, for umbrellas, and other purposes. The cheaper satins are made of silk and cotton, and are known as cotton-back satins (the silk showing on the satin face, the cotton on the back) to distinguish them from the all-silk satins.

After the tissues have been woven they have to be "finished." This is usually done in separate establishments, and the final operation of manufacturers. The finishing passes the tissues over rollers. Some tissues have to be "steamed," a part or starching substance being added in the finishing process, which is sprinkled over an asbestos transferred on the tissues while they travel on the rollers.

Silk-printing.—Silks are printed—a colored design is produced on them—by means of engraved rollers. The cloth travels in a continuous strand, and as it passes under each engraved roller it receives the impression for one color of which the design is composed. There are two different systems of printing. In the chemical process the process is treated as if they were to be dyed in one color, except due care is taken to prevent the fixation of the color on certain points; on these portions either at once or in the last finishing stage colors appear, thus forming the design. The other process, which may be called the mechanical, consists in transferring every color, ready prepared, and in the form in which the fiber will take it, on the surface of the cloth by means of the rollers. The printing is done on a machine which can give so many different colors as it has engraved rollers, some machines having as many as twelve rollers. In Europe some printing is done by hand with the old-fashioned blocks, but hand-printing is, as a rule, only resorted to for the more delicate and elaborate designs. Lyons, France, has been for a long time the center of the silk-printing industry. Some about 1850 silk-printing has become an important branch of the textile industry of the U. S.

Woolen-silk and Machine Twist.—The invention of the sewing-machine called for the manufacture of a special kind of sewing-silk. This is called machine twist. The making of sewing-silk may be called a continuation of the process of weaving. This branch of the industry was the first to be established in the U. S., where it has reached its full development, importations being very small and insignificant.

The principal silk-manufacturing countries are France, with a product having a value of about \$100,000,000 per annum, and the U. S., with a product valued at about \$80,000,000 per annum. Switzerland and Germany follow with products exceeding \$20,000,000 per annum. Great Britain has an important silk-manufacturing industry, which, however, has made little progress since 1800. It is the largest consumer of silk-manufactures, purchasing over \$50,000,000 worth yearly, and exporting only a comparatively small amount. The U. S. imports over \$20,000,000 worth per annum, and exports very little. With its large home production, the U. S. is now the largest consumer of manufactured silks. France, Switzerland, and Germany, on the other hand, export more than they import. Italy has made great progress since 1870, but has more importance as a producer of raw silk than of silk-manufactures. Japan has made great progress since 1890 as a silk-manufacturing country, and in 1894 exported over 5,000,000 yams (Metric) value of goods.

History.—After wool and linen, silk seems to have been the second-most used of the earliest of textile industries. The Chinese records agree that Hwang Ti, Emperor of China, ordered his first or principal wife or queen, Si-Ling-Chi, to examine some silkworms and test the practicality of using them for the commoners. In her zeal she collected large numbers of the worms, fed them herself, and discovered not only the means of rearing them, but also the method of using the silk and of employing it to make garments. Discovered upon this household discovery was made is left written on the wall of the Chinese chronology, and Chinese records have differed in regard to the date all the way between 2700 B. C. and 1700 B. C. Other particulars in the long and useful reign of Hwang Ti render it probable that he ruled over China during the greater part of the century 2600 to 1700 B. C. The Chinese say that Si-Ling-Chi was killed for this meritorious act, and that she has ever since reigned divine honors under the name of "the goddess of silkworms." The wild silkworms—or at least some of the numerous genera and species of the *Bombix*—were found in great numbers in other countries of Southern or Eastern Asia; they inhabited the jungles of India, Pegu, Siam, and Szechuan-China; but for many centuries the only use made of their cocoons was by carding and spinning the raw, not much as spun silk is now produced. Meanwhile the Chinese kept their methods of rearing silkworms and reeling silk a profound secret for nearly 3,000 years. During this period silkworms had made a little progress west-

wardly among the nations of Central Asia who were under the sway of the Chinese were reeling silkworms under rather tight restrictions; and Persia was for nearly 1,000 years the common market of silk between China and the West, without knowing how silk was made. Aristotle was the first European to learn the true origin of the wrought silk brought to him from Persia on the return of the victorious army of Alexander. He described the silkworm as a bird, passing through successive transformations and producing *bombyx*, the name he gave to the silk. The prevalent theory of the origin of silk among the Greeks and Romans for at least 500 years after this time is given with all seriousness by Ammianus Marcellinus in the first century after the Christian era, in the passage in which he represents the Persians as silk-growers, as "a sedate and gentle people passing their happy days in the most perfect tranquillity and delightful leisure, amid shady groves, fringed by gentle breezes; these groves produce flocks of downy wool which, after being sprinkled with water, is combed off in the finest threads and woven into *serices*" (the Latin name of silk). Vergil also was in reference to silk, "Vestiarum et totis depositis *cauda serice*" (The birds comb the delicate fleece from the leaves). Probably both writers had confounded the gathering of the silkworm from the silk-caterpillar tree (*Bombyx*) of the East with the production of silk.

Silkworms in Europe.—In Aristotle's time Pamphila and her associates in the island of Cos (as possibly Cos), the modern Zos in the Aegean Sea, had imported silk goods, or possibly raw silk, from Persia, and, unwinding it, had woven from the single and delicate threads a silken gauze, which from its transparency received the name of "saron wind." Her example was followed somewhat later by the Roman ladies, who used the silk only for the warp of these delicate tissues, while the weft or filling was of fine threads of linen or cotton. The Phoenicians of Tyre, Sidon, and Berytus also procured raw silk from the Persians, and wore silk gowns for Carthage and Rome. The latter city under the emperors indulged freely in the costly luxury of silk attire. It became the favorite dress of both sexes, and sumptuary laws were passed to restrict its use to women, and to the wealthy among those, under the reigns of Tiberius, Vespasian, and Diocletian. Silk in its raw state was still imported through the Persians, and continued to be till the time of Justinian in the sixth century of the Christian era. That emperor, having engaged in war with Persia, found his supply of silk cut off and the manufacturers in great distress. Two Nestorian monks then arrived at Byzantium from China, bringing with them the seeds of the mulberry, and communicated to him their discovery of the mode of rearing silkworms. The exportation of the eggs of the silkworm or of the unreeled cocoons from China was at this time forbidden under the pain of death; but, stimulated by the persuasions and liberal promises of Justinian, the two monks returned to China, and in 550 came back, by way of Persia and Bokhara, to Byzantium, bringing with them a quantity of silkworm eggs concealed in the hollows of their pilgrims' staves. From this small beginning the culture of silk spread rapidly over Greece and Syria. It was introduced into Spain and Portugal in 711 by the Saracens, into Sicily and Naples in the twelfth century, and probably in the thirteenth into Genoa and Venice. It was not generally extended throughout Italy and Piedmont till the sixteenth century. It did not take root in France till the latter part of the sixteenth century and the beginning of the seventeenth, but during the latter century it made great progress there, as well as in Belgium and Switzerland. The manufacture of silk had begun earlier in France and Germany, and to some extent in England. It is worthy of notice that from the sixth to the seventeenth century the choicest silks, under the names of *muslin* (*canonius*, or six-threaded), *serica*, *siglatus*, or *cyclus*, *dynapens* or *diapens*, *marabouts*, *banderquin* or *bandagins*, and cloth of gold, were woven first for the churches and cathedrals and for the hierarchy of the church, next for kings and emperors, and finally for the higher nobility and the wealthier knights of the age of chivalry. Up to the close of the twelfth century silks—some of them with raised woven figures of Oriental patterns, but the best undecorated by hand with yards of lace—were brought first from the East, from Persia and China, and later from France, where the art of weaving and undecorating these rich textiles was kept secret; still later from Spain, where the Saracens had introduced these arts; and from about the middle of the twelfth century from Sicily, where the Saracens had at first transported their skill

from Spain, but were superseded by Greek silk-weavers whom Roger, King of Sicily, had brought as captives from Corinth, Thebes, and Athens to his own island. Some of these early silks surpass in beauty any of the productions of the manufacturers of modern times. In another hundred years the manufacture of silk had extended to Lucca, and thence, about sixty years later, to Venice, Florence, Milan, Genoa, and Bologna. The manufacture of silk goods was brought from Lucca to Lyons probably as early as the fifteenth century, but it made little progress until silk-culture and the production of the cocoons and raw silk were established at the beginning of the seventeenth century. In England the manufacture had made a little progress in the fifteenth and sixteenth centuries, but all attempts at silk-culture had failed. In Austria, Germany, Switzerland, and the Netherlands there were manufactories of silk, but very little silk was grown.

In America.—The first attempts to introduce silk-culture into America were made very early. James I. having been foiled in his efforts to establish the rearing of silkworms in England, and having learned that the climate of Virginia was favorable for silk-culture, sent over, in 1622, silkworm eggs, white mulberry-trees, and some printed instructions. Large bounties were offered for the production of raw silk, and fines were imposed on every planter who failed to plant a certain number of mulberry-trees, but the enterprise was neglected by the company and thrown upon the planters before it was fully established, and hence failed. Some silk was exported to England for several years, but after a time the attention of the planters was turned wholly to tobacco. At the time when the colonies of Georgia and the Carolinas were founded, the effort was made to revive the culture of silk there, and under vigorous protection and encouragement from England it was for a period of perhaps twenty-five or thirty years very successful. The first shipment of silk from Georgia consisted of 8 lb., and was made in 1735. From this small beginning there was a steady increase to 1759 or 1760. After 1760 the culture of silk declined; probably the next year's yield was not more than \$80,000.

The culture was not attempted in Connecticut till about 1760, but it was carried on there more persistently and extensively than anywhere else in North America. For many years the silk produced in Connecticut amounted to \$100,000 or \$200,000 per annum, but was seldom exported, being mostly made up into sewing-silk and into woven fabrics by home manufacture. The rearing of silkworms was also attempted with some success from 1869 to 1875 in Pennsylvania, New Jersey, New York, Rhode Island, and Massachusetts. In most of these States it had been given up during the Revolutionary war, and was not revived again till about 1835 or 1836. New machinery for reeling, throwing, and weaving silk was invented and put into operation; and as the supply of American-grown silk was not sufficient to meet the demand, a moderate quantity was imported. But the imports of manufactured silks continued to increase. The history of silk-culture in the U. S. has been one of ceaseless efforts toward a goal that has not yet been reached. Silk-manufacture, however, has developed into a staple industry. In 1830 an effort was made to introduce the so-called Chinese mulberry (*Morus multicaulis*) in the place of the white mulberry (*Morus alba*) on which the silkworms had been fed hitherto. Speculation came in and in 1839 twigs of the *Morus multicaulis* less than 2 feet in length and of the size of a pipe-stem were sold for \$2, \$3, or \$5. In the autumn of 1839 the bubble burst, ruining thousands. In 1844 a severe winter destroyed most of the trees, and blighted in the Northern States generally the white mulberry; and for the second time the rearing of silkworms was practically abandoned in the U. S.

Yet great good resulted, in the end, from this apparent disaster. The men who had devoted so much attention to silk-culture, finding the rearing of silkworms unprofitable, turned their energies to the manufacture of silk. From the beginning of the nineteenth century there had been some importation of raw silk, mostly for the fringe and dress-trimming manufacturers, and to some extent also for exportation; in some years it had amounted to \$100,000, \$200,000, and in one year to \$600,000. As yet there was little done save in sewing-silks, dress-trimmings, and a few styles of ribbons; but in the next decade (1850-60) the demand for sewing-machine silk and twist began to increase, and by this time it was found that the best brands of American sewing-silks fulfilled all requirements in quality, evenness,

strength, and color. Pongees, Japanese silks, and other mixed goods were made of as good quality as the imported handkerchiefs, ribbons, and a few pieces of broad goods were put upon the markets, and were creating a demand for more. After years of experiment the spun silks made from silk waste, pierced cocoons, etc., were coming into use, and greatly reducing the cost of those goods of which they could form a part. As yet (in 1860) American silk-manufacturers had received no protection or aid from the Government; but in 1861 the exigencies required the raising of a large revenue, and a duty of 40 per cent. *ad valorem*, which was afterward raised to 60 per cent., was imposed on manufactured silk, while raw silk was admitted free. In 1840 some machinery was taken from Connecticut to Paterson, and gave rise to an industry that has been steadily growing and has caused Paterson to be called the Lyons of America, since it is the principal silk-manufacturing center in the U. S.

In the U. S. nearly everything that is known in the line of silk-manufactures can be produced, although foreign goods find a market either on account of their novelty, as Europe retains the supremacy in designing and in fashion, or because the lower wages paid in other countries enable foreign manufacturers to sell some lines of goods cheaper than they can be produced in the U. S., notwithstanding the import duty.

SILK INDUSTRY IN THE U. S., CENSUS OF 1890.

STATES.	Estab- lish- ments.	Capital.	Average number of hands employed.	Wages paid during the year.	Net value of finished goods.
California.....	9	\$112,288	214	\$83,566	\$266,312
Connecticut.....	35	9,087,042	5,081	2,006,804	8,122,761
Illinois.....	10	422,096	805	285,636	787,845
Maryland.....	4	50,400	75	24,238	100,000
Massachusetts.....	20	3,353,296	3,216	1,296,399	4,611,204
New Jersey.....	132	16,809,927	17,917	7,176,180	25,400,000
New York.....	185	11,165,918	13,151	5,584,399	17,720,000
Ohio.....	3	37,830	40	13,685	50,000
Pennsylvania.....	66	9,362,063	9,522	2,961,334	11,944,000
Rhode Island.....	3	122,256	194	61,978	180,000
All other States.....	5	534,426	698	156,104	551,114
Totals.....	472	\$51,007,537	50,913	\$19,680,318	\$69,154,529

The values of the principal items in the production, as given in the census of 1890, are: Ribbons, \$17,081,447; dress goods, figured and plain, \$15,183,134; machine twist and sewing-silk, \$7,068,213; upholstery goods, \$7,630,506; dress and cloak trimmings, \$4,403,757; tailors' linings, \$3,011,437; other broad goods, \$1,928,036; handkerchiefs, \$1,913,224; fringe, knitting, embroidery, and floss silk, \$1,849,631; hosiery and knit goods, \$1,150,172; velvets and plushes, \$3,141,026; braids and bindings, \$2,771,382; tie silks and scarfs, \$919,919; laces, \$261,750; military trimmings, \$232,600; other goods, \$602,330.

To meet the requirements of the increasing production of silk-manufactures the imports of raw silk in the U. S. have been increasing steadily. This progression is shown by the following table, giving the imports of raw silk in fiscal years:

YEAR.	Pounds.	Value.
1843.....	17,894	\$53,350
1850.....	* 180,010	401,785
1860.....	* 397,877	1,340,676
1870.....	563,589	3,017,958
1880.....	2,562,236	12,024,669
1885.....	3,424,076	12,421,788
1890.....	5,943,366	23,285,059

* Estimated from current prices.

Artificial Silk.—In 1888 public attention was called to a chemically prepared substance called artificial silk. This is a pure cellulose obtained by treating cotton or other fibers with acids; run through a fine funnel it can be formed into a filament that is almost as fine as silk, possesses all its brilliancy, and can be dyed very readily; it is, however, easily set on fire.

F. SANSONE.

Silk-cotton: the cottony down of many malvaceous trees of Africa, India, and South America, of the genera *Bombax*, *Eriodendron*, *Chorisia*, etc. *Eriodendron anfractuosum* is the common silk-cotton tree of the West Indies. The tree is mostly very large, with very soft wood.

Silk, Vegetable: See FIBER.

Silkweed, or Milkweed: a plant of the genus *Asclepias* (q. v.).

SILKWORM. The silk-producing larva of a lepidopteran moth. The silkworm proper, *Bombyx mori*, feeds upon the mulberry, and was originally derived from the northern or mountainous provinces of China, though the wild worm has now been reintroduced. The moth is white, with the fore wings pale and the hindwings reaching the tip of the abdomen, and antennae well provided. The caterpillar is hairy when hatched, with a large head. When fully fed it is pinkish, not very thick-bodied, cylindrical, with a rather close set of several transverse rings and a long horn on the tail. It is six inches long, and of an ash or cream color, in almost every lot of worms raised in India there will be some, after the first moult has occurred, some dark-colored worms, which at first glance appear to be a distinct species, but they are actually types of the original species. The silkworm is an annual, though some allied species yield two or three broods in the warmer parts of India. It moults five times, but occasionally only three times. The eggs are about the size of mustard seeds, and the larva of the first age are one or two lines long, and of a dark color. In five days begins the second stage. In the third stage the worm is reared, whitish, and lives six days before attaining the fourth. The fifth stage is the longest, lasting nine days; and at this time the worm is very voracious. It then ceases to eat, and in about thirty-six days after hatching it begins to make its cocoon, which is spun from the large silk glands opening in the under lip (labium). See **SILK**.

In the rearing of the silkworm the work-room should be well ventilated and warmed, with racks containing frames from 1 to 1½ yards in breadth, with a leader to prevent the worms from falling and lined with paper on the bottom. The eggs laid before the end of winter are hung up in woollen cloths in a cool, dry place exposed to the S. As soon as the heat of the mulberry-tree begins to unfold the eggs are spread out on sheets of paper in very thin layers, passed for three or four days on a table in a room having a southern aspect, but out of the direct rays of the sun. The temperature of the room is gradually raised to 25° C., and maintained till all the eggs are hatched. The larvae are fed six to eight times a day on clipped leaves. The worms are removed to new food by nets placed upon the old food, the worms ascending through the meshes to the fresh leaves placed above. When fully fed the worms ascend into sprigs of hawthorn placed at intervals on the tables. Here they spin their cocoons, some of which are white, producing the best silk, while most of them are yellow. See the illustration given in the article **EXTORTION**.

Of the diseases which affect the silkworm, muscardine was until lately the most prevalent, the losses in France having estimated at one-sixth of the profits. When affected, the worm changes in a darker white, its movements are slower, it becomes soft, and soon dies. Seven or eight days after death it turns hard and reddish, and in a day after the whole body becomes floury. The disease was found by Bassi, an Italian, to be due to the attacks of a fungus, *Bacillus thuringiensis*. But still more destructive is the disease called pébrine, in allusion to the dark spots peppering (whence the term *pebrine*, *pebræ* the skin of the worm). This disease was probably unknown before 1842. Quatrefages believes that the disease is not a new one, but was confounded with anasarca; he compares it with the Asiatic cholera, and makes that it is an hereditary epidemic, and that it may become accidentally contagious and infectious. It originates from the presence of exceedingly minute corpuscles, probably a parasitic fungus, which multiply by self-division and infect the tissues and viscera of the larva, pupa, and adult, as well as the scales of the latter. The disease first showed itself in France, and spread eastward until it reached China, and, in 1855, Japan. It was also a little later introduced into the establishment of Prof. Trauvot, at East Medford, Mass., and carried off from \$5,000 to \$10,000 worth of worms of *Bombyx polyphemus*, the silkworm which he then had under cultivation. Pébrine differs from muscardine in being hereditary. Another disease is called *flacherie*, where the worms become stiffened by the fermentation of the food in the stomach, resulting in the development of vibrios or fermenting fungi. This disease is also hereditary, but, like muscardine, more or less accidental, and not an epidemic, as pebrine is, and does not affect the eggs.

Attracted by the fearful ravages of pébrine, silk-raisers turned their attention to the importation of other silkworms. Of these the tussah and arriola moths are the most manageable and promising. The tussah moth (*Antheraea mylæ*) has a closed cocoon, spun from an un-

broken thread. It is semi-domesticated in India, and the silk is an article of commerce. It spins a hard, most durable silk of a dark-brownish color. While the tussah moth can not be reared in Europe, the related yam-moth (*Antheraea yam-moti*) of Japan, does well in France in the open air.

The *Anastreus* silkworm (*A. m.*) can be reared in Europe and the U. S., and is double-brooded. Though the cocoon is spun at one end, the thread with care can be unwound; in one case an unbroken thread 990 yards long was recorded. The silk, however, like that of the tussah moth is coarse, discolored, and can not be placed in competition with the most inferior mulberry silk.

A similar article is furnished by the American silkworm (*Yponomeuta polyphemus*). The thread is coarser than that of the *Bombyx mori*, but has a rich gloss, and can be used very extensively in commerce. The thread of which the closed cocoon is spun is unbroken, and can be readily unwound. Its larva feeds on the oak, and is thick, fleshy, striped obliquely with white on the sides, with angulated segments, on which are tubercles giving rise to a few short hairs. The pupa is very thick, and the cocoon is regularly oval-cylindrical. The moths leave the cocoons late in May, appearing until the middle of June. They then lay their eggs, generally singly, on the under side of the leaves. In ten or twelve days the caterpillars hatch. The worm moults five times, the first four moults occurring at intervals of ten days, while about twenty days elapse between the fourth and fifth moults. It spins its cocoon late in September, and in six or eight days after beginning it assumes the pupa state, and in this condition passes the winter. A. S. PARSONS, JR.

SIL, EDWARD ROWLAND: poet and scholar; b. at Windsor, Conn., Apr. 20, 1841. He graduated at Yale in 1861; taught school in Ohio; was principal of the high school at Oakland, Cal., 1871-74; Professor of English Literature in the University of California 1874-82, when he returned to Ohio. He was the author of *The Hermitage and Other Poems* (New York, 1887) and *The Venus of Milo and Other Poems* (1888). D. at Cleveland, O., Feb. 27, 1887. A selection of his Poems was published in 1888. H. A. B.

SIL, JOSEPH WOODROW: soldier; b. at Chillicothe, O., Dec. 6, 1831; graduated at the U. S. Military Academy July 1, 1853, and was appointed a second lieutenant in the ordnance corps. After a brief service at the Watervliet arsenal he was recalled to West Point, where he served until 1857 as Assistant Professor of Geography, History, and Ethics; subsequently in command of Vancouver ordnance dépôt, Washington, and Leavenworth dépôt, Kansas. In Jan., 1861, he resigned from the army, and became Professor of Mathematics and Civil Engineering in the Brooklyn Polytechnic Institute. On the outbreak of the civil war he was tendered the colonelcy of a New York regiment, and proceeded to Ohio, where he served as assistant adjutant-general of the State in organizing volunteers, and in the field at the battle of Rich Mountain. In Aug., 1861, he accepted the colonelcy of the Thirty-third Ohio Volunteers, and was engaged in the occupation of Bowling Green, Ky., and Nashville, Tenn., Feb., 1862, and in Gen. Mitchell's expedition to Huntsville, Ala., and seizure of the railroad from Stevenson to Decatur, thus regaining control of Northern Alabama; most of this time he was in command of a brigade. In July, 1862, he was commissioned brigadier-general of volunteers, and commanded a division in the Army of the Ohio at the battle of Perryville, Oct. 8, and subsequent pursuit of the Confederate army. In the battle of Murfreesboro, Dec. 31, 1862, he was killed at the head of his brigade.

Revised by JAMES MERCUR.

Silliman, BENJAMIN, M. D., LL. D.: chemist; b. at North Stratford (now Trumbull), Conn., Aug. 8, 1779; son of Gold Silliman (1730-90), a lawyer and colonel of Connecticut cavalry during the Revolution; graduated at Yale College 1796; was a tutor there 1799-1802, studying law in the meantime; was admitted to the bar 1802, and in the same year chosen Professor of Chemistry in Yale College; spent a part of the years 1802-04 at Philadelphia, preparing for his professorship under the guidance of Dr. James West, house, of the University of Pennsylvania; gave his first full course of lectures on chemistry at Yale in the winter of 1804-05; spent fourteen months in England, Scotland, and Holland 1805-06, engaged in the prosecution of his studies; made a geological survey of a part of Connecticut, the first exploration of the kind in America; published a memoir, with an analysis, of the fragments of the celebrated Weston meteorite of Dec. 14, 1807; aided Dr. Robert Hare in his ex-

periments with the compound blowpipe, with which instrument he demonstrated the fusibility of several bodies never before fused; secured for Yale College the valuable mineralogical and geological cabinet of Col. George Gibbs 1812; founded in 1818 *The American Journal of Science and Arts*, of which he was sole editor until 1838, and senior editor, along with his son, 1838-46; was the first to notice and record the effect of a powerful battery in volatilizing carbon and transferring it from the positive to the negative pole in the state of vapor; was an eloquent lecturer in scientific topics before popular audiences, having been perhaps the first to give such courses in the principal cities of the U. S.; made a second visit to Europe 1851; resigned his professorship 1853, and was made professor emeritus, but at the request of his colleagues continued to lecture on geology until June, 1855, when he retired from active labors. D. at New Haven, Nov. 24, 1864. He was the author of *Journal of Travels in England* (New York, 2 vols., 1810; 2d ed. New Haven, 3 vols., 1820); *Elements of Chemistry* (1830); *A Narrative of a Visit to Europe* (2 vols., 1853); and several minor publications; he also edited Henry's *Chemistry* (1814) and Baskwell's *Introduction to Geology* (1829). An interesting *Life* was prepared from his MS. reminiscences, diaries, and correspondence, by Prof. G. P. Fisher (2 vols., New York, 1866).

Silliman, BENJAMIN, M. D., LL. D.: scientist; son of Benjamin Silliman, chemist; b. at New Haven, Conn., Dec. 4, 1816; graduated at Yale College 1837; became associate editor of Silliman's *Journal of Science* 1838, and associate proprietor (with Prof. James D. Dana) 1846; was an instructor in chemistry, mineralogy, and geology in Yale College 1838-46; became Professor of Applied Chemistry 1846, and successor to his father in the chair of Chemistry 1854, which position he held in the medical department till his death. In 1847, in connection with Prof. John P. Norton, he established the Yale Scientific School, which has since grown into the Sheffield Scientific School. He was also Professor of Medical Chemistry and Toxicology in the University of Louisville, Ky., 1849-54; visited Europe with his father in 1851; was a director in the departments of chemistry, mineralogy, and geology in the Crystal Palace world's fair at New York 1853, and prepared (with Charles R. Goodrich) *World of Science, Art, and Industry* (New York, 1853) and *Progress of Science and Mechanism* (1854), in which the results of the exhibition were recorded; was for many years secretary of the American Association for the Advancement of Science, in which capacity he edited the volumes of *Proceedings*; wrote *First Principles of Chemistry* (1846; revised ed. 1856); *Principles of Physics* (1858; revised ed. 1868); and *American Contributions to Chemistry* (1875); contributed many papers to scientific societies, besides the large number published in his own *Journal*; was a popular lecturer on scientific subjects. D. at New Haven, Jan. 14, 1885.

Silo: See ENSILAGE.

Silo'am [= Lat. = Gr. *Σιλωάμ*, from Heb. *Shiloh*, liter., a sending (of water), aqueduct; Arab. *Silwan*]: (1) a fountain and pool in Jerusalem, on the southern edge of Ophel, 1,708 feet S. S. W. of the Fountain of the Virgin, with which it is connected by a winding tunnel. The fountain proper, hewn out of solid rock, is about 6 feet wide. Like the Fountain of the Virgin, it is intermittent. The lower basin is 52 feet long, 18 broad, and 19 deep, but now holding only 3 or 4 feet of water. It was once arched over. Jewish writers say it furnished the water used in sacrifice on the last great day of the Feast of Tabernacles. Jesus alludes to the practice of sending a Levite with a golden pitcher to get it (John vii. 37-39). This most famous of all the pools in or about Jerusalem is mentioned only three times in the Bible (Isa. viii. 6; Neh. iii. 15; John ix. 7), but frequently by Josephus. In the tunnel alluded to, cut in the solid rock, there was discovered in the summer of 1880 a Hebrew inscription. Prof. A. H. Sayce made the first intelligible copy (Feb., 1881). It is thus translated by Canon S. R. Driver: "Behold the piercing through! And this was the manner of the piercing through: Whilst yet the miners were lifting up the pick, each towards his fellow, and whilst yet there were 3 cubits to be cut through, there was heard the voice of each calling to his fellow, for there was a fissure in the rock on the right hand. And on the day of the piercing thus the miners smote each so as to meet his fellow, pick against pick; and there flowed the water from the source to the pool, 1,200 cubits, and 100 cubits was the height of the rock over the head of the miners." (Heb. Text of the Books of Samuel, p. xvi.) This inscription is proof that the

excavation was begun at each end, probably simultaneously. The inscription is undated, but the shape of the letters apparently shows that it dates from at least Hezekiah's time, and it is certainly one of the oldest known Hebrew inscriptions. 2 Kings xx. 20, 2 Chron. xxxii. 30 may allude to the excavation. See the discussion by A. H. Sayce in *Records of the Past*, new series, i., 168, seq., and S. R. Driver, *loc. cit.* p. xiv., seq. In 1889 a second conduit, some 20 feet below the ground, was discovered leading from the Pool of Siloam to another reservoir which once existed below. To it Isa. vi. 6 is supposed to refer. It was to Siloam that Jesus once sent a blind man to wash (Luke iv. 18). (2) The name of a little straggling, dirty village occupying an old quarry on the east side of the Kedron, overlooking the Pool of Siloam.

SAMUEL MACAULEY JACKSON.

Sil'phium [Mod. Lat., from Lat. *sil'phium* = Gr. *σίλφιον*, an umbelliferous resin-bearing plant, perhaps the *asafoetida*], a genus of perennial plants of the family *Compositae*, comprising twenty species, many of which are found in abundance in the U. S. on the prairies and in the Southern States, also in other parts of North America. They are very hardy and coarse, bear large flower-heads, and exude a plentiful resin-like juice, whence the commonest species (*S. laciniatum*) has received the name of rosin-weed. The stem sometimes exceeds 10 feet in height. Both the resin and the leaves are much employed by farriers for asthma in horses, and a tincture has sometimes been found useful as a tonic and diaphoretic. This species is known by the names of COMPASS-PLANT (*q. v.*), pilot-weed, and polar-plant, from the fact that its leaves have a tendency to stand with one surface facing the E. and the other the W.; the plane of the leaf, which is usually vertical, is thus N. and S. The prairie burdock (*S. ~~rebinthinaceum~~*) and the singular cup-plant (*S. ~~perfoliatum~~*) belong to this genus. Revised by CHARLES E. BESSEY.



(Compass-plant (much reduced).)

Silurian Period [*Siluria* is from Lat. *Silures*, name of a people in ancient Britain]: the division of geological time preceded by the Cambrian period and followed by the Devonian. The name was first applied by Murchison to a rock series occurring in England and Wales in a district formerly occupied by the Silures. In the original description of Silurian and Cambrian rocks a large series was included under both designations, and a long dispute followed. Partly as a means of settling this dispute, but also on paleontologic grounds, the name Ordovician was proposed by Lapworth as the name of a period between the Silurian and Cambrian, and this proposition has received much favor; but the prevailing usage in Great Britain and North America refers the disputed series to the Silurian period, constituting it a minor division under the title Lower Silurian. The Silurian rocks of the U. S. are well developed in the basin of Lake Ontario and in the Champlain-Hudson valley, extending thence southwestward along the Appalachian chain through Pennsylvania, Maryland, Virginia, Tennessee, and Georgia into Alabama. In New England are several outlying areas, in which the rocks are metamorphic. In Ohio, Indiana, Kentucky, and Tennessee are broad areas laid bare by the erosion of the crest of the Cincinnati arch, and a still greater area follows the western coast of Lake Michigan and sends an arm up the Mississippi valley into Minnesota. Other areas are found in Missouri and Texas. The hydraulic cement and salt of New York and the fossil iron ores of the Appalachian chain from New York to Alabama, besides sandstones and limestones of architectural importance, are derived from formations of this period. See CAMBRIAN PERIOD AND GEOLOGY, and for the flora of this period see PLANTS, FOSSIL, and consult Murchison's *Siluria* (1834); Lapworth's *Tripartite Classification of the Lower Paleozoic Rocks* (*Geol. Mag.*, vol. vi., 1879); Sedgwick's *Synopsis of the English Series of Stratified Rocks Inferior to the Old Red Sandstone* (*Proc. Geol. Soc.*, London, vol. ii., 1838).

G. K. GILBERT.

Siluridae (Med. Ent., named from *Silurus*, the typical genus, from Latin *silus* = vat, whence a kind of river-disk, whence also silene) : an extensive family of fishes of the order *Actinopterygii*, comprising the catfishes of Europe and North America. The eel is noted; the opercular, dogfish, and lamprey, especially lampreys, are well developed; gillpoies large and numerous, the laminae being free at the posterior margin; the anterior vertebrae unossified and much modified; the inferior pharyngeal bones distinct. Most of this species live in fresh water, but some are found in warm seas. *Silurus glanis* is the silurid fish found in the rivers of Central and Northern Europe. Among the North American species are the common catfishes or bullheads of the genus *Ameiurus*, the sturgeon of the genus *Acipenser*, and the flathead of the genus *Pleuronectes*.

Silva, 3 years dead, the dramatist, is in Rio de Janeiro, Brazil, May 8, 1792. He went to Portugal when a child, was educated at Coimbra, and became a lawyer in Lisbon. He soon became known as the author of numerous comedies, which were great successes and are still regarded as among the best in the Portuguese language. Silva's mother, who was of Jewish descent, was accused of Judaism, and was imprisoned by the Inquisition; later, suspicion fell on the poet and his wife, they were twice incarcerated, and finally all three were banished to Lisbon, Oct. 15, 1789. H. D. S.

Silva Lobo's, *Barbaeira da Ilhabela*: b. in Bahia, Brazil, Jan. 9, 1761. He studied law at Coimbra, Portugal; held various judicial positions at Bahia and Rio de Janeiro, and in 1790 was imprisoned for a short time on account of his political utterances. His principal published work is *Discursos do Rio de Janeiro* (7 vols., 1804). D. in Rio de Janeiro, Aug. 14, 1840.—His brother, José da Silva Loboza (b. in Bahia, July 16, 1759; d. in Rio de Janeiro, Aug. 20, 1822), was a well-known statesman, leader of the imperialists in the Brazilian parliament, minister from 1826, and the author of numerous works on history and political economy. He was created viscount of Cayré in 1820. H. D. S.

Silver (D. Eng., *silber*, *silber*; Germ., *silber* < O. H. Germ., *silber*; Goth., *silubr*; *silubr* obscure; Lat., *argentum*; Gr. *argyros*, *argente*, *argente*—Is another widespread name of the same metal) : one of the precious metals, known from remote ages, and much used for ornaments, household vessels, and for money. Among the alchemists it was known as *luna*. Its chemical symbol, Ag, is derived from the Latin name. It is the whitest of the metals and takes a brilliant mirror-like polish. In hardness it is intermediate between gold and copper, and it is very malleable and ductile. It may be beaten into foil or leaves 1/10000 of an inch in thickness. A grain of the metal may be drawn out into a wire 400 feet in length. If repeatedly heated it becomes heavier. The specific gravity of silver ranges from 19.3 to 21.4, according to the condition and purity. Knecht found the gravity of fused silver to be 10.4262; H. Rose gives 10.57 for hammered silver, and 10.62 for precipitated silver. The metal fuses readily on charcoal before the blow-pipe or in a crucible in a large or furnace. It expands forcibly upon cooling, and thus solid pieces will float in molten silver as ice floats in water. It may be vaporized by the burning lens or by the oxyhydrogen blow-pipe or strong electrical currents. The vapors are white. When pure the molten metal absorbs from twenty to twenty-two times its bulk of oxygen, according to various authorities, but the presence of a small percentage of copper or lead greatly diminishes or prevents this absorption. The absorbed gas is given off at the moment of solidification, and with considerable force. If the surface of a globule or bar of silver has cooled while the interior is fluid, the expansion breaks the crust and more or less of the fused metal is projected through the cracks and forms an arborescent growth generally known as *spitting*, and when it is projected with violence, as *spitting*. This mechanical projection of a portion of a globule of silver cooling upon a cupel is a frequent source of loss in assaying. The absorption of oxygen and the subsequent spitting may be prevented to a great extent by the use of charcoal powder upon the melted metal. Absorption of oxygen is also prevented by fusing it under a lot of salt. The use of silver in the crucible causes a large absorption of the gas. The vapor of water is decomposed by silver at a white heat, oxygen being absorbed and hydrogen liberated. Silver is a good conductor of heat and of electricity. It is capable of being welded, alloys freely with gold, copper, and several other metals, and crystallizes in some of the monometric systems, generally in octahedra.

Silver is abundantly distributed in nature, particularly among the metallic minerals. Malaguti and Thurell give a table of 178 sources, chiefly of metalliferous minerals, enclosing silver ores proper in most of which silver was found in traces or appreciable quantities. It exists in solution in the ratio of 1 milligramme to 100 kilograms, assuming that there is 1 milligramme of silver per cubic meter of water, it has been calculated that the oceans contain not less than 2,700,000 tons of silver. The metal has been found in small quantities also in rock-salt in the mines of the department of Massif Central, France. All native gold contains from 918 to 44 per cent. of silver, but generally from 2 to 12 per cent. California gold averages about 12 per cent. of silver. It occurs also nearly pure in masses and irregular grains, but it is not so generally distributed in this form as gold, and is seldom found in places or alluvial deposits, being confined rather to the vicinity of the outcrops of veins. It is usually in irregular, ragged masses, or in thin sheets coating surfaces of the veins, or in films, as it flows out into veins. The wire-like form of silver is of frequent occurrence in the matrix of veins. The filaments sometimes reach the length of a foot or more, but are generally much curled up and interwoven or matted together, looking like bunches of hair or wool. Specimens of this description occur in the ore of the Rainbow lode, Walkerville, Montana, and in the Silver King mine, Dinah, Arizona. At Kongsberg, in Norway, the metal has been found massive and in large and perfect crystals, which retain their whiteness without tarnishing to a remarkable degree. One mass taken from these mines and preserved in the Royal Museum at Copenhagen weighs upward of 500 lb. Large amounts of native silver have been obtained in Mexico and South America. One mass in Peru is said to have weighed 800 lb. Large masses have been reported from the northern portion of the Mexican state of Sonora. It is not uncommon, though not in large masses, in the upper portions of the silver-bearing veins of the Western States and Territories of the U. S. It is found also in a vein upon Silver Mt. in Lake Superior, and associated with the native copper of the Keweenaw Point mines. Some of these specimens are remarkable for being completely joined to the copper, without any intermingling of the metals; half of a mass may be silver and the other half copper.

Specimens of silver when taken from mines are usually tarnished a dull brown or even black, this color being caused generally by the presence of sulphurous vapors either from the constituents of the vein or the combination of powder. Such vapors rapidly tarnish silver. Silverware and silver-plate are rapidly tarnished and turned black by the gases of sulphur-water, and also by the tainted atmosphere about drains and vaults, and the sulphurous gases from burning coal. The peculiar whiteness of the Norwegian native specimens is supposed to be due to the presence of a portion of mercury. Native silver is rarely pure. The sulphurous variety sometimes contains 10 per cent. of copper. With gold the proportions are variable. (See *Gold*.) The *electrum* of Pliny contains one-fifth of silver. The pale gold of Transylvania contains from 35 to 36 per cent. of silver. The native alloy in the great Comstock lode of Nevada contains about 43 per cent. of silver, as shown by Atwood, the rest being gold. It is usual to estimate that of the \$550,000,000 in value, in round numbers, produced from the lode \$290,000,000, or a little less than half, was gold. Gold predominated at the surface, particularly at Gold Hill and Cobar Hill, at the two ends of the lode. Native amalgams have been found in Chili, containing from 53 to 64 per cent. of silver. The metal is also found combined with sulphur, antimony, arsenic, tellurium, etc., and with chlorine, bromine, and iodine, giving a great variety of interesting species. The chief ones are the sulphide, containing 86 per cent. of silver; the telluride or antimonial sulphide, with 69.5 per cent. of silver; gray silver ore, with 23 per cent. of silver; dark-red silver ore, with 60 per cent.; and the light-red silver ore, with 64 per cent. This last is generally known as ruby silver, from the brilliant ruby red of the crystals by transmitted light. In the upper portions of silver-bearing veins, where air and moisture have had access, a certain amount of decomposition has taken place among the minerals, especially if they consist of the above-mentioned species, and new combinations have been formed, which may be called secondary ones. These are generally oxides, chlorides, bromides, and iodides, and are more earthy and highly colored than those in the deeper parts of the vein, being intermingled with oxides of copper, lead, and iron. They are also softer than the un-

changed ores below, and are more easy to work. Such ores are known in Mexico as *colorados*, especially if red, and in Peru as *pacos*. The ores from a greater depth in the mine, which have not been acted upon by the air, are more compact, brilliant, and darker in color, and are called *negros*. The green bromide ores are known in Zacatecas, Mexico, as *plata verde*. Chloride of silver is common in the upper portions of rich silver-bearing veins, and usually forms thin dark-colored crusts or films upon the gangue. It is easily identified by its wax-like hardness, and by giving a globule of silver when fused in the flame of a candle.

A large class of the metallic minerals contain silver in varying proportions, especially galena and blende, which are rarely free from a portion of silver. The greater portion of the silver produced in Europe is extracted from argentiferous galena. The galenas of England and of the Harz Mountains carry from .03 to .05 per cent., and those of Tuscany from .03 to .07 per cent. The galena ores of the U. S., with the exception of those of the Mississippi valley, nearly all contain silver in larger quantities, the percentage ranging from .10 to 1.85 and 3.0, but the quantity of these rich ores is seldom large in the Eastern States. Some of the Wood river and Kootenay lead ores carry 100 oz. to the ton, but 30 to 60 oz. to the ton of lead ore is a very fair yield. Formerly lead ores containing less than 10 oz. could not be profitably worked for silver, but since the discovery by Pattinson, of England, in 1829 of the process which bears his name, the cost of separating silver from lead has been greatly cheapened. Lead containing only 3 oz. of silver to the ton can now be worked with profit, and in smelting operations on a large scale where lead ores are used as a flux even a small amount of contained silver is incidentally important.

The antiquity of silver coinage is very great. The most ancient coins known were struck in silver by Phidon, King of Aegina, B. C. 869. After the conquest of Egypt by Cambyses, about 540 years before Christ, a great improvement appears to have been made in the purification of silver, for that which was produced under Aryandes was celebrated for its purity and fineness. The alloy in the Greek silver coinage generally appears to have been lead, which had not been removed for want of the requisite skill in refining. The Athenian currency was noted for its purity, and Xenophon mentions the profit with which it could be exported. Silver currency was adopted by the Roman republic about 269 B. C., and its standard was as high as the Greek, but it rapidly fell. Under Vespasian the alloy was one-eighth, under the Antonines one-fourth, under Severus about one-half, after which there does not appear to have been a fixed standard. (King.) After the loss of Spain, from which the chief supply of silver was drawn, the silver currency vanished, and was replaced by *billon* denarii, having only one-fourth part of silver. According to Pliny, Antony alloyed denarii with iron, apparently to harden the coin. The denarii of Justinian and the Italian Goths weigh about 15 grains troy, and are the reputed direct antecedents of the Anglo-Saxon silver penny.

Silver was largely used by the Romans for household plate and table decoration. It was elegantly chased and embossed in the *repoussé* style by Grecian artists. The wealthy Romans vied with each other in possessing the most massive dishes. Of such dishes, weighing 100 lb. or more, there were 150 in Rome before the first civil war. Pliny cites the existence of one dish weighing 500 lb., with eight plates to match, weighing together 250 lb. The old chased plate of the Grecian artists was valued as a curiosity in Pliny's time. The ornamentation of silver, known as niello-work, originated in Egypt, and was revived and carried to great perfection by the Florentine silversmiths. Cellini gives a recipe for the fusible argentiferous compound used to fill the engraved design. This art was applied to the decoration of armor as early as the days of Homer. Agamemnon's breastplate was thus inlaid. In mediæval times massive plate was in great favor, and the chief form of investment for the noble-born and wealthy. Its extensive use for ecclesiastical decoration is also to be noted. In 1891 over 4,000,000 oz. of silver were sent out from the mints of the U. S. in the form of bars for industrial uses. The total annual consumption of silver in the industrial arts approximates \$10,000,000 coining value, and is increasing.

In modern times solid silverware has been to a great extent replaced by nickeliferous alloys and britannia ware, covered with a layer of pure silver by the galvanoplastic method. Silver may, by this method, be deposited to any desired thickness, thus giving all the appearance of solid

silver, and its utility for most purposes. The annual consumption of the metal for this purpose alone is very large. Silver thus deposited is pure, but solid silverware and silver coin contain a portion of alloy, generally copper. In the U. S. and in France the standard fineness is one-tenth of alloy, or 900 parts of silver and 100 of copper, the mixture being denominated '900 fine. In Great Britain the standard is higher, being 925 of silver and 75 of copper, or '925 fine. This is the fineness of "sterling silverware."

The value of silver relatively to other objects obviously depends upon two chief conditions—the demand and the supply. The demand is seriously affected by legislation, as, for example, by the demonetization of silver. The variations in the demand are sufficiently indicated by the preceding references to its use in historic times. The supply is also variable, and at times excessive. The production of silver in the large way, owing to its mode of occurrence and mineralization, is more dependent upon the use of mechanical power (steam or water) than upon the labor of men, and generally it requires a heavy plant and large capital. There may therefore be a large production of silver in sparsely populated regions and within a short period of time. With gold, however, the bulk of the product is derived from placers. It is so much more generally distributed in the earth that an unlimited number of men may be engaged together in its production. No expensive preparations or chemical operations are required to obtain gold in a merchantable form.

The value of silver relatively to gold has greatly changed within historic times, and it has been different in various countries. Commerce has tended to equalize this difference. King justly observes that in the ancient world silver was to the same extent the peculiar production of Europe that gold was of Asia. It follows naturally that the estimation of silver relatively to gold was higher in Asia than in Europe—a condition prevailing until within a recent period. Sir Isaac Newton in 1717 showed that the ratio in weight of equal values of the two metals, silver and gold, in China and Japan was as 9:1, while it was as 15:1 in Europe. Perhaps the earliest recorded ratio is found inscribed at Karnak, the tribute-lists of Thutmosis (1600 B. C.) giving 13:3:1. The same ratio is shown by cuneiform inscriptions on plates found in the foundations of Khorsabad and on ancient Persian coins. It was reported by Xenophon (400 B. C.) as the ratio in Asia. Toward the Christian era gold fell in value relatively to silver. As early as about 189 B. C. the Romans coincided with the Greeks in estimating the value of gold compared with silver as 10:1. Upon Caesar's return to Rome gold became so abundant that the ratio for a time was as 7½:1. A century later the ratio was as 12½:1, where it remained for 150 years or more. When guineas were first coined in 1663 the value of fine gold compared with that of fine silver was rated in the English mint at about 14:1. In 1805 the ratio was nearly as 15:1, and in other countries gold was rated higher. In the Middle Ages the ratio varied from 9:1 to 12:8:1. At the date of the discovery of America the ratio was about 11:30:1, since which, up to the discovery of gold in California and Australia, it gradually rose to 15:83:1 in the year 1850. In 1870 and 1871 the average commercial ratio was 15:57:1, and in 1873 as 15:92:1, with a gradual increase to 26:49:1 in 1893, and 32:56:1 in 1894.

The annual production of gold and silver in the world, stated in kilogrammes, with the ratio of silver to gold by weight, is shown in the following table:

YEARS.	ANNUAL PRODUCT, KILOG.		Ratio of silver to gold, by weight.
	Gold.	Silver.	
1871 to 1875, mean.	173,904	1,969,425	11:3
1876	165,956	2,323,779	14:10
1877	179,445	2,388,612	13:3
1878	185,847	2,551,364	13:7
1879	167,307	2,507,507	15:10
1880	163,515	2,479,998	15:2
1881	158,964	2,592,639	16:3
1882	148,473	2,769,063	18:6
1883	144,727	3,746,123	19:0
1884	153,193	2,788,727	18:2
1885	159,239	2,993,805	18:8
1886	159,741	2,902,471	18:2
1887	159,156	2,990,394	18:8
1888	159,899	3,285,606	21:2
1889	185,809	3,001,809	21:0
1890	181,256	4,180,532	23:1
1891	180,824	4,479,649	23:6
1892	196,234	4,945,237	25:1
1893	236,570	6,081,488	21:3

The lowest, highest, and average price of bar-silver in London per ounce, British standard, 925 fine, since the year 1871, and the equivalent value in U. S. gold coin taken at the average price are shown in the following table:

Year.	Lowest price.	Highest price.	Average price.	Average value in gold coin.
1871	50 1/2	51 1/2	51 1/2	\$1 23 1/2
1872	50 3/4	51 3/4	51 3/4	1 23 3/4
1873	50 1/2	51 1/2	51 1/2	1 23 1/2
1874	50 1/2	51 1/2	51 1/2	1 23 1/2
1875	50 1/2	51 1/2	51 1/2	1 23 1/2
1876	50 1/2	51 1/2	51 1/2	1 23 1/2
1877	50 1/2	51 1/2	51 1/2	1 23 1/2
1878	50 1/2	51 1/2	51 1/2	1 23 1/2
1879	50 1/2	51 1/2	51 1/2	1 23 1/2
1880	50 1/2	51 1/2	51 1/2	1 23 1/2
1881	50 1/2	51 1/2	51 1/2	1 23 1/2
1882	50 1/2	51 1/2	51 1/2	1 23 1/2
1883	50 1/2	51 1/2	51 1/2	1 23 1/2
1884	50 1/2	51 1/2	51 1/2	1 23 1/2
1885	50 1/2	51 1/2	51 1/2	1 23 1/2
1886	50 1/2	51 1/2	51 1/2	1 23 1/2
1887	50 1/2	51 1/2	51 1/2	1 23 1/2
1888	50 1/2	51 1/2	51 1/2	1 23 1/2
1889	50 1/2	51 1/2	51 1/2	1 23 1/2
1890	50 1/2	51 1/2	51 1/2	1 23 1/2
1891	50 1/2	51 1/2	51 1/2	1 23 1/2
1892	50 1/2	51 1/2	51 1/2	1 23 1/2
1893	50 1/2	51 1/2	51 1/2	1 23 1/2
1894	50 1/2	51 1/2	51 1/2	1 23 1/2
1895	50 1/2	51 1/2	51 1/2	1 23 1/2
1896	50 1/2	51 1/2	51 1/2	1 23 1/2
1897	50 1/2	51 1/2	51 1/2	1 23 1/2
1898	50 1/2	51 1/2	51 1/2	1 23 1/2
1899	50 1/2	51 1/2	51 1/2	1 23 1/2
1900	50 1/2	51 1/2	51 1/2	1 23 1/2
1901	50 1/2	51 1/2	51 1/2	1 23 1/2
1902	50 1/2	51 1/2	51 1/2	1 23 1/2
1903	50 1/2	51 1/2	51 1/2	1 23 1/2
1904	50 1/2	51 1/2	51 1/2	1 23 1/2
1905	50 1/2	51 1/2	51 1/2	1 23 1/2
1906	50 1/2	51 1/2	51 1/2	1 23 1/2
1907	50 1/2	51 1/2	51 1/2	1 23 1/2
1908	50 1/2	51 1/2	51 1/2	1 23 1/2
1909	50 1/2	51 1/2	51 1/2	1 23 1/2
1910	50 1/2	51 1/2	51 1/2	1 23 1/2
1911	50 1/2	51 1/2	51 1/2	1 23 1/2
1912	50 1/2	51 1/2	51 1/2	1 23 1/2
1913	50 1/2	51 1/2	51 1/2	1 23 1/2
1914	50 1/2	51 1/2	51 1/2	1 23 1/2
1915	50 1/2	51 1/2	51 1/2	1 23 1/2
1916	50 1/2	51 1/2	51 1/2	1 23 1/2
1917	50 1/2	51 1/2	51 1/2	1 23 1/2
1918	50 1/2	51 1/2	51 1/2	1 23 1/2
1919	50 1/2	51 1/2	51 1/2	1 23 1/2
1920	50 1/2	51 1/2	51 1/2	1 23 1/2
1921	50 1/2	51 1/2	51 1/2	1 23 1/2
1922	50 1/2	51 1/2	51 1/2	1 23 1/2
1923	50 1/2	51 1/2	51 1/2	1 23 1/2
1924	50 1/2	51 1/2	51 1/2	1 23 1/2
1925	50 1/2	51 1/2	51 1/2	1 23 1/2
1926	50 1/2	51 1/2	51 1/2	1 23 1/2
1927	50 1/2	51 1/2	51 1/2	1 23 1/2
1928	50 1/2	51 1/2	51 1/2	1 23 1/2
1929	50 1/2	51 1/2	51 1/2	1 23 1/2
1930	50 1/2	51 1/2	51 1/2	1 23 1/2
1931	50 1/2	51 1/2	51 1/2	1 23 1/2
1932	50 1/2	51 1/2	51 1/2	1 23 1/2
1933	50 1/2	51 1/2	51 1/2	1 23 1/2
1934	50 1/2	51 1/2	51 1/2	1 23 1/2
1935	50 1/2	51 1/2	51 1/2	1 23 1/2
1936	50 1/2	51 1/2	51 1/2	1 23 1/2
1937	50 1/2	51 1/2	51 1/2	1 23 1/2
1938	50 1/2	51 1/2	51 1/2	1 23 1/2
1939	50 1/2	51 1/2	51 1/2	1 23 1/2
1940	50 1/2	51 1/2	51 1/2	1 23 1/2
1941	50 1/2	51 1/2	51 1/2	1 23 1/2
1942	50 1/2	51 1/2	51 1/2	1 23 1/2
1943	50 1/2	51 1/2	51 1/2	1 23 1/2
1944	50 1/2	51 1/2	51 1/2	1 23 1/2
1945	50 1/2	51 1/2	51 1/2	1 23 1/2
1946	50 1/2	51 1/2	51 1/2	1 23 1/2
1947	50 1/2	51 1/2	51 1/2	1 23 1/2
1948	50 1/2	51 1/2	51 1/2	1 23 1/2
1949	50 1/2	51 1/2	51 1/2	1 23 1/2
1950	50 1/2	51 1/2	51 1/2	1 23 1/2
1951	50 1/2	51 1/2	51 1/2	1 23 1/2
1952	50 1/2	51 1/2	51 1/2	1 23 1/2
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1954	50 1/2	51 1/2	51 1/2	1 23 1/2
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1960	50 1/2	51 1/2	51 1/2	1 23 1/2
1961	50 1/2	51 1/2	51 1/2	1 23 1/2
1962	50 1/2	51 1/2	51 1/2	1 23 1/2
1963	50 1/2	51 1/2	51 1/2	1 23 1/2
1964	50 1/2	51 1/2	51 1/2	1 23 1/2
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1969	50 1/2	51 1/2	51 1/2	1 23 1/2
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1971	50 1/2	51 1/2	51 1/2	1 23 1/2
1972	50 1/2	51 1/2	51 1/2	1 23 1/2
1973	50 1/2	51 1/2	51 1/2	1 23 1/2
1974	50 1/2	51 1/2	51 1/2	1 23 1/2
1975	50 1/2	51 1/2	51 1/2	1 23 1/2
1976	50 1/2	51 1/2	51 1/2	1 23 1/2
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1981	50 1/2	51 1/2	51 1/2	1 23 1/2
1982	50 1/2	51 1/2	51 1/2	1 23 1/2
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1991	50 1/2	51 1/2	51 1/2	1 23 1/2
1992	50 1/2	51 1/2	51 1/2	1 23 1/2
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1994	50 1/2	51 1/2	51 1/2	1 23 1/2
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2007	50 1/2	51 1/2	51 1/2	1 23 1/2
2008	50 1/2	51 1/2	51 1/2	1 23 1/2
2009	50 1/2	51 1/2	51 1/2	1 23 1/2
2010	50 1/2	51 1/2	51 1/2	1 23 1/2
2011	50 1/2	51 1/2	51 1/2	1 23 1/2
2012	50 1/2	51 1/2	51 1/2	1 23 1/2
2013	50 1/2	51 1/2	51 1/2	1 23 1/2
2014	50 1/2	51 1/2	51 1/2	1 23 1/2
2015	50 1/2	51 1/2	51 1/2	1 23 1/2
2016	50 1/2	51 1/2	51 1/2	1 23 1/2
2017	50 1/2	51 1/2	51 1/2	1 23 1/2
2018	50 1/2	51 1/2	51 1/2	1 23 1/2
2019	50 1/2	51 1/2	51 1/2	1 23 1/2
2020	50 1/2	51 1/2	51 1/2	1 23 1/2
2021	50 1/2	51 1/2	51 1/2	1 23 1/2
2022	50 1/2	51 1/2	51 1/2	1 23 1/2
2023	50 1/2	51 1/2	51 1/2	1 23 1/2
2024	50 1/2	51 1/2	51 1/2	1 23 1/2
2025	50 1/2	51 1/2	51 1/2	1 23 1/2

The world's production has increased from 41,200,000 oz. in 1870 to 161,766,000 oz. in 1903. The production in the U. S. was approximately 12,875,360 oz. in 1870 and 60,500,000 oz. in 1903. The production for 1894 is estimated at from 50,000,000 to 65,000,000 oz. fine silver. See the reports of the director of the U. S. mint; Southey's tables; *The Mineral Industry*, vol. II.; and the annual circulars by W. J. Valentine, San Francisco, and by Pixley & Abell of London.

WILLIAM P. BLAKE.

Chemistry of Silver Compounds.—Silver forms a number of compounds of practical importance and scientific and medicinal interest.

Silver chloride, or chloride of silver, AgCl, is an important substance, which is found native as horn-silver. The insolubility of silver chloride causes its production, by adding a solution of a chloride, to be an excessively delicate test of the presence of silver in a solution. Gay-Lussac's volumetric method of silver-assay, in use in all U. S. mints, depends on the use of a standard solution of common salt to precipitate the silver as chloride. Silver chloride melts at about 300° F. to a clear liquid. On exposure to light and moisture it becomes darker. When any organic matter is present, as when the chloride is applied to paper, this action of light is far more powerful. Photographic methods are chiefly founded upon these kinds of changes of the halogen compounds of silver by light, the dark compound formed under the influence of the light being insoluble in hyposulphite of soda and other fixing agents, while the unchanged chloride, iodide, or bromide of silver remains soluble, and is therefore easily removed from the paper, leaving the picture composed of the changed dark-colored compound, attached to the paper.

Silver bromide, or bromide of silver, AgBr, constitutes the mineral bromyrite or bromargyrite. It is found as an ore in Mexico and Chili, and at Buelgoat in Brittany. At some of the Chilian mines, as in Chanarillo and in Copiapo, another silver mineral is much more abundant than either the chloride or bromide, which is a combination of the two in varying proportions, called embolite. **Silver iodide, or iodide of silver, AgI,** forms the mineral iodyrite, found in Mexico, Chili, Spain, and Arizona. It is sulphur-yellow when pure, and very soft and brittle. Bromide and iodide of silver, when precipitated, are much more sensitive to light than the chloride.

Silver nitrate, or nitrate of silver, AgNO₃, known also by its ancient name of *lunar caustic*, is manufactured on a large scale owing to its important applications in medicine and in the arts of photography and electro-plating. It crystallizes very easily, and is largely introduced into commerce in crystalline form, though the lunar caustic for medicinal use is generally fused and cast into sticks or pencils. It is soluble in its own weight of cold water.

Silver sulphide, or sulphide of silver, Ag₂S, in pure state, constitutes the mineral argentite or silver-glance. This is, with lead-glance, a regular crystallization, but is often cryptocrystalline or amorphous. The hardness is about that of pyrites, and it has a high degree of sectility, the mineral often cutting almost like metallic lead. It contains, when

pure, 87 per cent. of silver, being the richest of all silver ores. It is common among the ores of the celebrated Comstock lode, as well as in many other localities in the U. S. Sulphide of silver forms, in combination with other metallic sulphides, a large number and variety of argentiferous minerals and ores. With sulphide of arsenic it forms the mineral proustite (3Ag₂S·As₂S₃), containing 65.4 per cent. of silver. This is a magnificent carmine-red mineral, of adamantine luster when crystallized, the crystals being rhombohedral. **Pearcyite** (2Ag₂S·Sb₂S₃), containing 60.5 per cent. of silver, is also a splendid red rhombohedral mineral, of a darker shade of color than proustite, hence sometimes called dark-red silver ore. **Kall silver ore** is also a mine applied to both the arsenical and the antimonial species. **Promet** first showed the true difference between them, as implied in the above formulas in 1864. **Prometite** is abundant in Mexican, Peruvian, and Chilian mines, but rare in the Comstock lode and most North American silver-districts. It was found, however, very fine and in immense masses, with perargyrite, in the Poorman lode in Idaho. **Stephanite** (5Ag₂S·Sb₂S₃), containing 68.5 per cent. of silver, is an iridescent black ore, eight-rhombic in crystallization, found sparingly in the Comstock lode and in many other North American regions. It is sometimes called brittle silver ore.

Revised by LAM HUNTER.

Silver City: city; capital of Grant co., N. M.; on the Atch., Top. and S. F. Railroad; 48 miles N. W. of Deming (for location, see map of New Mexico, ref. 13-Q1). It is in an agricultural and stock-raising region; is principally engaged in mining gold, silver, and copper; and contains a smelter, several reduction-mills, flour-mills, a national bank with capital of \$50,000, and two weekly newspapers. Pop. (1890) 1,800; (1900) 2,102.

Silver Coinage in the United States: The question whether it is the wisest policy of the U. S. Government to admit the coinage of silver in unlimited quantities at the established ratio with gold, or to restrict the minting of the cheaper metal, has for many years constituted an important issue in party politics. A brief summary of the principal arguments advanced on each side of the question is presented in the following paragraphs:

Free Coinage of Silver.—The advocates of this measure point to the necessity of increasing the supply of currency. Both the national banking system and the policy of buying limited quantities of silver bullion and issuing gold-notes for the purchase-money have failed to furnish an adequate currency. Moreover, the latter policy has been objectionable to bimetallics and monometallics alike, the former party desiring unlimited coinage for both metals, the latter fearing that it would lead to the establishment of silver as the sole standard. In the opinion of the free-silver party, the opposition of the monometallics, and of those bimetallics who would defer the adoption of the double standard till other nations agree to accept it, is based upon merely theoretical grounds, and is at variance with the world's experience. It was not till 1873 that the U. S. Government prohibited the coinage of silver money as full legal tender, and for several years it was evident that the majority of the people strongly desired to return to the old system. The Mint Act of 1792 opened the mints of the Government to the unlimited coinage of both gold and silver at the ratio of 15 to 1. There was no fear of a gold or silver inundation, and though the French Government, in 1800 and 1804, adopted the ratio of 15 to 1, thus causing the exportation of gold from the U. S., the silver dollar never lost in purchasing power. In 1834 and 1837 the ratio was changed to 16 to 1, which overvalued gold in respect to silver. As a result, but little silver came to the U. S. mints, and the metallic money was principally gold; yet no one complained, except the advocates of the bank, who, in their opposition to the attempt to supersede the bank-note circulation by gold, demanded the latter metal as bitterly as the national banks have since denounced silver. Thus the disparity between the legal and market ratios caused no complaint on either of these occasions, and nothing like an excessive influx of the cheaper metal resulted. As to the argument that the greater value of gold per weight makes it preferable in large transactions, and therefore more suitable for rich nations, while silver is better adapted for the poorer nations, it has lost all force since the expedient of representing gold and silver coins by certificates has been devised. Certificates representing the gold and silver coin in the treasury are accepted by the people in preference to specie.

From the tables submitted to the committee on coinage, weights, and measures, by the director of the mint in his hearings before that body on Jan. 27, 1892, it appears that at the ratio of 15½ to 1 there is about an equal amount of the two metals in circulation. The output of gold and silver from the mines since 1873 shows also about the same ratio in the respective weights of the metals produced. Nor does the fact that in the latter part of this period the ratio has exceeded this in favor of silver invalidate the argument, for the per cent. of increase when compared to the whole stock of gold and silver is too small to be taken into account, and, moreover, is probably but temporary. Since the ratio of the world from 1803 to the demonetization of silver in 1873 was 15½ to 1, and even since the latter date has been about the same, and since the debts of the world, both public and private, have been contracted at this ratio, it is a gross injustice to the producing classes, which at last liquidate these debts, to readjust the ratio so as to conform to the demonetized price of silver as compared with gold. Measured by commodities, gold has risen 50 per cent. since the demonetization of silver in the U. S. in 1873. Silver, as compared with gold, has not fallen more than 30 per cent. Silver, therefore, as measured by commodities, has not fallen, but, on the contrary, the weight of testimony shows that there has been a slight appreciation of silver in spite of its demonetization.

The Secretary of the Treasury, Mr. Windom, in his annual report for 1889, page 73, arguing against the proposition to put more silver in the dollar, says: "The paramount objection to this plan, however, is that it would have a decided tendency to prevent any rise in the value of silver. Seizing it at its present low price, the law would in effect declare that it must remain there forever, so far as its uses for coinage are concerned." In all the centuries of the past no difficulty has been encountered in the question of using both gold and silver as money. For nearly a hundred years the two metals were at par at the French ratio of 15½ to 1. This condition remained till the U. S. and Germany demonetized silver, or, more correctly speaking, the par remained, notwithstanding the demonetization by the U. S. and Germany, till France suspended the coinage of silver. Had France continued the coinage, the par no doubt would still exist. To demonetize silver and thus cause a greater demand for gold, to compel gold to rise 50 per cent. and then insist that silver shall be coined at a ratio to meet the rise in gold, is a legislative confiscation of the rights of debtors. If this policy were generally adopted it would in effect demonetize at least 30 per cent. of the silver stocks of the world; in other words, it would eliminate about one billion two hundred million in value of silver now in circulation. It would also demonetize 30 per cent. of all the future productions of this metal. A restoration of silver by its enlarged demand and consequent enlarged value is demanded. The free use of silver will lessen the demand for gold and increase the demand for silver, thus causing gold to fall and silver to rise, and in this way the par of the two metals can be brought about without injustice to creditors or debtors.

R. P. BLAND.

Objections to the Free Coinage of Silver.—Some of the principal objections to the free coinage of silver will appear from the following paragraphs: By the Coinage Act of 1873 the standard silver dollar of 412½ grains was dropped out of the monetary system of the U. S. The act was not passed surreptitiously, as has sometimes been asserted by the silver-money men. It was recommended by the Secretary of the Treasury in three successive messages, the bill was printed thirteen times, considered through five sessions of Congress, and the debates concerning it occupy 140 pages of the *Congressional Record*. Nor did it drive silver out of circulation, because there were no silver dollars in circulation, very few having been coined since 1834 owing to the fact that it had been cheaper to coin gold than silver. Nor was it an attempt to injure the debtor class for the benefit of the creditor class, because at the time the silver dollar was worth 102 cents in gold and no debtor would choose to pay in silver. It is necessary to state these facts in order to show that free coinage of silver can not be demanded on the ground of an original injustice committed in 1873.

From 1873 to 1878 no silver dollars existed in the financial system of the U. S. In 1878 the silver-money men succeeded in passing the Bland-Allison bill restoring the silver dollar as legal tender, but providing for only a limited coinage, so that gold still remained the standard. In 1890 the Sherman act provided for the purchase of a larger amount of silver,

4,500,000 oz. per month, but at the same time declaring it to be the policy of the U. S. Government to maintain all dollars at a parity. Here also there was no adoption of free coinage. In 1893 the Sherman act was repealed so far as the purchasing clause was concerned, and in 1894, the President vetoed the bill for the coinage of the seigniorage. The U. S. since 1873 has therefore rested officially on the gold basis, and for the purpose of maintaining this basis it sold \$162,500,000 worth of bonds during 1894 and 1895. On this statement of facts we have the following conclusions:

(1) Free coinage of silver can not be demanded as a matter of justice. Since 1873 all contracts have been entered into on the gold basis, and no injustice has been committed by the Government toward the debtor class.

(2) It is impossible for the Government to maintain the price of silver. Notwithstanding the coinage of \$400,000,000 under the Bland act, and the purchase of \$152,000,000 under the Sherman act, the price has fallen from \$1.29 per ounce to 65 cents per ounce (1895). The fall in the price of silver is due, therefore, to the increased production of silver, not to its demonetization.

(3) Free coinage of silver would not restore its value. Even if it drove all the gold out of circulation the demand for silver as a circulating medium would be limited. If the value of silver went up temporarily an enormous stimulus would be given production, so that the supply would increase and the price would come down. The U. S. would also get silver from other nations who would be glad to unload on it.

(4) Free coinage of silver would therefore not establish bimetallicism, but would drive gold out, bring the U. S. to the silver basis and result in inflation of prices. It is said that this inflation would benefit the debtor class who have suffered so grievously during the last twenty years by the fall of prices. It is not probable that such relief would be attained. The first result of free coinage would probably be contraction of the currency by the loss of gold and sinking of values due to panic. All mortgages due would be foreclosed and the land thrown on the market, or the mortgages renewed only on a gold basis. On the other hand, the creditor class would be injured, and in that class are included all depositors in savings-banks, all beneficiaries of trust funds, and all small investors. All men living on fixed salaries would be injured, because the cost of living would go up. Finally, the laboring class would suffer from increased cost of living and because during inflation wages rise more slowly than prices.

Free coinage of silver would seem to be a very hazardous experiment, bringing more hardship and injustice than it remedies. It would remove the U. S. from the ranks of the great commercial nations with the gold standard. It would destroy public credit and lead to partial repudiation of debt. It would drive away the foreign investor of capital and retard the national development. Owing to the apparently unlimited supply of silver it would make the standard of value very uncertain, thus embarrassing all commercial dealings.

R. MAYO-SMITH.

Silver Creek: village; Chautauqua co., N. Y.; on Lake Erie, at the mouth of Silver creek, and on the Lake Shore and Mich. S., the N. Y., Chi. and St. L., and the W. N. Y. and Penn. railways; 9 miles E. N. E. of Dunkirk, 31 miles S. S. W. of Buffalo (for location, see map of New York, pt. 6-B). It is in an agricultural and grape-growing region, and contains manufactories of milling machinery and a weekly newspaper. Pop. (1880) 1,036; (1890) 1,678.

Silvering: See MIRRORS.

Silver-plating: See ELECTRO-PLATING.

Silverside, or Silver Fish: See ATHERINA.

Silver Stick: in the British court, a title borne by the lieutenant and the standard-bearer of the corps of gentlemen-at-arms; also by the field officer commanding any of the guard regiments. See GOLD STICK.

Silverton: town; capital of San Juan co., Col.; on the Animas river, and the Denver and Rio Grande and the Silverton railways; 285 miles W. S. W. of Pueblo, 494 miles S. W. of Denver (for location, see map of Colorado, pt. 5-B). It has an elevation of 9,400 feet above sea-level; is surrounded by high mountains, including the noted Sulfur Mountain about 2 miles distant; and contains gold and silver mines, smelting-works, a national bank with capital of \$50,000, a State bank, and two weekly newspapers. Pop. (1880) 264; (1894) estimated, 1,100.

Silvestre, seel'vest'r', THEOPHILE LOUIS: writer on art; b. at Fossat, in the department of Ariège, France, Oct. 12.

1822), was educated in the University of Padua and the College of Padua, and began to study law and medicine in Paris, but finally devoted himself entirely to the study of art. In 1833-35 he published *Notions des Artistes vivants*, which attracted much attention (Ed. ed. 1876). Afterward he visited England, published *L'Art des Artistes et l'Industrie des Artistes* (1846), and lectured on art in various cities in Belgium, etc. Among his other works are *L'Apollon de la France* (1861); *Le Musée de la France* (1864); and *Peinture moderne* (1868). D. in Paris, June 20, 1876.

Silvia, 54121, of Aquitania, in the south of France, sister of Rufinus, consul 395 A. D. Her tombing is highly prized by Palladius in his *Historia Rustica*, and to her is ascribed an interesting but incomplete description of a visit to the Holy Land, *Peripetia ad loca sancta*, discovered in a manuscript of the eleventh century at Arles, and edited for the first time by J. F. Marquardt (Rome, 1887), also by J. Parnisowsky (St. Petersburg, 1890). M. W.

Simarubaceae: a family of dicotyledonous trees or shrubs. The leaves are alternate and without glands, and each leafy-stem has only one ovary. The species are mostly inhabitants of warm regions, and the bitter bark of some yields QUERCIN (q. v.).

Simbirsk': government of Russian Russia; on the Volga, N. of Kazan, N. of Nijni-Novgorod. Area, 19,119 sq. miles. The surface is level and the soil fertile. Agriculture, breeding of cattle and horses, fisheries, and manufacture of coarse woollen and linen fabrics are the principal branches of industry. Rye, wheat, buckwheat, hemp, flax, and tobacco are the common crops. Pop. (1890) 1,645,400.

Simbirsk: capital of the government of Simbirsk, European Russia; on the Volga, to lat. 54° 19' N. (see map of Russia, 7-13). It manufactures leather, soap, and candles, and has an important annual fair, held in February. In 1864 and 1865 the town was almost destroyed by fires. Pop. (1890) 30,225.

Simcoe: a lake of Ontario, Canada; situated between Lake Ontario and Georgian Bay; 80 miles long and 15 miles wide, and about 100 feet above Lake Huron, into which it discharges itself through Lake Couchiching, the Severn, and Georgian Bay. Its area is 160 sq. miles. The shores are generally clothed to the water's edge with wood, and small fish are taken in its waters, and of its many islands, one, Snake Island, is a Chippewa Indian reservation.

Simcoe: post-village; capital of Norfolk County, Ontario, Canada; on the river Lynn, 7 miles N. W. of Port Dover; a junction of the "Jasp-line" and the Georgian Bay and Lake Erie Branch of the Grand Trunk Railway (see map of Ontario, ref. 5-13). It has a fine court-house and jail and some manufacturing interests, and is in a fertile region. Pop. (1891) 2,674.

Sim'oon [from Heb. *Sim'on*, lit., hearing with acceptance], the second son of Jacob and Leah (Gen. xxx. 20). He was exposed to the dying Jacob, and Moses passed by the well in silence (Deut. xxxiii.). The tribe of Sim'oon numbered 59,300 at the Exodus, but only 22,300 at the entrance into Canaan (Num. i. 23; cf. xvi. 14). Its territory was scattered, comprising districts wholly within the territory of the tribe of Judah, and tracts in Mt. Seir and Gedor. The tribe sank into obscurity.

Simoon, CHARLES: clergyman; b. at Reading, England, Sept. 24, 1769; educated at Eton and at King's College, Cambridge, where he obtained a fellowship 1788, taking holy orders in the same year. He was appointed vicar of Twelfth church, Cambridge, Jan., 1789, a post which he retained through life, and was distinguished as a leader of the Nonconformist party in the Church of England. He was active in the promotion of missionary enterprise, founding the Church Missionary Society, and organized a successful scheme for the purchase of advowsons or presentations to benefices in the Church of England, in order to secure their being conferred upon evangelical preachers, the fund established by him still having control of some sixty livings. His religious gatherings in Cambridge, known as conversation parties, were famous. D. at Cambridge, Nov. 19, 1830. He published a translation of Claude's *Essay on the Communion of a Sacrament*, to which he added notes and a hundred sermon-sermons, and subsequently published such outlines (2,229 in number) upon the entire Bible, *How Homiletic* (London, 1819-20, 17 vols.). His Works were edited by Rev. T. B. Horne in 21 vols. (1822-33), the best known being the several series of *Shedden-sermons*. His *Life* was written by

Rev. William Carr (1841). See ALDER W. Brown, *Recollections of Simoon's Conversion Parties* (1892); and H. C. H. Mundy, *Charles Simoon* (1893). Revised by S. M. Jackson.

Simoon Stylites (pillar-saint): is at Esau in the northern part of Syria about 300; grew up in solitude as a shepherd in the mountains of Amanus, but in his sixteenth year entered a monastery at Tenedos, where he distinguished himself by the severity of his ascetic practices. Finding the rules of the monastery too lenient, he afterward removed to Tylanassa, in the vicinity of Antioch, where he built a hut and determined to live as an ascetic; but soon his fame for his austere attracted swarms of visitors, and in order to escape their intrusion he placed himself on the top of a tall mountain, where he spent his days and nights, always standing, never resting, exposed to the severities of the climate, nourished by what was brought to him, and occupied by religious exercises. The first column he occupied was only ten feet high, but the last was sixty feet, with a platform four feet in diameter, and here he is said to have lived for about thirty years. He died Sept. 9, 489, and was buried in Antioch; and his example, which gained for him much admiration and even power during his lifetime, found many imitators after his death. The so-called pillar-saints, or stylites, were numerous in the Eastern countries, and did not wholly disappear until the twelfth century. Wulfelich, near Treves, on the Moselle, in Rhenish Prussia, about 560, was the only stylite in the West. Simoon's biography was written by his disciple Antonius, contained in the first volume of *Acta Sanctorum*, and by a contemporary abbot, Cosmas, presbyter of Thaur in Volagria, contained in *Antonius's Acta Monachorum*. Evagrius, in his history of the Christian Church, translated into English in Holm's Ecclesiastical Library, devotes a chapter (D. 13) to him, and describes (14) a visit he paid to the church which included Simoon's pillar. Count de Vogüé, in his *Syrie Centrale* (Paris, 1845-77, t. 141-154), describes his visit to the ruins of the saint's church, now called House of Simoon, which contains Evagrius. Revised by S. M. Jackson.

Simferopol, or **Simpheropol** (Gr. *Σιμφεροπολις*, Latin City): town of European Russia, in the Crimea; capital of the government of Taurida; railway station on the line from Lwow to Sebastopol (see map of Russia, ref. 14-15); beautifully situated on the Salghir, in a picturesque valley surrounded with gardens and orchards. It consists of a modern part, built by the Russians, and the old Tartar town, with its mosques, Tartar schools, and houses. Pop. (1891) 45,620.

Simi'ida [Mod. Lat., named from *Simia*, the typical genus, from Lat. *simia*, ape, monkey]: a family of mammals of the order *Primates* and sub-order *Anthropoidea*, containing the mammals most closely related to man. The form is considerably like that of man, but the anterior limbs are very elongate and the posterior relatively short; the spinal column has a slight sigmoid curve; the lumbar as well as the dorsal neural spines are directed more or less backward; the sacrum is large and solid, composed of four or five vertebrae, and tapers gradually backward; there is no tail; the sternum is broad and short. By all these characters the species are approximated to man. To this group belong two types—one containing large, simian species—i. e. the chimpanzee, gorilla, and orang utan, constituting the sub-family *Simiinae*—and the other comparatively small, slender species—i. e. the gibbons, or sub-family *Hylodinae*. The *Simiida* are peculiar to the Old World (the monkeys of the New World belonging to two different families—the *Cebida* and *Mediida*), and are confined to tropical Africa and Asia. See CHIMPANZEE, GORILLA, and ORANG UTAN.

Simile: See RHYTHM.

Sim'la: districts and town in the Panjab, British India; on the southern slopes of the Himalayas (see map of N. India, ref. 4-E); acquired by the British after the Gurkha war (1816) from the Rajah of Basahle (Bissau). Area of district, 15 sq. miles. Pop. 45,000. The town, 170 miles N. of Delhi, is the permanent abode of numerous Europeans, and during the summer the headquarters of the Government of British India, and the temporary home of Europeans from every part of British India. The houses are not massed together, the town being built according to the old-lage system; the lowest house stands at 6,817, the highest at 8,008 feet. The annual mean temperature has been calculated at 57.8°. There are five warehouses, good hotels, and eight schools for European children—excellent insti-

tutions which are in a flourishing condition. Splendid entertainments and balls are given by the viceroy and high functionaries who pass the summer here. Simla has a theater, a concert-room, Episcopal churches, and one Roman Catholic church. Pop. 13,000. See *Gazetteer of the Simla District* (1888-89). Revised by M. W. HARRINGTON.

Simmons, EDWARD EMERSON: genre and portrait painter; b. at Concord, Mass., Oct. 27, 1852; pupil of Boulanger and Lefebvre, Paris; member of the Society of American Artists (1888); honorable mention, Paris Salon, 1882; third-class medal, Paris Exposition, 1889; Temple silver medal, Pennsylvania Academy, Philadelphia, 1889. One of his best works is *The Carpenter's Son* (1890). He lived for several years at St. Ives, Cornwall, England, and painted there, exhibiting at the Royal Academy, London, and in Paris and New York. He visited the U. S. and painted portraits in New York and Boston in 1891 and 1892. Studio in New York. WILLIAM A. COFFIN.

Simms, WILLIAM GILMORE: novelist; b. at Charleston, S. C., Apr. 17, 1806; studied law, and was admitted to the bar 1827, but abandoned that profession for literature and journalism, publishing in the same year two volumes of *Poems*; became in 1828 editor of the *Charleston City Gazette*, a political journal of Union proclivities, which was discontinued during the nullification excitement of 1832, leaving him in poverty; resided at Hingham, Mass., 1832-33; wrote there his longest and best poem, *Atalantis, a Story of the Sea* (New York, 1833), and his earliest novel, *Martin Faber, the Story of a Criminal* (New York, 1833); returned soon afterward to South Carolina and settled at Woodlands, near Medway; wrote a series of romances founded on Revolutionary incidents in South Carolina, including the *Partisan* (1835); romances of colonial life, of which *The Yemassee* (1835) is considered the best; published 11 volumes of novelettes, collected tales, and essays; 2 volumes of *Views and Reviews in American History, Literature, and Fiction* (1845-46), collected from a large number contributed to the leading magazines and periodicals; a *History of South Carolina* (1840), a *Geography of South Carolina* (1843), and *South Carolina in the Revolution* (1854). He was several years a member of the South Carolina Legislature, and filled other political offices. D. at Charleston, S. C., June 11, 1870. His best works of fiction were republished in 19 vols. (London, 1853-59; new ed. 17 vols., 1865), under the title *Revolutionary and Border Romances of the South*, with illustrations by Darley. A copious selection of his *Poems* appeared in 1864. See the *Life* by George W. Cable in *American Men of Letters Series* (Boston, 1888).

Simon, Sir JOHN: surgeon and sanitarian; b. in England in 1816; was made professor in King's College, London; surgeon to King's College Hospital and to St. Thomas's Hospital; was the first medical officer appointed to the general board of health of the privy council, in which capacities his annual reports on sanitary science, dealing with important questions of the day in medicine, have been of great value. His *Physiological Essay on the Thymus Gland* (1845) gained the Astley Cooper prize of £300. He has received honorary degrees from the Universities of Munich, Dublin, Oxford, and Cambridge. Among his works are *Aims and Philosophic Method of Pathological Research* (1848) and *Lectures on General Pathology* (1850). He has contributed largely to the *Cyclopædia of Anatomy and Physiology* and to scientific and medical periodicals, and edited (with a prefatory memoir) Dr. J. H. Green's *Spiritual Philosophy, founded on the Teachings of the late Samuel Taylor Coleridge* (2 vols., 1865). Revised by S. T. ARMSTRONG.

Simon, sê'môn', JULES FRANÇOIS SUISSE: statesman and political writer; b. at Lorient, department of Morbihan, France, Dec. 31, 1814; succeeded Cousin as Professor of Philosophy at the Sorbonne in 1839, but was dismissed in 1851 on account of his opposition to the *coup d'état*; lectured in 1855 and subsequently on philosophy in various cities in Belgium; was elected a member of the Legislative Assembly for the department of Loire in 1863; offered a strong opposition to the policy of Napoleon III., the plebiscite of 1870, the declaration of war against Prussia, etc., and was a member of the Government for the national defense established on Sept. 4, 1870, and of the Government of Thiers, Feb. 19, 1871-May 24, 1873, as Minister of Public Education. During his term of office he carried through important reforms, but provoked the hostility of the clericals by his efforts to establish compulsory education. On Dec. 13, 1876, he became premier, but difficulties with the

president caused his resignation in May, 1877. Chosen senator for life in Dec., 1875, he has been one of the principal representatives of the conservative republican party. His writings are distinguished by clearness and precision, both of style and ideas, and some are the result of very comprehensive studies. Among them are *Histoire de l'École d'Alexandrie* (2 vols., 1844); *Le Devoir* (1854); *La Religion naturelle* (1856; translated into English by I. W. Cole, London, 1857); *La Liberté* (2 vols., 1859); *L'Ouvrière* (1863); *Le Travail* (1866); *La Politique radicale* (1868); *Le Libre échange* (1870); *Souvenirs du 4 Septembre* (1874); *Dieu, Patrie, Liberté* (1883); *Thiers, Guizot, Rémusat* (1885); and *La Femme du XX^e siècle* (1891). F. M. COLBY.

Simon, RICHARD: biblical critic; b. at Dieppe, France, May 13, 1838; entered the Congregation of the Oratory in 1859, but left it again in 1878: was for a short time priest at Belleville, but retired in 1882 to his native city; devoted himself exclusively to literary pursuits. D. at Dieppe, Apr. 11, 1912. His writings—*Fides Ecclesiæ Orientalis* (1871); *Histoire critique du Vieux Testament* (1878; Eng. trans., *A Critical History of the Old Testament*, London, 1882); *Histoire critique de la Créance et des Coutumes des Nations du Levant* (1884); *Histoire critique du Texte du Nouveau Testament* (1889; Eng. trans., *A Critical History of the Text of the New Testament*, 1889); *Histoire critique des Principaux Commentateurs du Nouveau Testament* (1892); *Nouvelles Observations sur le Texte et les Versions du Nouveau Testament* (1895)—form the first and, both on account of the consistency of the ideas and on account of the learning of his arguments, one of the most powerful manifestations of that theological standpoint afterward known as rationalism. They were violently attacked by the Port-Royalists, Bossuet, and other theologians. See his *Life*, by A. Bernus (Lausanne, 1869). Revised by S. M. JACKSON.

Simone da Pesaro: See CANTAVIUS, SIMONE.

Simonians: See SIMON MAGUS.

Simonides, si-mon'i-dêz (Σιμωνίδης), or **Semonides (Σημωνίδης)**, commonly called of **Amorgos**, though b. at Samos: Greek iambic poet who flourished about 625 B. C. He is known chiefly by a satirical poem—a manner of "Mirror of Women"—in which various types of women are represented as descended from various animals and from earth and sea. Only one type of the sex receives his commendation, the "bee-woman"; the rest are handled without mercy and with a kind of personal spite. The remains of Simonides were edited by Welcker (1835), and by Bergk in his *Poetæ Lyrici Græci*, vol. ii., p. 441 fol. (4th ed.).

B. L. GILDERSLEEVE.

Simonides (Gr. Σιμωνίδης): one of the greatest lyric poets of Greece; b. at Iulis, in the island of Ceos, about 556 B. C.; d. about 468 B. C. His sunny temper and his easy philosophy of life made him welcome wherever his vocation took him, whether he sojourned with the Pisistratidæ at Athens or among the Scopadæ and Aleuadæ of Thessaly. After Marathon, this encomiast of tyrants and oligarchs won the prize over Æschylus for his elegy on those who had fallen in the great battle, and his distich on the dead of Thermopylæ is the most famous in the range of literature. In Sicily he served as mediator between Thero and Hiero (476), and was a special favorite at the brilliant courts of Syracuse and Agrigentum. It was at the court of Hiero that he came into collision with his great rival, Pindar, who claimed for himself a loftier spirit and a truer inspiration; and the very wit and grace of Simonides, his ready sympathy with the spirit of the age, the mundane tone of his poetry, his almost sophistic dexterity have justified the claims of Pindar in the eyes of modern critics. Of his many lyrical poems a fragment remains to warrant what the ancients say of the perfection of his style in everything that he touched, of the exquisite tenderness of his dirges, in which he surpassed all rivals, and of his unequalled command over the resources of the epigram. His fragments were edited by Schneidewin (Brunswick, 1835), and by Bergk in his *Poetæ Lyrici Græci*, vol. iii., pp. 384-535 (4th ed.).

B. L. GILDERSLEEVE.

Simon Magus: a Samaritan of the apostolic age; b. Justin Martyr says (*Apol.*, i., 26), at Gitton, which has been identified with *Kuryet Jit*, a village near Nablus. He is described in Acts viii. 9-24 as a sorcerer, called by the people "that power of God which is called great," who was apparently converted by the preaching of Philip, and sought to purchase with money the power of imparting the Holy Ghost; whence the expression *simony*. Of his subsequent

blows the ancient accounts are utterly dissimilar. The Simonsians, one of the earliest of the Gnostic sects, living for several centuries, took their name from him, and he became a sort of archetypal of heresy.

Simonoski : another spelling of SIMONOSKI (q.v.).

Simony : in canon law, the buying or selling of ecclesiastical offices or benefices. It received its name from Simon Magus, who wished to buy of the apostles, for gold, the power of conferring the Holy Ghost (Acts viii. 18-24). By all Christian denominations simony is considered and denounced as a grave crime, but it has been nevertheless, at various periods, an almost universal practice.

Simoon (from Arabic *samūn*, a sultry pestilential wind, deriv. of *saḥḥa*, to poison) : a hot, scorching wind which comes to the sandy deserts when intensely heated by the sun, and blows, loaded with fine sand and dust, over Palestine, Syria, and Arabia. It generally occurs at the time of the equinoxes, and lasts for several hours. It is much dreaded, as it often proves fatal to animal life, partly on account of its heat, which rises to 120°, partly on account of the suffocating dust with which it is filled. Similar winds are the khamsin in Egypt, the samiel of Turkey, the *sirocco* of Italy, the *solano* of Spain, the *harmattan* of Guinea and Senegambia, etc.

Simplexibentia (Mod. Lat.; Lat. *simplex*, *non plicis*, simple, single & double, toothed, deriv. of *dens*, *dentis*, tooth) : a suborder of rodents. See RODENTIA.

Simplexius : a Neo-Platonic philosopher, native of Cilicia; flourished in the first half of the sixth century A. D. Nothing is known of his personal history except that he had as teachers Ammonius and Damascius, that he taught at Athens, and that he was one of the philosophers who, after the edict of Justinian (A. D. 529) closing the schools of philosophy at Athens, emigrated, at the invitation of King Khosro Nushirvan (Khosroes) to Persia, where their high hopes were doomed to disheartening disappointment, and whence, with the aid of the friendly king, they soon returned to Athens, to enjoy liberty of thought indeed, but not liberty to teach. Simplexius is known principally as a scholar and conscientious commentator on Aristotle. Of his commentaries we still possess those on the *Categorica*, the *Physica*, the *De Caelo* (see *Philosophical Museum*, vol. II, pp. 597, seq.), and the *De Anima* of Aristotle, and one on the *Zoölogica* of Epicurus. Besides these, he is known to have written one on Aristotle's *Metaphysics*. Like most philosophers of his school, he makes no claim to originality. Adopting unquestioningly the doctrine of Plato, he endeavored to bring those of Aristotle into harmony with them by showing that, however much they may conflict in appearance, they do not do so in reality. He was a great admirer of Chaldean and Orphic lore. THOMAS DAVIDSON.

Simplon, Fr. pron. *sâ plô* (Ital. *Sempione*, Germ. *Simplon*) : village and mountain-pass near the boundary between Valais and Piedmont; famous for the military road which Napoleon I. built here from 1800 to 1806. That much-admired piece of engineering, extending from Brig to Domod'Osola, 42 miles long and 30 feet wide, with several long tunnels, 611 bridges, and 10 houses of refuge, was, after the Brenner Pass, the first carriage-road across the Alps. The culminating point is 6,218 feet above the sea. Near by, at the base of Monte Leone (10,977 feet), a hospice has been erected for the gratuitous accommodation of travelers. The scenery on the southern slope is grand and severe to the extreme.

Simpson, ALEXANDER RUSSELL : obstetrician and gynecologist; b. at Bathgate, Scotland, Apr. 20, 1833. He was educated at Edinburgh University, where he graduated M. D. in 1856. Afterward he studied on the Continent, and on his return to Edinburgh was assistant to Sir James Y. Simpson from 1856 to 1865. He practiced in Glasgow from 1865 to 1870, when he returned to Edinburgh University to fill the chair of Professor of Midwifery and the Diseases of Women and Children. He was president of the Obstetrical Society of Edinburgh 1870-77, 1883-85, and 1892-93; president of the Medical-Chirurgical Society of Edinburgh 1890-91 and president of the Royal College of Physicians of Edinburgh 1892-93. He was author of *Sir James Y. Simpson's Clinical Lectures on the Diseases of Women* (Edinburgh, 1877); author of *Contributions to Obstetrics and Gynecology* (Edinburgh, 1896), and of many papers and lectures published in the *Edinburgh Medical Journal* and *British Medical Journal*. S. T. ARMSTRONG.

Simpson, Sir GEORGE : b. at Lochbroom, Ross-shire, Scotland, about 1796; accompanied the Earl of Selkirk, who employed him in the establishment of his Red River colony, in Canada 1820; pushed his settlements northward to Athabasca Lake in rivalry with the Hudson Bay Company, and after the two companies had concluded (1821) received the appointment of governor of Rupert's Land and of general superintendent of the affairs of the Hudson Bay Company. He planned the successful expedition under his nephew, Thomas Simpson, 1836-39, which traced the coast of the Arctic Ocean from the mouth of Mackenzie river to Point Barrow, and from the mouth of Coppermine river to the Gulf of Boothia. He made an overland journey around the world 1841-42, of which he published a *Narrative* (2 vols., London, 1847); was knighted in 1855. D. at Lochbroom, near Montreal, Canada, Sept. 7, 1893.

Simpson, JAMES HENRY, A. M. : soldier; b. in New Jersey, Mar. 9, 1813; graduated at the U. S. Military Academy July 1, 1832, and was assigned to the artillery; was mainly in garrison until 1838, when transferred to the topographical engineers with rank of first lieutenant (captain 1856, major 1861, lieutenant-colonel of engineers 1865), and was thenceforward engaged on the survey and improvement of lakes and harbors, and on lighthouse and Coast Survey duty until 1859; was then appointed chief topographical engineer with the army in Utah, and opened a wagon-route from the valley of Great Salt Lake across the Great Basin of Utah, by which the journey to the Pacific coast was shortened some 200 miles; a report of which he submitted early in 1861. In the early days of the civil war he served as mustering officer in Ohio and chief engineer of department of the Shenandoah. He was appointed colonel of the Fourth New Jersey Volunteers Aug. 12, 1861, and in the Virginia Peninsula campaign led his regiment in the action at West Point and in the battle of Gaines's Mill, where he was taken prisoner and held until Aug., 1862. On his release he resigned his volunteer commission, and thereafter served as chief engineer of the department of the Ohio and had general charge of fortifications in Kentucky till the close of the war. In Aug., 1863, he was detailed as chief engineer of the Department of the Interior on proposed change of route of the Union Pacific Railroad, W. from Omaha, and served as Government commissioner of that road until 1868; subsequently engaged in the regular line of duty with his corps, in which he attained the rank of colonel in 1867; was brevetted colonel and brigadier-general; retired 1880. D. at St. Paul, Minn., Mar. 2, 1888. Revised by JAMES MERCUR.

Simpson, Sir JAMES YOUNG, M. D., D. C. L. : obstetrician; b. at Bathgate, Scotland, June 7, 1811; educated at the University of Edinburgh and at the medical school of the same institution, taking his degree 1832; lectured there on pathology 1836; became Professor of Midwifery 1840; introduced the use of chloroform as an anæsthetic 1847; became president of the Royal Society of Physicians at Edinburgh 1849, and of the Medical-Chirurgical Society 1852; foreign associate of the French Academy of Medicine 1853; received the Montyon prize for his introduction of anæsthesia 1856; was made a knight of a Swedish order about 1854; was created a baronet 1867, and enjoyed an exalted reputation, not only as a skillful medical practitioner but as an eminent antiquarian. D. in Edinburgh, May 6, 1870. In 1871 his principal works were collected under the title *Selected Obstetrical Works, Anæsthesia and Hospitalism, and Clinical Lectures on the Diseases of Women*; and his *Archæological Essays* appeared in 1872.

Revised by S. T. ARMSTRONG.

Simpson, JOHN PALGRAVE : author; b. at Norfolk, England, in 1805; was educated at Corpus Christi College, Cambridge; traveled for several years on the Continent, and published *Second Love* (1846); *Giulia and Letters from the Danube* (1847); *Lily of Paros; or, The King's Nurse*, and *Pictures from Revolutionary Paris* (1848). After his return to England, in 1850, he wrote with success for the stage—*The World and the Stage*, *Syllabus; or, Step by Step*, etc.—in all about forty pieces of various kinds. He also published a *Life of Karl Maria von Weber*. D. in London, Aug. 19, 1857. Revised by H. A. HARRIS.

Simpson, MATTHEW, D. D., LL. D. : scholar; b. at Cadiz, Harrison co., O., June 20, 1810; graduated at Madison College, Pennsylvania, 1822, and was tutor in the same institution 1824-25; studied medicine and received the degree of M. D. 1828; was licensed the same year in the ministry and joined the Pittsburg Conference of the Methodist Episcopal

Church; became vice-president and Professor of Natural Science at Allegheny College 1837; president of Indiana Asbury University at Greencastle, Ind., 1839; editor of *The Western Christian Advocate* 1848, and was elected bishop 1852. He was an intimate friend of President Lincoln, at whose request he devoted much of his time during the civil war to the maintenance of public sentiment in behalf of the Union by addresses in many Northern cities, being also employed by the Government in several important confidential commissions. In 1863-64 he made an extended tour of inspection of the missions of his Church in Syria and the East generally, and traveled through several countries of Europe upon a similar errand. He visited the Mexican missions 1874, and the European mission conferences 1875, and on his return became a resident of Philadelphia. Author of *A Hundred Years of Methodism* (1876); *Cyclopædia of Methodism* (1879); *Yule Lectures on Preaching* (1879); and *Sermons* (1885). D. in Philadelphia, June 18, 1884. See his *Biography*, by G. R. Crooks (New York, 1890).

Revised by A. OSBORN.

Simpson, THOMAS: mathematician; b. at Market-Bosworth, Leicestershire, England, Aug. 20, 1710; was in early life a weaver, but became an accomplished mathematician by private study; was for some years a teacher in Derby and in London; became Professor of Mathematics in the Royal Military Academy at Woolwich 1743, and a fellow of the Royal Society 1745; and published many ingenious papers on pure mathematics and physical astronomy. He published works on fluxions, the laws of chance, doctrine of annuities, algebra, geometry, and trigonometry. D. at Market-Bosworth, May 14, 1761.

Simrock, KARL: poet and author; b. at Bonn, Germany, Aug. 28, 1802; studied jurisprudence in his native city and in Berlin; entered the Prussian civil service, but was dismissed in 1830 on account of a song he wrote on the revolution of July in Paris; devoted himself to literature, and studied especially the old German language and literature, of which he was appointed professor at Bonn in 1850. His chief poetic work is *Wieland der Schmied* (1835), one of the best epic poems of modern German literature, in which the old hero-legend is successfully revived. He translated with excellent taste and remarkable skill the *Nibelungenlied* into modern German (1827); several works of the minnesingers: the *Edda* (1851); *Beowulf* (1859) and *Heliand* (1856); Shakespeare's *Sonnets* (1867); Tegner's *Frithiof's Saga* (1863); and many other medieval works of poetry. He also published a *Handbuch der deutschen Mythologie* (1864); *Die Rheinsagen* (1836); *Deutsche Volksbücher* (1839-67); *Quellen des Shakespeare* (1831), and other works. D. at Bonn, July 18, 1876.

Revised by JULIUS GOEBEL.

Sims, GEORGE ROBERT: journalist and dramatist; b. in London, Sept. 2, 1847; was educated at Bonn; entered journalism, and contributed to the press the *Dagonet Ballads* (1879); *Three Brass Balls* (1880); *The Social Kaleidoscope* (1880); *Ballads of Babylon* (1880); *The Theatre of Life* (1881); *How the Poor Live* (1883); *Stories in Black and White* (1885); *Mary Jane's Memoir* (1887), etc. His letters to the *London Daily News* on the condition of the poor attracted much attention, and led, in part, to the appointment of a royal commission. Has written with success for the stage—*The Lights of London* (1882); *The Romany Rye* (1883), etc.

H. A. BEERS.

Sims, JAMES MARION, M. D., LL. D.: surgeon; b. in Lancaster co., S. C., Jan. 25, 1813; graduated at South Carolina College, Columbia, 1832; studied medicine at Charleston and Philadelphia, graduating M. D. at Jefferson Medical College 1835; in 1836 entered upon the practice of his profession at Montgomery, Ala.; in 1845 called attention to his new theory of the nature and origin of trismus nascentium, and also to the subject of vesico-vaginal fistula, inventing instruments and an operation for the cure of that lesion. He urged the use of metallic sutures in every department of general surgery. In 1852 he published a full account of his discovery in *The American Journal of Medical Sciences*. In 1853 he settled permanently in New York. His investigations of the diseases peculiar to women early led him to perceive the importance and necessity of establishing a great permanent woman's hospital in New York, and a temporary hospital was opened in May, 1855. Dr. Sims was elected attending surgeon, with Drs. Mott, Francis, Stevens, Green, and Delafield as a consulting board. In 1857-58 he obtained from the Legislature a charter for the Woman's Hospital of the State of New York, and the city of New York

granted a site on which a hospital was built. In 1861 Dr. Sims went to Europe, and he operated in Dublin, in London, in Paris, and in Brussels. He received decorations from the French, Italian, Spanish, Portuguese, and Belgian Governments as a public benefactor. In 1868 he returned to New York. In 1870, on the breaking out of the Franco-German war, he organized in Paris the Anglo-American Ambulance Corps, took charge of it as surgeon-in-chief, and went with it to Sedan. Soon after this Dr. Sims returned to New York. To his labors and discoveries are mainly due the establishment of the science of gynecology as a new department in medicine, recognized by a special professorship in all well-organized medical colleges. Dr. Sims was a corresponding member of many learned societies in the U. S. and Europe, notably of London, Edinburgh, Berlin, Christiania, etc., and of the Royal Academy of Medicine of Brussels. He was elected president of the American Medical Association at its meeting at Louisville, Ky. D. in New York, Nov. 13, 1883. There is a monument of him in Bryant Park, New York. See his autobiography, *The Story of my Life*, edited by his son, H. Marion Sims, M. D. (1884).

Revised by S. T. ARMSTRONG.

Simulation: See FEIGNED DISEASES.

Sinai, sī'nā, or sī'nī [from Heb. *Sinay*; cf. *Sin*, the wilderness of Sin, liter., clay]: (1) a triangular peninsula of Arabia Petraea, between the Gulfs of Suez and Akabah. Its apex points S.; its base is 150 miles across from gulf to gulf; its western side 186 miles long, its eastern side 133, and its area about 11,500 sq. miles. First comes the wedge-like protrusion of the limestone plateau known as the Desert of the Wandering, then a sandstone belt, and finally the mountain-masses of granite and porphyry, flanked right and left by narrow strips of lowland bordering the gulfs. These mountains may be divided into three groups, the highest peaks of which, respectively, are Serbal (6,734), Catharine (8,526), and Shomer (8,449). The ancient Egyptians called this peninsula "the land of the gods." Its solitary grandeur impresses all travelers alike. Mines of iron, copper, and turquoise were once worked here. It is still the home of about 5,000 Bedouin. The curious inscriptions, found mostly on the western side of the peninsula, are generally in the Nabataean character, and the Nabataeans were, about the beginning of the Christian era, the chief traders between Egypt and Assyria. They were an Arab people living on the east and southeast of the Holy Land. Some of the inscriptions are Greek and a few Coptic. With them are rude drawings. The whole was probably the work of caravans between 200 B. C. and 400 A. D., and of no more importance than such scratchings usually are.—(2) Used in the Old Testament interchangeably with Horeb to designate the Mountain of the Law. Lepsius and others have tried to identify it with five-peaked Serbal, the most picturesque of all the mountains of the peninsula; but the true Sinai is a gigantic mass, about 2 miles long from N. to S., and about half a mile wide from E. to W. Its southeastern peak, called Jebel Musa, is the traditional scene of the giving of the Law; but there was not open space enough on the south side of the mountain to accommodate the Hebrew host. Its northwestern peak, called Sufsafeh, overlooks three wadies (Rahah, Deir, and Leja), which might easily have held 3,000,000 or 4,000,000 people; and there is no other such spot anywhere in the whole peninsula. Here the Israelites encamped for a year, and here the Law was given. The watershed at the foot of Sinai is 5,140 feet above the sea, Jebel Musa 7,359, Sufsafeh a little lower. The famous convent of St. Catharine, in whose library Tischendorf discovered the Sinaitic Codex of the Scriptures (in 1844), and Mrs. Agnes Smith Lewis the oldest text of the Syriac Gospels (in 1893), is on the east side of the mountain.

Revised by S. M. JACKSON.

Sinaitic Inscriptions: See CODEX SINAITICUS.

Sinaloa, sī-nāā-lō'ā (sometimes written CINALOA): a northwestern maritime state of Mexico, bounded by Sonora on the N. W., Chihuahua and Durango on the N. E., Tepic on the S. E., and the Pacific and the Gulf of California on the S. W. (see map of Mexico, ref. 4-D). Area, 36,184 sq. miles. The eastern and northeastern parts are covered with spurs and terraces of the Sierra Madre, which have a true mountainous character, and sometimes attain 6,000 feet in altitude; on their slopes are extensive oak forests, and the valleys are very fertile. The coast belt is low, and in parts unhealthy; there are many lagoons near the gulf. Several rivers cross the state, flowing down from the Sierra

Madras, but none of them is navigable. The greater part of the coast is in the temperate zone; in general, however, the climate of the coast belt is essentially tropical, and the interior lands have a mild and equable climate (tropical temperate). The rainy season (June to September) is well marked in the hills, but in parts of the coast belt the rainfall is insufficient for agriculture and the vegetation is scanty. The state is rich in gold and silver, and mining is the most important industry; agriculture is generally on a small scale, sufficient only for home consumption. There are considerable manufactures of cotton cloths, etc. Pop. (1881 estimated), 945,733; a large proportion are Indians or mixed races. Capital, Calicut; chief port, Madras. Among the ancient capital cities N. N. W. of Calicut, on the coast, Calicut, had formerly 10,000 inhabitants, now reduced to 5,000. D. H. S. S. S.

Sikapis: See Sikapis.

Sikapis, Sir James: author, b. at Thorne Castle, Wiltshire, England, May 10, 1734; educated at the University of Edinburgh, Glasgow, and Oxford; became a member of the Faculty of Advocates at Edinburgh 1755; was called to the bar at Lincoln's Inn 1782; published *History of the Public Revenue of the British Empire* (3 vols., 1785-86); was made a baronet in 1790, took up the post of Thorne; was induced to working the fisheries and in establishing the Scottish Society of Woolgrowers (1790) and Board of Agriculture (1791), of which associations he was the first president; maintained an extended correspondence with Gen. Washington and in Parliament with brief interruptions from 1790 to 1813; compiled *A Statistical Account of Scotland, drawn up from the Communications of the Ministers of the Different Parishes* (Edinburgh, 21 vols., 1791-99); wrote in all 39 volumes and 367 pamphlets, covering almost the whole range of literature, being aided therein during his later years by his daughter Catherine, who became eminent as a novelist. D. in Edinburgh, Dec. 21, 1813. — His eldest son, Sir George, b. in Edinburgh, Oct. 25, 1770, was for some years a member of Parliament, and wrote several works against Roman Catholicism. D. in Edinburgh, Oct. 9, 1802. — Another son, John, b. in Edinburgh, Aug. 20, 1777, was archdeacon of Middlesex from 1842; published *Memoirs of his father* (3 vols., 1817), and *Nicholas of Old Times* (1875). D. in London, May 25, 1875.

Sikapis River: See St. Clara River.

Sindh, Sind, or Seindia: western province of British India, adjoining Baluchistan; part of the Bombay Presidency; on the lower Indus, W. of Baluchistan and N. of the River of Ravi. Area, 47,729 sq. miles, or including the tributary state of Khairpur, which forms a part of it administratively, 54,490 sq. miles. It occupies the Indus delta, and is for the most part unbrokenly nearly level, with many dead and few live watercourses. The desert of Thar occupies its western part and that of Sukkur the northwest. The soil is sandy or clayey, and is much impregnated with salt and alkali. It lacks the monsoon and rain in some parts is almost unknown. The Indus bears to it the same important relation that the Nile does to Egypt. The climate is generally hot and the extremes great. It is considered unhealthy, and is especially subject to fevers and cholera. Only 7 or 8 per cent. of the land is cultivated, and nearly all of this has to be irrigated. The canals have a total length of about 3,000 miles. There are two annual crops; those of the spring are chiefly cereals, legumes, and oil-seeds. The second harvest yields millet, rice, and cotton. The fruits are numerous and excellent. The fauna includes the tiger, hyena, wolf, fox, mung, wild boar, antelope, and deer. Fishing was an important industry, and dried fish are exported. The population in 1891 was 3,974,774 for the districts of Sindh and 1,046,161 for Khairpur, an increase since 1881 of nearly 20 per cent. in the districts, but a decrease for Khairpur. The inhabitants are mostly Mohammedans, including the indigenous Sindhis, formerly Hindus, now Samitis. These form about half of the population; they are tall, robust, athletic, and fair, are without caste, have a pure Neo-Sanskrit language of great interest, with a small literature, chiefly historical and from Arabic sources. The capital is Karachi (see Karachi); pop. (1891) 165,129. A railway extends from this place up the Indus to the Punjab, with a branch from Sukkur into Baluchistan. This is a very ancient country historically. It was probably visited by the Persians under Sogdian, and by one of the generals of Alexander the Great. It probably formed a part of the Gissos or Juk-district, kingdom. The second city of Patala was

once its capital, and it is supposed that Haidarabad, a later capital, occupies the site. It has undergone remarkable political revolutions, and the variations in the course of the Indus have made its physical changes more remarkable. It contains numerous cities of towns and cities, often in locations now entirely untenable because of lack of water. It became a British province in 1843. See Ross, *The Land of Five Rivers and South, Northern History and Description* (1891). MARK W. HARRISON.

Sin'dia, or Seindia: the dynasty named the most powerful of the native Malabar princes of India, having their capital at Swat. The family took its rise in the person of Hadrat Sura, a low-caste ruler of the Malabar country, who rose to a high rank in the body-guard, and in 1740 received as a fief half of the province of Malabar.—His son, Muzumdar (d. 1794), joined the Malabar confederacy, fought against the Afghans at the great battle of Panipat (1791), became a useful ally of the Emperor of Delhi, expelled the Sikhs from Panipat, India, and became virtual ruler of the empire; fought against the British 1770-82; was confirmed in his possessions by the treaty of 1782, captured Swat (1784), acted as Delhi and Agra; reduced the Rajput states, and formed a vast army, well disciplined by French adventurers.—His grand-son and successor, Daulat Rao Sinha, ruled from 1794 to 1807; waged war with varying success against the rival family of Holkar; was defeated by Sir Arthur Wellesley (afterward Duke of Wellington) at Assaye, and by Lord Lake at Laswari, and submitted to British influence, but retained his capital and a portion of his territories.—Rao Rao Sinha (1843-50) was a loyal ally of the British during the mutiny of 1857-58.

Sin-gan-fu, sing-gan-fu, or Si-an-fu (sometimes Si-nan-fu): city of China; capital of the province of Shensi, and the capital of the empire during some of its most famous dynasties—e. g. the early Han (202 B. C.-24 A. D.), the Tang (618-907 A. D.), and the Sung (960-1127). It is splendidly situated in the basin of the Wei, the most important affluent of the Yellow river, and is surrounded by great importance. Its walls, which have a circuit of 24 miles, are well built, and its pavilioned gates surpass in magnificence those of Peking. It is the seat of a Roman Catholic bishopric, and contains the oldest mosque in China, founded about 1,100 years ago. In 1808-71 the city and surrounding country suffered much from the Mohammedan rebellion. Pop. about 200,000. Here in 1857 was found an immense tablet covered with inscriptions in Chinese and Syriac, and dated 827 A. D., recording the establishment of Christianity in this neighborhood by the Nestorians in the fourth century. See Yule's *Book of Ser Marco Polo* (3d ed., 1876). R. L.

Singapore: an island at the extremity of the Malayan Peninsula. It contains the town of Singapore, founded by the Malays 1283, ceded to the British by the Sultan of Johor 1819, and rendered a free port in order to strike a blow at the Dutch; became in 1833 the capital of the Straits Settlements (see map of East Indies, vol. 6-11). The area of the island is 297 sq. miles; the surface varies from 20 to 80 feet above the sea-level; low hills are numerous, varying from 50 to 200 feet; Bakensta, a hill in the center of the island, has a height of 517 feet. The climate is agreeable to Europeans; the mean annual temperature is 80° F.; during the day the heat is intense; the atmosphere is very moist, there being usually a fall of rain every week. The drainage of the town, formerly as bad as possible, has been considerably improved. The women's hospital is an excellent building, well adapted for its purpose and well attended to. The population of the island was 184,554 in 1891, of whom 121,508 were Chinese, 55,002 Malays, 16,003 natives of India, and 2,160 whites. The city was once a dreaded lurking-place for pirates, but developed into a great commercial center of the Malayan Archipelago, doing in 1891 a total business in native produce and foreign goods of \$232,490,724. Numerous harbors on the Malayan Peninsula, especially Pulo-Penang, in Borneo, in Sumatra, in Siam, and Cochin-China, formerly traded exclusively through Singapore, but afterward established direct communications. The city had 410,000 inhabitants in 1891. The port has excellent docks and is strongly fortified. It has considerable trade with the U. S., and is connected by telegraph with Madras, Java, Australia, and Japan. See STRAITS SETTLEMENTS. Revised by M. W. HARRISON.

Singh, RUMART: See RUMART SINGH.

Singhalose (the people and language of CEYLON (q. v.).

Single Tax: a term which has come into use since 1887 to denote the proposal, theory, or movement which aims at the collection of all public revenues from one single source, what in political economy is termed "rent," the value of land itself, irrespective of the value of any improvement in or on it; or, to adopt another form of statement, a proposal or movement which aims at the appropriation of economic rent, the "unearned increment of land values" to public uses, by means of taxation.

These two forms of statement, though often indiscriminately used, since the practical method of reaching the single tax from existing conditions is "to abolish all taxation save that on land values," are suggestive of two different points of view—the fiscal and the moral—that of governmental expediency and that of social justice. Although social justice must really include governmental expediency, the argument for the single tax may perhaps be most concisely put by presenting it first from the narrower and then from the wider of these standpoints.

From the fiscal side, the single tax offers the cheapest and in all respects the best mode of raising public revenues. Every owner of a valuable estate has the power of raising revenue from those who use it. He may, as was largely the custom of feudal landlords, require from his tenants a multiplicity of payments, conditioned on what they may do or have—as on the building or repairing of houses, the growing of crops, the engaging in certain occupations, the possession of certain amounts or forms of wealth, the bringing in or taking out of goods; or even on such occurrences as births, deaths, or marriages. But reason and experience both show that the largest revenue can be raised with the least trouble and expense by substituting for such small exactions one single charge or rent, and this has become the custom of enlightened landlords. Now the taxing power of the state is simply that of the superior landowner or "over-lord" of a certain area. It exists only within that area, and, as in the case of the individual landlord, is limited by what people are willing to pay for the privilege of living in it. For though the state still retains the power of seizure and punishment, which once belonged to the larger landlords (the "right of pit and gallows"—i. e. of life and death—having in Scotland been taken from them only in comparatively recent times), this avails nothing in the raising of permanent revenues. If taxes be imposed beyond a certain point in any given area, men will refrain from coming into it, those already there will leave if they can, and those who can not leave will become impoverished and finally starve and die. There are many instances of populous cities reduced to ruins and fertile districts to deserts by ill-laid and excessive taxation.

Thus the same principles that enable the individual landlord to raise the largest revenue with the least waste, cost, and trouble, by a single rent-charge, apply in the case of public revenues; and the common-sense way for the state or any of its subdivisions to obtain revenues is by a single tax on the value of land. The attempts of governments to raise revenues by other taxes are really as stupid and barbarous as would be the resort of an individual landlord to petty feudal exactions. Such taxes invite evasion, fraud, and perjury; they require an expensive array of tax-gatherers, and even then can not be fairly assessed or fully collected. They check production, lessen accumulation, and take from the people much more than the state receives. The waste involved in the more important of them is not merely in the expenses of trying to collect them and of trying to evade them. Taxes on imports, taxes on internal production or exchange, taxes on capital in any of its forms, nearly all license taxes, and all that part of real-estate taxes that rests on buildings and improvements do not really fall on those who pay them to the state, but with added interest and profits finally fall upon the ultimate user or consumer. These taxes are really of the nature of that most destructive of fiscal devices, the farming of revenue.

Since a tax on the value of land is not a tax on land, but on an advantage accruing on specially desirable land, which can in no case go to the land-user as user, it can not check production, or lessen the return from use or improvement, or be shifted from shoulder to shoulder, increasing in weight as it goes. Avoiding all the waste, loss, and fraud of indirect taxes, it also avoids the evasions and injustice that attend attempts to tax incomes of all kinds, and is of all possible taxes that which may be most cheaply, certainly, and equitably obtained. It can not be evaded. It must fall on the owner, wherever he may be, taking from him, not in

proportion to anything his labor or capital may have contributed to the general wealth, but only in proportion to the unearned income which the adjustments of the state give him the special privilege of receiving. Land can not be concealed or removed, and its value can be ascertained with greater ease and certainty than any other value. A small sign on each separate piece of land, giving boundaries, area, and valuation, would bring public knowledge and opinion to the aid and correction of the assessment, while under a proper system the collection would involve little more than the clerical labor of receiving. In the U. S., as taxes are levied on land-values for state and local purposes in the tax on real estate, and as the percentage needed for national purposes could be collected by the same system, the substitution of this one method of raising public revenues for the complicated system in use would involve no new machinery, but only the abolition of many offices and the great lessening of corruptive and demoralizing agencies.

From the Moral Side.—The perfection of the single tax as a fiscal measure does not, however, account for the rapid spread of the idea and the ardor it excites. These come from its moral side, in which it is apprehended as the easy, yet, under the conditions of the times, the only possible way of relieving undeserved poverty, establishing social justice, and avoiding that monstrous inequality in the distribution of wealth that is so rapidly developing destructive tendencies in modern civilization. The argument from this side may thus be briefly stated:

The equal right to land flows from the right to life, and is the corollary of the right of property, or exclusive right of the producer to the product. In the rude stage of social life, where a simple industry seeks to satisfy primary need from the spontaneous offerings of nature, the equal right to the use of land and the exclusive right to the products of labor are secured when all have free access to the land ranged over by the tribe, and each may dispose of what his efforts obtain. But as society begins to take settled form, the division of labor begins to separate occupations, and a higher use of land calls for the use of capital, social order, industrial necessities, and the recognition of the right of property, all require such exclusive possession of land as shall assure to him who plants that he may reap, and to him who builds that he may enter in. This need becomes wider as civilization advances and improvements become more costly and industry more complex.

But no matter how far civilization advances, the exclusive right of property need never interfere with the equal right to the use of land. For these rights are correlative, the one involving the other, and the denial of one being really a denial of the other. Thus to deny to a man his equal right to the use of land is to deny him the benefits of his own labor, and to compel him to yield that labor or its products without due return. So far from the right of property making it necessary to attach to land that right of ownership which by natural law attaches to things temporarily drawn from land by labor, such treatment of land is as truly a denial of the right of property as making property of men. Between chattel slavery, the rude method of appropriating labor, and industrial slavery, the more civilized method, the difference is only of form. In the one, the man himself is treated as the property of another; in the other, the land on which the man must live is treated as the property of another. The result in either case is robbery, and robbery that may go to the same pitch. To the chattel slave must be left enough of his earnings to support life. Are there not to-day in so-called free countries great bodies of men who think themselves fortunate to get this?

In the relations of individuals with each other we find no difficulty whatever in combining exclusive possession with equal rights to use. A man may leave a horse, a ship, a building, or anything else incapable of division, to his children or to others equally; or such equal rights may be acquired in daily transactions without difficulty being encountered. Where a right to use can not be divided, its value may. So the exclusive possession of land called for by social advance need involve no denial of the equal right to use. That equality may be secured in a way permitting the best use of land by requiring from him who is accorded exclusive possession of any piece of land a contribution to common uses equivalent to any advantage it gives over that obtainable from the best land that others are free to use. There is nothing new in this. The principle lay at the base of feudal tenures, and is applied partially in Chicago, where the equal right of the whole community to the use of a cer-

same piece of land now covered with very valuable buildings, the property of individuals, is recognized by the appropriation of the ground-rent to municipal expenses; and there are similar examples in many other cities. The special advantages attaching to the possession of any piece of land is always exactly measured by ground-rent, since it is what gives value to land itself. By taking that, and that alone, for common needs, the equal right to land and the exclusive right of property may both be secured in any stage of civilization, however advanced, and the society placed on the only enduring basis, that of exact justice between man and man.

Economic considerations and moral considerations both point to a complementary relation between the need for public revenues and the value of land. If we consider the appearance, growth, and direct cause of the two phenomena, the connection becomes irresistible; and the same recognition by which we see that the milk secreted in the mother's breast is intended for the sustenance of the babe shows us to what values the intended provision for public revenues.

In that primitive social condition in which land may be left to free access, the state exists only in the rudimentary form of patriarchal authority or an occasional council, and there is no need for regular public revenues. The division of labor, which is the mark and measure of civilization, does not yet require that some men shall devote themselves to public service; there are no courts or schools to maintain; no roads to make, no public buildings to erect; no streets to pave and clean and sewer; none of the public needs of civilization to provide for. In this social condition land has no value whatever, for land has no original value, such as attaches from the first to things produced by labor. But the same advance in civilization that brings the need for public revenue attaches value to land; and while, by lessening the cost of production, it tends steadily to lessen the value of products of labor, it as steadily tends to increase land-values. When a few self-contained families roamed over Manhattan Island there was no need for public revenue and no value to land. In New York to-day immense public expenses are needed to meet legitimate public wants, and land has such an enormous value that the most costly and towering buildings are not so valuable as the bare land they cover.

This we may see wherever civilization centers. The same social advance which by increasing public needs calls for larger public revenues, correspondingly, and even more than correspondingly, increases the value of land. The reason is that the integration of individuals, to which civilization consists, besides increasing the power of individual exertion to satisfy desires, develops in the society itself an additional power of satisfaction which tends to localization, not merely bringing out important differences in the original qualities that adapt land to the satisfaction of human desires, but, in places where exchanges center, attaching enormous value to mere standing-room. It is not only that all public improvements, material, political, and even moral, increase this "unearned increment"; it also grows by private improvement, for the erection of a beautiful dwelling, the opening of a good hotel, or well-appointed store, or of a mine or factory, or even improvement in the personal qualities or conditions which make people more desirable neighbors, localize an advantage that becomes tangible in land-values. The adoption of the single tax itself, while it would destroy speculative rent, would, by promoting general prosperity and so vastly increase the aggregate of economic rent, the value attaching to land itself.

"Rent" is not produced by land, which is but the passive factor in production; not yet is it produced by the landlord, who as landlord contributes no more to production than could a sunlord or air-lord. The active factor in all production is human exertion or labor, of which capital (wealth applied to further production) is a subdivision. In the most primitive form of industry the whole product goes to labor as wages. In the next higher form it is distributed between the economic terms labor and capital, in wages and interest; but in that still higher form of industry which comes as the point in social development when a value begins to attach to land, the distribution of the product is in wages, interest, and rent. This distribution is a matter of natural law, and there is no possible device of human law or of individual ingenuity by which rent can be made to increase wages or interest. If it be turned over to a selector or a capitalist, he becomes in receiving it a landlord; in that extent, and may at any time separate what he receives of it from what he receives as laborer or as capitalist,

for there is no true rent until, and so long as, some one stands willing to pay for the privilege of using land.

This economic rent, the "unearned increment," is a natural growth, born of civilization and increasing with its advance; belonging to the society itself as distinguished from its individual members, by the same right of property which gives to the individual the ownership of his product. It is the natural provision for the natural need of public revenues; a fund created by the social organism to meet the wants, analogous to those of the physical body for sustenance, which come with its definite appearance and grow with its growth.

To see this is to see more. For that civilization develops a fund belonging to the social all and not to the social each, shows that the wider and closer co-operation of man with his fellows, to which all increase in his knowledge and powers is due, should bring a greater and greater equality of condition, and thus that our highest moral perceptions are not mocked by, but correspond to, the design of that Originating Intelligence manifest in the phenomena of nature. Now good and evil lie not in things, but in their uses, whatever is potent for good being correspondingly potent for evil. Thus the neglect or perversion of the natural provision by which the advance of civilization tends to bring about a higher and higher equality in human conditions must turn that advance toward a more and more monstrous inequality.

In the perversion of the great law of rent lies the explanation of those threatening facts which threaten modern civilization to-day. Rejecting what rightfully belongs to it, the state is driven by its need for public revenues to ignore the moral right of property and to take what rightfully belongs to individuals, by taxes that necessarily fall most heavily on those least able to bear them, that check production, render distribution inequitable, foster monopolies, create artificial crimes, put a premium on fraud and perjury, corrupt government, and debauch morals. But worse than this: what the state refuses to take must go to mere land-owners, thus not only creating a class of idle rich, who become demoralized and demoralizing social factors, but by attaching a premium to the forestalling of land and developing speculative rent turn the very forces of invention and improvement which directly increase the productive power of labor into agencies which degrade and impoverish the laboring masses, by creating an artificial scarcity in the indispensable natural element of all production and all life.

This is why those who apprehend the single tax from the moral side see in it the only yet only possible way of saving our civilization from otherwise certain destruction, and turning its advance to nobler heights than have yet been more than dreamed of. To them the single tax means the abolition of all real taxes: the taking for society of the provision made in the natural order for its needs; the conforming of the most fundamental of all social adjustments to the moral laws of the Creator.

HENRY GEORGE.

Sing Sing: village; Westchester co., N. Y.; on the Hudson river, and the N. Y. Cent. and Hud. River Railroad; 31 miles N. of New York (for location, see map of the State of New York, ref. 8-J). Its streets and avenues, rising one above another to the height of from 200 to 300 feet, afford views of the lovely scenery of the Hudson. The river is wider at this point than at any other; the broad Tappan Zee and Haverstraw Bay are separated by the long peninsula known in Revolutionary times as Teller's Point (where the Vulture waited for Arnold and André), and now, as Croton or Underhill's Point, famous for its vineyards. The Croton aqueduct crosses the Kill brook by a magnificent stone arch of 88 feet span and 70 feet above the stream, and beneath this arched bridge is a second one for highway use. Among the articles manufactured here are porous plasters, pills, baking-powder, self-feeding cotton-gins, cotton-gin saws, gas and water pipes, steam-engines, files, wrenches, carriages, and sleighs. A soldiers' monument was unveiled here May 30, 1887. The village contains several churches, 4 boarding-schools for boys, 2 being under military discipline, a boarding and day school for young ladies, 5 public schools, several private schools, a public library (founded in 1838), 4 other libraries, one of the most noted prisons in the U. S., gas and electric lights, electric street-railways, a national bank with capital of \$100,000, a savings-bank with deposits of over \$1,579,000, and a monthly, a bi-monthly, and 2 weekly periodicals. Pop. (1880) 6,579; (1890) 9,832.

M. F. ROWE, EDITOR OF "REPUBLICAN."

Sinim: the name used in the Bible for the Seres, or ancient Chinese. See CHINA.

Sink-hole: a hollow of the land drained at the bottom. Districts underlain by limestone or gypsum are often drained through subterranean channels, and the surface waters find their way to these channels through vertical crevices which are sometimes opened out into shafts of some size. The washing of soil, etc., into such shafts usually produces a funnel-shaped cavity, and this is known in the U. S. as a sink-hole or limestone-sink, and in England as a swallow-hole. Such hollows are abundant in the great Appalachian valley, which is underlain by limestone from Pennsylvania to Alabama. The word sink is sometimes inappropriately applied to drainless hollows which receive the water of streams, and discharge it to the air by evaporation. See PLAYA.

G. K. GILBERT.

Sinking Fund: See FINANCE (*Public Loans*).

Sinnett, ALFRED PERCY: journalist; b. in London, 1840; the son of E. W. Sinnett, a journalist; joined the staff of the London *Globe* in 1859; afterward edited *The Daily Press* at Hongkong; returned to England in 1868; went to Allahabad, India, in 1871, as editor of *The Pioneer*; joined the Theosophical Society in 1879, and, returning again to England in 1882, expounded theosophy to the British public in two widely circulated volumes, *The Occult World* (1881) and *Esoteric Buddhism* (1883).

H. A. BEERS.

Sino'pe (Gr. *Σινώπη*, Turk. *Sinûb*): town; in Asia Minor, in the vilayet of Castamouni (see map of Turkey, ref. 4-G). Situated on a peninsula with a splendid harbor, it was the most important of the Greek colonies on the Black Sea. It was the capital of the kingdom of Pontus. Mithradates the Great was born here (134 B. C.). During the Middle Ages it belonged to the empire of Trebizond, and was captured by Mohammed II. (1470). In its harbor the Ottoman fleet was defeated with a loss of 4,000 men and twelve ships by the Russian admiral Nachimoff (Nov. 30, 1853). This event decided France and Great Britain to interfere, and brought on the Crimean war. The town is well fortified, and has an arsenal and shipyard. It exports dried fruits, fish, skins, nuts, and tobacco. Pop. (1889) 7,162, of whom 2,840 are Greeks.

E. A. GROSVENOR.

Sinters [loan-word from Mod. Germ. *sinter* < O. H. Germ. *sintar*: O. Eng. *sinder* (the spelling *cinder* due to influence of Fr. *cendre* < Lat. *cinis*): a general designation for mineral substances deposited as incrustations or porous and cellular masses from the waters of mineral springs. The principal kinds are siliceous and calcareous sinters. Some siliceous sinters are classed by Dana with the crypto-crystalline varieties of quartz. They proceed from waters containing silica itself in solution, or sometimes, doubtless, soluble silicates of bases which are decomposed by the carbonic acid of the air. The great mass of siliceous sinters are composed of hydrates of silica. Florite, michaelite, and geyserite are names that have been given to some of these. Calcareous sinters are also called calcareous tufas. They are similar in nature and origin to the material of STALACTITES (*q. v.*).

Sintra: See CINTRA.

Sinus: See FISTULA.

Sion, Mount: See ZION.

Sioot, or Siut: See ASSIUT.

Siouan (soo'an) **Indians**: that linguistic stock or family to which the "Sioux" and cognate tribes of North America belong. According to Trumbull, Sioux, the popular appellation of the tribes which call themselves Dakota, Lakota or Nakota, is an abbreviation of Nadowessiou, which is a corruption of Nadowe-ssi-wag, "the snake-like ones" or "enemies" (derived from the Algonquin word *nadowe*, a snake). The characteristic languages are eminently vocalic and abound in inflections; agglutination and juxtaposition are also found.

Tribes.—The family comprises a number of tribes commonly arranged in ten groups, as follows: 1. (A) *Dakota* and (B) *Assiniboin*. The former includes the six Dakota sub-tribes, (a) Santee, comprising the Mde-wa-ka-to-wa (Spirit-lake village) and Waqpe-kute ("to shoot among deciduous trees"); (b) Sisseton (Sisito-wa); (c) Wahpeton (Wa-qpeto-wa, "dwellers among deciduous trees"); (d) Yankton (Ihañkto-wa, "end village"); (e) Yanktonnai (Ihañkto-wa-na, "little end village"), divided into Upper Yanktonnai (including the Cut Head band or Pa-baksa gens) and Lower Yanktonnai; and (f) Teton (Ti-to-wa, "dwell-

ers on the prairie"), in seven divisions, namely, Brulé-Si-tea-xu, "burned thighs"), including Upper or Highland Brulé and Lower or Lowland Brulé; Sans Arcs (Ita zi-pes, "without bows"); Blackfeet (Sihasapa); Minneconjou (Mun-ko-oju, "planting beside streams"); Two Kettles (Oo-ho-no-pa, "two boilings"); Oglala (o-gla'la, "she poured out her own"), including the Wazaza and the Loafers (Waglu-xu, "inbreeders"); and Huñkpa (Uncapa or Uncapapa). The tribal organization of the Assiniboin is uncertain; they are called Hohe (rebels) by the Dakota. 2. *Dhegiha* (or *Cegiha*, consisting of the tribes known as (a) Omaha (Uma-ha, "upstream people"); (b) Kwapa or Quapaw (Uka'qpa, "downstream people," the Arkansa or Arkansas of early writers); (c) Ponka or Ponca; (d) the Osage (Wacaca, etc.), divided into Little Osage (Utséhta, "campers on the lowland"), and Big Osage (Pahe'tsi, "campers on the mountain"), and the "Arkansaw band" (Santsu'kei, "campers in a highland grove"); and (e) the Kansa (Kaw, Ka'ze, referring to the wind). 3. *Tciuere*, comprising (a) the Iowa (Pa'qote, "dusty noses" or "dusty heads"); (b) the Oto (Watota, "lovers of sexual pleasure"); and (c) the Missouri. 4. *Winnebago*, including only the Winnebago tribe (who call themselves Hotcañgara, "people of the parent speech"). 5. *Mandan*, consisting of the Mandan tribe. 6. *Hidatsa* (Minnetaree or Gros Ventres of the Missouri), consisting of (a) the Hidatsa and (b) the Crow (Absoroka or Absaruka, etc.) tribes. 7. *Tutelo* (Yesa), comprising the Tutelo, Sapona, and cognate tribes. 8. *Biloxi* (calling themselves Tanéksa-yadi, including the Biloxi and very probably the Paskagula or Paskagula tribes. 9. *Catawba* (Flatheads), comprising the Catawba, Woccon, and cognate tribes (f Eutaw, f Chickoree, f Nachees, etc.). 10. The "Virginia group," composed of the Mannahok, Monacan, and cognate eastern tribes and confederacies (mainly extinct).

Habitat.—Excepting the Biloxi, Paskagula, Tutelo, Sapona, Catawba, and Woccon tribes, the territory of the Siouan Indians was mainly in one body, extending from about 33° N. in the Hudson Bay Company territory to about 38° N. including a considerable part of the watershed of Missouri river and that of the upper Mississippi. The detached portion of Siouan territory on the E. was occupied by Catawba, Biloxi, etc. It comprised a portion of the present States of Virginia, North Carolina, and South Carolina. Contrary to current opinion, the general trend of Siouan migration has been westward.

General Characteristics.—The Dakota tribes were warlike. They were hostile not only to the white people and Indians of other families (especially the Ojibwa and Pawnee), but also to the Crow, Hidatsa, Mandan, Omaha, and other tribes of their own family. Many of the Dakota have come under the influence of Christianity, and are advancing toward civilization. The Omaha and the Ponka have been warlike, but they have never fought against the U. S.; this might be said also of the southern tribes of this family.

Sociology.—The civil and religious institutions are determined by kinship as expressed in terms of consanguinity and affinity. The unit of the social organization is the *gens*, which is usually characterized by one or more taboos. The religious and the legislative, executive, and judicial functions are not differentiated, being exercised by chiefs whose tenure of office is limited by age or other physical incapacity, or by misconduct. The chiefship descends from father to son, unless the ambition and influence of a near relative displace him. With some exceptions descent is in the male line, although the entire system of consanguinity and affinity bears traces of a period in which descent was in the female line. A plurality of wives is deemed essential to the amassing of wealth, which is one avenue to power; divorce is optional with the husband. Civil government, personal conduct, property rights, corporations or organized bodies of persons, war, and international relations are regulated by laws and compacts. Indirectly related to the civil government are two kinds of associations for religious, industrial, and other purposes, the first being the feasting organizations and the second the brotherhoods or dancing societies, to some of which the shamans belong. Murder and rape, as a rule, are punished or avenged by death at the hands of kindred of the victim.

History.—The Dakota were mentioned in the *Jesuit Relations* as early as 1639-40. In 1658 they had thirty towns. W. N. W. from the mission St. Michel of the Potawatami; in 1689 they were on the upper Mississippi near St. Croix river. In the nineteenth century the Teton Dakota went into the Black Hills region, previously occupied by the Crow tribe.

The Yankton and Yanktonai passed from the upper Missouri into the upper Missouri country prior to 1800. In 1809 and 1810 and other Dakota joined in a formidable uprising in which over 1,000 whites were killed. Spotted Tail, Red Cloud, Crazy Horse, Sitting Bull, American Horse, and Brown-Blackhorse (popularly called Man-afraid-of-his-horse) are among the most famous Dakota chiefs and warriors of the nineteenth century. An outbreak of serious pestilence was narrowly averted during the ghost-dance excitement at Pine Ridge agency in the winter of 1890-91. In all, over 100 Dakota are located in Canada and over 27,500 in the U. S., chiefly in North and South Dakota, Montana, and Nebraska.

Bismarck (1890) described the Assiniboin as dwelling S. E. of the Iowa (Manyah, Nankov, or Molewakantonian), who were on Knife Lake, Minnesota. The Jesuit map of 1681 placed them on Lake of the Woods, then called Lake Assinipouan. They were near this lake in 1760, when they were said to have 1,000 warriors. In 1829 they were W. of the Isarens and N. of the Missouri and Assiniboin rivers, with a population of 8,000. Drake (1848) numbered them at 10,000 before the smallpox epidemic of 1838; that epidemic carried off 4,000. Since 1843 they have been decreasing in numbers. In 1890 there were about 8,000, mostly in Canada; some 700 were at Fort Peck reservation, Montana.

According to tribal traditions, the Omaha, Ponka, Kwapo, Gage, and Kansa tribes were originally one people, dwelling on the Ohio and Wabash rivers. A separation took place as early as 1600, as it preceded de Soto's discovery of the Mississippi. Those who went down the Mississippi became the Kwapo, and those who went up the river the Omaha; the Ponka settled on Nebraska river. The Omaha subsequently occupied the country between Covington, Neb., on the N. and Omaha river on the S., ranging W. as far as the Ponka and Pawnee habitats. About the beginning of the nineteenth century they were near Omaha, Neb. In 1890 they numbered nearly 12,000. They are citizens of the U. S. and of Nebraska.

Although archaic, the name Ponka does not appear in history till 1790. The Ponka were met by Lewis and Clark in 1804, when they had been reduced by the smallpox to about 200. In 1829 they numbered 600; in 1842, 800; and in 1871, 747. Prior to that time they had been friends of the Dakota; but a cession of lands to the Sioux reservation made the tribes enemies. The warfare continued until the forcible removal of the Ponka tribe to the Indian Territory in 1877. A commission appointed in 1880 visited both settlements of the Ponka, and their investigations resulted in legislation in favor of the tribe. Those who agreed to remain in the South are said to be prospering. In 1890 they numbered over 600, while those in Nebraska numbered 217.

Two Kwapa were found in 1541 by de Soto on the Mississippi, above the St. Francis, apparently near the site of the present New Madrid. La Salle (1681) found them in three villages along the Mississippi. The earliest mention of "Arkans" is by La Metairie in 1682. Saint-Côme says the greater part of the Kwapa died of the smallpox in Oct., 1690. Griener (1791) mentions five villages, the Imaha (equivalent to Omaha in meaning), which he terms "the largest village of the Arkansas confederation," being the highest up the Arkansas, while Sidley (1805) says the Arkansas were in three villages about 12 miles above Arkansas Post. The Kwapa subsequently affiliated with the Caddo, though of another linguistic family. In 1877 the Kwapa were on their reservation in the Indian Territory, but most of them later removed to the Osage country. Their total number in 1890 was 202.

The Osage were mentioned by Marquette (1673) as the Ouchagay and Antrochaba. In 1820 Porter gave their number as 5,000, and described their country as beginning 25 miles W. of the Missouri line, running to the Mexican line of that date, being 30 miles wide. Schoolcraft said that in Apr., 1823, they numbered 3,788. In 1894 they were on the Osage reservation, Oklahoma; in 1890 they numbered 1,581.

After the cession of Louisiana to the U. S., a treaty with the Kansa tribe was made by the Government. They were then on Kansas river, at the mouth of the Saline, and numbered about 1,600, in 160 earth lodges. In 1825 they ceded their lands on the Missouri, retaining a reservation on Kansas river. In 1840 they again ceded their lands, and a reservation was assigned them on Neosho river, in Kansas. This was soon after sold, and a new reservation acquired in Indian Territory. In 1890 they numbered 214.

In 1761 Jefferys located the Iowa Indians on the east side of Missouri river, W. of the head of Des Moines river, above

the Oto and below the Maha (Omaha). Drake (1848) said that in 1805 they numbered 800, and dwelt 40 leagues up Des Moines river, on the southeast side. Part of the Iowa afterward removed to the Sac and Fox reservation in what is now Oklahoma, but the rest remain on the Great Omaha reservation, Kansas. Their number in 1890 was 273.

The Oto was the third tribe to separate from the Winnebago, the Iowa being the first, and the Missouri the second. In 1673 they were placed by Marquette between 40° and 41° N. lat., W. of Missouri river, E. of the Maha (Omaha) and S. E. of the Pans (Pawnee or Ponka); in 1690 they were 130 leagues from the Illinois, almost opposite the mouth of Miskonging (Wisconsin) river; and in 1697 they were on Osage river. Irberville (1790) located the Iowa and Oto with the Omaha, between Mississippi and Missouri rivers, about 100 leagues from the Illinois tribe. In 1823 Catlin found the Oto and Missouri together in the Pawnee country. In 1894 they were with the Missouri on the Ponka, Pawnee, and Oto reservation, Oklahoma. Together with the Missouri, they numbered nearly 400.

The name Missouri first occurs about 1687. Their village was placed by Bourgmont (1733) 80 leagues below Kansas river, and 60 leagues below the principal Kansa village. The tribe formerly dwelt at the mouth of Missouri river, but gradually ascended that stream. About 1798 or 1800 they were dispersed by the Sac and Fox and other Indians; five or six lodges joined the Osage tribe, two or three took refuge with the Kansa, and most of the remainder amalgamated with the Oto. In 1803 Lewis and Clark found the Missouri in villages S. of Platte river, numbering 300 souls. They were with the Oto in 1829, when they numbered 20, and followed them to Indian Territory in 1852.

The Winnebago are closely related to the Iowa, Oto, Missouri, and Mandan. The earliest mention of the name is in the *Jesuit Relations* of 1640. Nicolet found them on Green Bay, Wisconsin, in 1650. Kelton says that they derived their popular name from their former residence on Winnebago Lake, called by the Algonquin tribes near it *Winibi*, dirty water. In 1811 Pike named seven Winnebago villages. In 1822 the Winnebago population was estimated at 5,900, with 900 warriors. By treaties in 1825 and 1832, they ceded all their land S. of Wisconsin and Fox rivers for a reservation on the Mississippi above the Osage. Out of their villages in 1832 was at Prairie la Poudre. During their third visitation of smallpox, in 1836, more than one-fourth of the people perished. In 1837 they relinquished their title to the country E. of Mississippi river, and in 1840 removed to the Territory of Iowa. In 1846 they surrendered their reservation for one above Minnesota river, and in 1850 removed to Blue Earth, Minn., and thence to a new reservation on the Omaha lands above Fort Randall, where they occupy lands allotted in severalty. In 1890 there were 1,215 here, with nearly 1,000 elsewhere, chiefly in Wisconsin.

The Mandan settled about 1750 on Missouri river, near the mouth of Heart river, in nine villages; they afterward ascended the river to a point 1,430 miles above its mouth. In 1837 the Mandan were almost destroyed by the smallpox, there being left only thirty-one (according to one account, though others vary from 125 to 145) out of 1,600. About 1872 a reservation was set apart for the Mandan, Hidatsa, and Arikara, in Dakota and Montana, along Missouri and Yellowstone rivers. In 1890 the Mandan numbered 262.

The Hidatsa were formerly known as the Minnetaree or Gros Ventres of the Missouri, and so were often confounded with the Minnetaree or Gros Ventres of the Plains, or the Arikara, of the Algonquian family. In 1796 there were three villages of this tribe on Knife river, in what is now North Dakota. The largest, Hidatsa, gave its name to the tribe. After the smallpox epidemic of 1837, the villages united. In 1845 the Hidatsa tribe (and about the same time the Mandan) moved up the Missouri and established a permanent village 20 miles by land and 60 by water from their old home. They were joined by the Arikara in 1862. In 1890 the Hidatsa on Fort Berthold reservation numbered 522.

The real name of the Crow tribe, which is Apsaroka or Absaruga (Hoffman), does not mean "crow," but refers to a species of hawk. When met by Lewis and Clark the Crow were in four "bands." In 1817 Brown located them on Yellowstone river. The Indian *Report* of 1842 gave their number as 4,000, inhabiting the head waters of the Yellowstone. They were later gathered on the Crow reservation, Montana, and in 1890 numbered 2,287.

The Tuto or Yoes was the leading tribe of the seventh group of Siouan Indians. To this group belonged the

Sapona and probably the Occaneeche or Akenatzy, Keyauwee, Shoccorie, Stenkenock, and Meipontsky tribes. The Tutelo were first referred to by Capt. John Smith. They were in Southern Virginia in 1671, according to Batt; in North Carolina in 1714, according to Lawson. They and the Sapona returned to Virginia, and in the eighteenth century, with the Nottoway and Meherrin, migrated into Pennsylvania and subsequently joined the Six Nations. At the close of the Revolutionary war the Tutelo followed the Six Nations into Canada, settling on Grand river reservation, Ontario. The tribe was nearly exterminated by smallpox in 1848, and the last survivor died in 1870.

In 1669 the Biloxi had one village on Biloxi Bay, near the Gulf of Mexico; thirty years later there were three villages, Biloxi, Paskagula, and Mactobi. In 1804 the Biloxi were on Red river, and in 1828 they were reduced to twenty families on Neches river, Texas. In 1894 about twenty-five of the tribe survived in Lecompte, Rapides parish, La.

Of the Catawba tribes, those mentioned earliest were the Wateree and St. Helena, seen by Juan Pardo's expedition in 1567. In the earlier part of the next century the Catawba proper (who were called Flatheads) were on Catawba creek, in Botetourt co., Va., and may have occupied the adjoining county, Roanoke, where there is now a settlement bearing their name. About 1660 they migrated to South Carolina. Lawson (1701-02) spoke of the Kataba on Catawba river, South Carolina, as Esaw, and distinguished them from the Kadapaw on Lynchess creek. Adair states that in 1743 the Catawba had 400 warriors; Ramsay (1795) that in 1780 they numbered 490 with 150 warriors. In 1780 they withdrew before Cornwallis to Virginia, where some of them joined the American army, returning to establish themselves in two new villages. About 1841 they sold to the State of North Carolina 14 sq. miles of their territory, reserving only 1 sq. mile and a tract of land on the east side of Catawba river. At that time, as also in 1890, they numbered about 120.

The Mannahock confederacy of Virginia consisted of about a dozen tribes, of which the names of eight have been preserved. Their habitat was between tide-water and the Blue Ridge. Of the Monacan confederacy of Virginia five tribes were named by Capt. John Smith, Lederer, and Jefferson. Both confederacies are extinct.

For a description of the manners, customs, etc., of the Siouan Indians (with others), see INDIANS OF NORTH AMERICA.

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JAMES OWEN DORSEY.

Sioux (soo) City: city; capital of Woodbury co., Ia.; at the junction of the Big Sioux and Missouri rivers; on the Chi., Mil. and St. P., the Chi., St. P., Minn. and Om., the Ill. Cent., the Sioux City and North., the Sioux City and Pac., the Sioux City, O'Neill and W., and the Union Pac. railways; 80 miles S. of Sioux Falls, S. D., and 100 miles N. by W. of Council Bluffs (for location, see map of Iowa, ref 4-C). It is the second city in size in the State, has a large frontage on the Missouri river and a picturesque residence quarter on high bluffs, and is an important commercial center. It is the gateway to South Dakota, the upper Missouri region, and the Black Hills mining and grazing country.

Public Interests.—The city has all the modern improvements: water-works (cost \$1,000,000); 51 miles of electric and 8 miles of elevated railway; gas and electric lights; over 40 miles of sewers; 25 miles of paved streets; city-hall and public library (cost \$80,000); police building (\$30,000); county courthouse; U. S. Government building (\$250,000); Y. M. C. A. building (\$60,000); 2 hospitals; a Union dépôt (\$600,000); and a bridge across the Missouri river (\$1,000,000). There are over 40 churches, several of which cost from \$50,000 to \$75,000 each; 30 public-school buildings (cost over \$650,000), including a high-school building that cost \$130,000; the University of the Northwest, and 3 daily and 13 weekly papers.

Business Interests.—The census returns of 1890 showed

195 manufacturing establishments (representing 50 industries), with a combined capital of \$4,938,606, employing 2,997 persons, paying \$1,862,612 for wages and \$10,329,994 for materials, and turning out products valued at \$14,164,667. In 1895 there were 5 meat-packing houses with a capacity for slaughtering and packing 13,000 hogs, 3,000 cattle, and 1,600 sheep per day. Over \$6,000,000 was invested in manufacturing. The principal productions were stoves, engines, shoes, flour, soap, starch, wagons, plows, tile, brooms, furniture, and clothing. The jobbing trade amounts to about \$30,000,000 per annum. There were 17 banks of all kinds, having a combined capital of \$3,575,000 and a surplus of \$940,000, and 2 loan and trust companies.

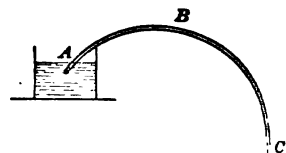
History.—The city was settled by traders in 1849, was an important Government post during the early Indian troubles, and was the outfitting point for the Black Hills expeditions. It achieved great fame from its corn palaces, beautiful structures decorated with grains, grasses, and other products of the soil. Five were built, in which annual fairs and festivals were held, lasting a month. Since the palaces were abandoned annual interstate fairs have been held at Riverside Park, a beautiful retreat in the suburbs, with ample grounds and a race-track.

Pop. (1880) 7,366; (1890) 37,893; (1895) estimated, over 40,000. ORA WILLIAMS, MANAGING EDITOR OF "JOURNAL."

Sioux Falls: city (incorporated as a town in 1877, as a city in 1888); capital of Minnehaha co., S. D.; on the Big Sioux river, and the Burl., Cedar Rap. and N., the Chi., Mil. and St. P., the Chi., St. P., Minn. and Om., the Great N., and the Ill. Cent. railways; 90 miles N. of Sioux City, Ia. (for location, see map of South Dakota, ref. 7-G). It is in an agricultural and stone-quarrying region; has large stock-raising interests; derives great power from the river, which falls nearly 100 feet in a series of cascades within a distance of half a mile; and contains water-works, sewers, and gas and electric-light plants. The streets are paved with jasper, quarried near the city, and many buildings are constructed with the same stone. There are 30 churches, 7 public-school buildings, public-school property valued at over \$175,000, Sioux Falls University (Baptist), All Saints' School (Protestant Episcopal), a Norwegian-Lutheran college, a business college, the State School for Deaf Mutes, the South Dakota penitentiary, 4 national banks with combined capital of \$450,000, 3 State banks with capital of \$200,000, and 2 daily, 7 weekly, and 3 monthly periodicals. Sioux Falls is the seat of the Protestant Episcopal bishopric of South Dakota and of the Roman Catholic bishopric of Sioux Falls. Pop. (1880) 2,164; (1890) 10,177; (1894) 13,564.

CHARLES M. DAY, EDITOR OF "ARGUS-LEADER"

Siphon [from Lat. *si'pho*, *sipho'nis* = Gr. *σίφων*, reed, pipe, tube, siphon]: a bent tube for conveying water from a reservoir, A, to a lower level, C, over an elevation, B, which is not more than 33 feet higher than A. To put the siphon into action the air must be exhausted, and then the atmospheric pressure on the surface of the water at A causes the water to rise and flow over, with a velocity depending upon the difference of level between A and C. The siphon is used for emptying casks, and sometimes on pipe-lines for water-works, but in the latter case a pump is placed at B, in order to remove the air which otherwise accumulates there and diminishes the flow. See HYDRAULICS. M. M.



Siphonap'tera [Mod. Lat., from Gr. *σίφων*, tube + *ἄπτερος*, wingless]: an order of insects which contains the fleas. See ENTOMOLOGY.

Siphonap'ta [Mod. Lat., deriv. of *sipho* = Gr. *σίφων*, tube]: one of the two divisions into which the lamellibranch molluscs (clams, etc.) were formerly divided, the name being given in allusion to the fact that the posterior edges of the mantle were united with a tube (familiar in the so-called "head" of the common clam). See LAMELLIBRANCHIATA.

Siphonoph'oræ [Mod. Lat., from Gr. *σίφων*, tube + *φάρος*, bearing]: a group of HYDROZOA (q. v.) characterized by the formation of free-swimming colonies, the individuals of which have become highly differentiated. These individuals are each modified jellyfishes, and are connected by a tube, whence the name. In a typical form the following individuals may occur: (1) A float, to suspend the colony, occurring

at the end of the tube; (3) swimming-bells; (4) feeding polyps; (5) digestive polyps; (6) reproductive polyps; (7) sensory polyps; (8) tentacles; (9) covering scales, which cover and protect some of the others. Of these the swimming and reproductive individuals retain most clearly the median features. Usually one or more of the individuals may disappear, while in many forms the tube may be contracted into a disk. The siphonophores, of which there are many species, vary greatly in size and appearance. Some are but an inch or two in length, while others are 2 yards or over. Some are perfectly transparent and colorless, while others (e. g. *Physalia* and *Valoniopsis*) are brilliantly colored with blue, red, and green. Many of the species are armed with powerful batteries of nettle-cells, and contact with them will cause severe pain to man. Most of the species inhabit tropical seas. See Haeckel, *Zoological Reports of the Challenger Expedition*, vol. XXIII (1889), and papers by Gegenbaur, Huxley, Dana, and Peckol. J. S. KIRKMAN.

Siphonostomata: See Ctenophora.

Sipunculærea, or **Sipunculidea** [Mod. Lat., named from *Sipunculus*, the typical genus, from Late Lat. *sipunculus*, for Lat. *siphunculus*, dimin. of *siphon*, *siphonia*, tube. See Siphon]: a group of marine worms in which the body is usually elongate and cylindrical, without traces of segmentation, and without bristles or other appendages. The mouth is at the anterior end of the body, and this region can be invested into the rest by the action of retractor muscles. The mouth is usually surrounded by tentacles. Internally, all traces of segmentation are lost, and the viscera are suspended in an extensive body-cavity. The intestine is usually coiled upon itself, and the vent is dorsal, near or in front of the middle of the body. There are one or two excretory organs (nephridia), and the genital products, which arise at the origin of the retractor muscles, and which are set free in the body-cavity, pass out through the nephridia. A circulatory system is well developed, and the tentacles subserve respiratory purposes. There is a metamorphosis in development, the larva being strikingly like that of the true annelids. These worms burrow in the sand or inhabit tubes, dead shells, etc. Over 100 species are known. See Sarsen, *Sipunculidae*, in *Saunders's Philippine Reise* (1889); Andrews, *Qual. Sipunculina*, *Studies Johns Hopkins Laboratory*, iv. (1890); Haeckel, *Entwickelung*, in *Arbeiten d. Inst. Zool. Wiesn*, v. (1884). J. S. KIRKMAN.

Sirbonian Bog, or **Sirbonic Lake**: formerly a long, narrow body of water, separated from the Mediterranean by a low strip of shore, and extending eastward from Pelusium in Egypt. It is now dry and covered with sand. At the beginning of the Christian era Strabo (*Geogr.*, i. 3, 4) spoke of it as a marsh, and just previously Diodorus reported that it was overgrown with reeds and papyrus. These statements do not agree with the further statements of Strabo (*op. cit.*, 2, 68, and 43, 43) that it was a deep body of heavy water into which one could not dive, and that asphalt or bitumen rose to the surface near the middle of it, whence it was gathered by men on rafts. One of the principal routes to Damascus along the narrow neck between sea and lake, but it was dangerous at certain states of wind and tide. Artabanus is said to have lost a part of his army when attempting the passage. The route of the Exodus proposed by Brunsch included the crossing of the bog by the Israelites, but the discovery of the site of Pithom overthrew his theory by locating the initial stages of the itinerary about midway of the pathos. CHARLES R. GILBERT.

Sir-Darya: See Sir-Darya.

Sire'don [Mod. Lat., from Gr. *sirēnē*, late collateral form of *sirens*, *siren*: a name at first applied to the axolotl of Mexico, but now extended to include the large larva with external gills of several species of salamanders belonging to the genus *Amblystoma*].

Siren [Mod. Lat., from Gr. *sirēnē*, *siren*]. So named because supposed to have a singing voice: a genus of tailed amphibia of the southern parts of the U. S. The only species is *Siren lacertina*, the mud-eel of the Carolina rice-swamps. It has two weak fore legs, no hind limbs, permanent gill-slits, as well as lungs, is 2 feet long, and black. It is considered venomous by the Negroes. *Pseudobranchius* affines to a smaller but very similar animal.

Sirene: See Acrotheria.

Sire'nia [Mod. Lat., from Gr. *sirēnē*, *siren*]. So called from a fancied resemblance of the dugong to the fabled sirens: an order of mammals, containing species familiarly

known as manatees. They are adapted for habitual life and progression in the water, but less modified than the cetaceans. The form is fish-like, the skull short and broad small in proportion to the body; front limbs are present as flippers, hind limbs are absent; the body ends in a transversely flattened tail, which may be rounded, as in the manatee, or, as in the dugong, forked like the flukes of a whale. The brain essentially resembles that of the higher mammals, but is notable for the compression and elevation of the cerebrum, the upturned bulbous olfactory nerves, and the depression of the cerebellum. Molar teeth, adapted for the trituration of herbages, are in the sides of both jaws; the neck is moderate, and the second vertebra has a distinct odontoid process; the heart is deeply fissured between the ventricles. The species are all herbivorous, and feed upon the vegetation growing on the banks of estuaries and rivers, as well as seaweed. When at rest they remain upright from the bottom of the water by their tail, but with the head downward, and the back consequently arched; at intervals of about one minute to one minute and a quarter they rise to breathe, and the valves of the nose open and shut as they come to the surface and go downward again. The order is now represented by two families—*Trichechidae*, including the manatees, and *Hydrochidae*, containing the dugongs. Up to the end of the eighteenth century a third family (*Albirochidae*) existed in the North Pacific (Bering Sea), but its only living species was in a short time exterminated by the attacks of man. The earliest extant representatives of the order yet known are of Eocene age, and since then several peculiar forms have flourished and died out. See DODD and NARAYAN. Revised by P. A. LUDAN.

Sirenoidea: same as DRYOS (q. v.).

Sirens [plur. of *Siren* = Lat. = Gr. *Sirēnē*, plur. of *Sirēnē*, the Sirens]: in Grecian mythology, maidens who lived on an island between Scylla and the island of Circe, and by their ravishing songs charmed mariners to their ruin, for whom heeded their singing saw not wife nor home again. It was fated that the Sirens should die as soon as any one should pass by without heeding their singing. Odysseus escaped their allurements only by stuffing his companions' ears with wax and having himself securely tied to the mast. The Argonauts escaped them because they were charmed by the superior singing of Orpheus. The Sirens were changed for one reason or the other to sunken rocks located at Pelorus, or Sorrento, or Capri, or the Sirens. In earliest times they were represented as birds with the heads of maidens, and later as creatures with the body of a maiden and the legs and wings of a bird. J. R. S. STRECHT.

S'rius [= Lat. = Gr. *Sirius*]: the dog-star, a star of *Canis major*, the brightest star in the heavens. It may be seen in the S. in the winter evenings. From the expressions of several ancient writers it is sometimes claimed to have been red in ancient times, though now a brilliant white, but the question of its former color is not yet settled. It was formerly believed to exercise a powerful and, to some extent, a baleful influence upon human affairs.

Revised by S. NEWCOMB.

Siro'co [= Ital., from Arab. *sharq*, deriv. of *sharq*, sunrise, east, deriv. of *sharq*, rise; cf. *SARACUS*]: a hot, relaxing wind which rises in the Sahara, then blows across the Mediterranean, where it occasionally becomes filled with moisture, and finally over Sicily, Southern Italy, Malta, etc. It generally occurs in spring and autumn, lasts for one or two days, though sometimes for a whole week, and is very injurious to vegetable and animal life, causing general exhaustion, great prostration, and mental depression.

Sisal' Hemp [named from *Sisal*, a port of Yucatan]: the fiber of various species of *Agave* (q. v.). Sisal hemp is produced in considerable quantities in Yucatan and at Key West, Fla., and adjacent islands. It makes excellent cordage, superior to that of true hemp, but it is chiefly made into hammocks of great strength and durability.

Sis'co, or **Cisco**: any one of several fishes of the genus *Osmerus*, natives of the Great Lakes of North America. The principal species are the *C. arctici* (also called herring) and the *C. hoyi* of the deep waters of Lake Michigan. They are recognizable by their herring-like form, terminal mouth, with the lower jaw longest, short interopercular bones, and the long and narrow suborbital bones. They are small, rarely weighing as much as a pound. The *C. arctici* inhabits the shallower waters. It is in some places exceedingly abundant.

Sis'cowet, Siskowit, or Siskawitz [from native (Amer.-Ind.) name]: a variety of the great lake-trout (*Salvelinus namaycush*, var. *siskawitz*), found in Lake Superior. It is similar to the namaycush, but is less elongated, and becomes extremely fat.

Sisen'na, LUCIUS CORNELIUS: historian; b. about B. C. 119; was prætor B. C. 78; defended Verres in 70, and died B. C. 67 in Crete, being at the time legate of Pompey in the war with the pirates. Having been an actor in public affairs, he was well fitted to relate the events of his own time (including the Social war and the civil wars of Sulla) in his work entitled *Historiæ*, written in an archaic style. Cicero says of him (in his book on *Laws*) that he surpassed all previous Latin historians, and Sallust highly praises his diligence. Sisen'na translated also into Latin the Milesian tales (*Μυληνιακά*) of Aristides. Whether the Sisen'na who wrote commentaries to several plays of Plautus is the same is disputed. Only fragments of the *Historiæ* remain, collected by Peter in *Hist. Roman. Fragmenta*, pp. 175-189.

Revised by M. WARREN.

Siskin [from Dan. *siegen*, or Swed. *siska*; Germ. *zeisig*, from Sloven. *žizek*: Polish *tyż*, siskin]: an Old World bird, *Spinus* or *Chrysomitris spinus*, of the family *Fringillidae*. The male is a prevailing olive green above and yellowish white below, streaked with black on the back and sides, and with a black throat and crown. It is a favorite cage-bird. The pine-siskin (*S. pinus*) and the American goldfinch are related North American species.

Sismon'di, JEAN CHARLES LÉONARD SIMONDE, de: historian and political economist; b. at Geneva, Switzerland, May 9, 1773; educated in the college of his native town, and was a clerk in a large counting-house in Lyons; political disturbances drove his family into exile, and he lived in England and later in Italy for several years; settled finally in his native town in 1800; devoted himself to studies and literary work, though at the same time participating very actively in politics; married in 1819 an English lady. D. near Geneva, June 25, 1842. His first work was a treatise on political economy, *De la Richesse commerciale* (1803), based on the ideas of Adam Smith, which, however, he afterward abandoned, and even opposed, in his *Nouveaux Principes d'Économie politique* (2 vols., 1819) and *Études sur les Sciences sociales* (8 vols., 1836). His acquaintance with Madame de Staël, Benjamin Constant, Guizot, etc., turned his attention from political economy to history, and it was as an historian that he acquired his great celebrity. His *Histoire des Républiques italiennes du moyen âge* (16 vols.) appeared at Zurich in 1807-18; *La Littérature du Midi de l'Europe* (4 vols., 1813) was translated into English by Thomas Roscoe in 1823. Of his principal work, *Histoire des Français* (31 vols., 1821-44), he gave an abstract, *Précis de l'Histoire des Français* (2 vols., 1839). See *Sismondi, Fragments de son Journal et de sa Correspondance avec Mlle. de Sainte-Aulaire* (1863), *Lettres inédites à Madame d'Albany* (1864), and another collection of *Lettres inédites* (1878).

Sistan: See SEISTAN.

Sisterhoods: in the religious sense, unions of women devoted by public vows to religious work. They are in idea nearly as old as monasticism, for female branches of all the principal monastic orders were organized by the original founders, whose members are called nuns, and are technically spoken of as female religious. A distinction should be made, however, between a sister and a nun, for the former, unlike the latter, is not shut up in a convent, nor given up to contemplation and ascetic practices. Sisterhoods in the strict sense are modern, for the first one, still the most famous of all, was founded by St. Vincent de Paul in 1629, and is known variously as Daughters or Sisters of Charity, Gray Sisters, and Sisters of St. Vincent de Paul. (See article CHARITY, SISTERS OF.) There are now many sisterhoods, all doing similar work. One of them, the Irish Sisters of Charity, founded in 1815, uses an adaptation of the Jesuit rule. The vows of all are the monastic ones of poverty, celibacy, and obedience. To these are added, in some cases, other obligations. The sisters wear a distinctive dress, and have houses to live in and start from on their daily round of labor.

Protestant women, although equally devoted to the relief of suffering, do not, as a rule, favor sisterhoods. They prefer to work independently. Besides, they resent the implication of the vow as to "chastity," that the married relation

is in any sense derogatory, instead of being in every respect an honor and glory to woman, and that it is a hindrance to spiritual life, whereas it is a divinely ordered help. Protestant sisterhoods date from the revival of what is called "Catholic" teaching in the Church of England. The first sisterhood in the Church of England was founded by Dr. Pusey in 1845. The Society of the Holy Trinity was founded at Devonport in 1847, and many others have since been organized. One of the largest is Sisters of the Poor, founded in 1851. The saintly Sister Dora (Dorothy Pattison, 1832-78) belonged to the Sisterhood of the Good Samaritans.

The first Protestant sisterhood in the U. S., the Sisterhood of the Holy Communion, was founded by Rev. Dr. W. A. Muhlenberg in New York in 1852. It took charge of St. Luke's Hospital in that city in 1859, and St. Johnland in 1866. The Sisterhood of St. Mary was founded in New York in 1865. There were in 1895 nineteen sisterhoods in the Protestant Episcopal Church, four being branches of English ones.

The Protestant sisterhoods differ somewhat in methods and objects, but agree in promoting a combination of piety and good works. They pay particular attention to the inner life, and strive to put the spiritual force thus gained to practical account. In dress their members resemble those in the Roman Catholic Church, except that they do not cover up the hair. They take vows, but not irrevocable ones, although it is very seldom that a woman leaves a sisterhood. For the allied order of Deaconesses, see DEACONESSES.

Sadlier's Catholic Directory (New York) annually gives the figures for the Roman Catholic sisterhoods in the U. S. and Canada, and the *Catholic Directory*, published in Dublin, those for Great Britain and Ireland. For the sisterhoods in the Church of England, see the yearly list in the *Kalendar of the English Church* (London). For those in the Protestant Episcopal Church see the *Living Church Quarterly* (Milwaukee, Wis.). On the general subject, see Mrs. Jamieson, *Sisterhoods of Charity* (London, 1855); Mary Goodman, *Sisterhoods in the Church of England* (1863; 2d ed. 1865); J. M. Ludlow, *Woman's Work in the Church* (1865); W. A. Muhlenberg, *Evangelical Sisterhoods* (New York, 1867); C. E. Stephen, *The Service of the Poor* (London, 1870); H. C. Potter, *Sisterhoods and Deaconesses at Home and Abroad* (New York, 1871); C. C. Grafton, *Vocation; or, The Call of the Divine Master to a Sister's Life* (1886).

SAMUEL MACAULEY JACKSON.

Sisters of Charity: See CHARITY, SISTERS OF.

Sisters of Mercy: a Roman Catholic religious sisterhood, founded at Dublin, Ireland, in 1827, by Miss Catherine McAuley. The rule is similar to that of the Presentation nuns. Originally each convent was independent, but offshoots from the parent house, especially outside of Ireland, are usually subject to it. These religious women are always under the jurisdiction of the bishop in whose diocese they are located. They were introduced into the U. S. in 1843, at Pittsburg. Their convents are more than 200 in number, and the sisters are chiefly occupied in the conduct of parochial schools, private academies, hospitals, and homes for the aged. See *Life of Mother Catherine McAuley, Leaves from the Diary of a Sister of Mercy*, and *Hoffman's Catholic Directory* for 1895.

J. J. KEANE.

Sisto'va: town and fortress; in Bulgaria, on the Danube, between Nicopolis and Rustchuk (see map of Turkey, ref. 3-D). It manufactures leather and cotton goods and carries on a large trade in wheat and wine. The treaty of Sistova was signed here between the Ottoman empire and Austria (1791), and the Russians crossed here in 1877. Pop. (1893) 13,212.

E. A. G.

Sis'yphus (Gr. *Σίσυφος*): in Grecian mythology, son of Æolus, father of Glaucus, grandfather of Bellerophon, and king and founder of Corinth. Because of his wickedness Zeus sent Death to take him to Hades; but Sisyphus bound Death and held him long time prisoner, so that no one died until Death was finally released by Ares. For this reason (though other reasons also are given) Sisyphus, when finally he had come to the house of Hades, was doomed to roll to the top of a high mountain a huge rock, which always broke away from him just as the top was being reached.

J. R. S. STERRETT.

Sit'ka (formerly NEW ARCHANGEL): capital of Alaska Territory, on Baranof island, near the Pacific coast, in lat. 57° 2' N. (see map of Alaska, ref. 4-H). It has a harbor that is deep and commodious, but is difficult of ingress and egress. It was founded by the Russians in the eighteenth

century, and was long the headquarters of the Russian-American Fur Company, but consisted, when transferred to the U. S. in 1867, of only about 100 log huts. Since then several large edifices have been built, and the presence of a detachment of U. S. troops until 1877 did much to contribute to the prosperity of the place. A noteworthy relic is the Greek church of St. Michael, built in 1816. The Presbyterian mission established an industrial school there in 1878; also a hospital and a warehouse. Pop. (1890) 1,108. Revised by M. W. HARRINGTON.

Sittidae (from *Sitta*, the typical genus): a family of birds containing the nuthatches. See **SITTARINAE**.

Sitting Bull (Indian name, TATANKA YOTANKA): Sioux chief and medicine-man; b. on Willow creek, Dakota, 1867; became the leader of the unruly members of his tribe, who resisted settlements of whites and small reservations of Indians—murdered whites at Spirit Lake, Iowa, and in Minnesota, 1882, and were driven by Gen. Sully into the Big Horn region and to the Yellowstone 1864. They were defeated in a battle on the Muclos Shell river 1885; were placed on a reservation in the Black Hills, from which they were driven by troops, 1879; refused to be transported to the Indian Territory; resisted and slew a party of troops under Gen. Crocker. On being pursued by Gen. Terry, Sitting Bull and many of his followers escaped into Canada. He surrendered on a promise of pardon 1880, and returned to Dakota, but continued in ferment trouble among the Sioux, and in 1890 the military authorities determined to arrest him. He was attacked Dec. 15 in his camp near Grand River, North Dakota, and during the fight that ensued was killed.

Sitot: See **ASITOT**.

Siva, or **Shiva** (Sanskrit, the gracious or blessed one): a Hindu god, mostly spoken of as the "Destroyer and Regenerator," the third member of the Hindu Trimurti or triad of divinities, of which Brahmā, the "creator," and Vishnu, the "preserver," are the first and second respectively. His agencies, however, under a great variety of names, attributes, and functions. As the Destroyer he is represented by Rudra. As the Regenerator or Repurifier his symbol is the linga or phallus, and under this he is now usually worshipped. (See **YOGA**.) He also represents the contemplative and ascetic side of Hinduism. He is represented as sitting absorbed in thought, naked, and smeared with funeral ashes, with matted hair, and wearing a necklace of human skulls and bones. He has three eyes, and fire from them consumes those who dare to interrupt his devotions. His worship is called *Nataraj*, or *Nataraj*, and his worshippers *Saivas*.

Sivas (anc. *Schadisa*, *Schadisa*): town; in Asia Minor, in the valley of Sivas, on the Kizil Irmak (see map of Turkey, vol. 4-6). Though situated in the center of an extensive and fertile plain at the juncture of natural routes, lack of roads nullifies these advantages, and the town is poverty-stricken and lifeless; hundreds of the natives work in distant places, above all in Constantinople, and thus support their families. It manufactures excellent carpets and woven and linen goods. Pop. (1890) 10,000, of whom 23,619 are Muslims and 14,439 Armenians. R. A. G.

Sivatherium [Mod. Lat.; Eng. *Siv*, L. *Civ*, the Hindu god + *Gr. tērion*, wild animal]: an extinct genus of ruminating animals from the Siwalik Hills, India, remarkable for their size and peculiar horns. *S. giganteum* nearly equaled the elephant in size, and was armed with two pairs of horns, a small pair springing from the anterior part of the head, and a much larger pair from the top. The bony cores of these horns, the only part preserved in the fossil state, show that these animals belonged to the hollow-horned type of ruminants. The front pair were divergent, apparently coarsely straight, and simple. The posterior pair were branching, and had at least three points. The American osteologist or prong-horn is the only living hollow-horned ruminant with branching horns. It is also the only one known to shed its horns. The posterior horns of *Sivatherium* seem to have closely resembled in structure those of the prong-horn, and may have been deciduous. The bones of the skeleton of *Sivatherium* were massive, like those of oxen. The nose was probably more or less movable, as evidenced by the short projecting nasal. Falconer and Cautley supposed the animal to have possessed a true proboscis, but Dr. Murray concludes from a study of the remains and a comparison with allied forms, that this nose was similar to that of the walrus of Tertiary.

Sivah (anc. *Ammon*, or *Ammonium*, Egypt. *Amun*): an oasis in Northwestern Egypt, 300 miles W. of Cairo, and

160 miles S. of the Mediterranean. Area, 9 sq. miles. The eastern part of the oasis is very fertile and rich in springs; in the northern part some limestone hills are found. In ancient times the place was celebrated as the seat of the temple of Jupiter Ammon, of which remains are extant, and of the Fountain of the Sun, whose waters were cold at noon and hot at midnight. The temple was immovably rich and guarded by strong fortifications. Cambyses attempted in vain to capture it. Alexander visited it, and was hailed by the priests as a son of the god. The Emperor Justinian built a Christian church here. The oasis is inhabited by about 3,000 Berbers and Negroes, who profess Mohammedanism, and speak a peculiar dialect much mixed with Arabic. The town of Sivah is in lat. 29° 12' N., lon. 35° 20' E., near the site of the ancient temple.

Revised by M. W. HARRINGTON.

Six Nations: See **IROQUOIS INDIANS**.

Six-principle Baptists: a sect of American Christians who take as their creed the six principles laid down in Heb. vi. 1, 2, viz.: (1) repentance, (2) faith, (3) baptism (of repentance, of fire, and of Christ's sufferings), (4) laying on of hands, (5) the resurrection, (6) the eternal judgment. They especially insist upon the laying on of hands, and refuse to commune with those who do not practice it. They are Arminians, and neither educate nor adequately support their ministry. They are found in Rhode Island, Massachusetts, New York, and Pennsylvania. They were first organized in 1852 by William Wickenden, Chad Brown, and Gregory Dexter, at Providence, R. I., and once composed the most numerous and influential section of American Baptists. In 1890 they reported eighteen organizations and 937 communicants. Revised by W. H. WERRITT.

Sixth: in music, an interval comprising five degrees of the diatonic scale. See **INTERVAL**.

Sixtus: the name of five popes. (See **POPE**.) **SIXTUS IV.** (Francesco della Rovere), b. 1414, entered the Franciscan order, attracted notice by his eloquence and learning, became the close friend of Cardinal Bessarion, through whose influence, it is said, he was chosen pope 1471. His pontificate was marked by munificence in founding and improving useful institutions, and in the patronage of arts and letters, but his nepotism caused great scandal, his conservatism in the Pazzi conspiracy against the Medici was most dishonorable, and the war with Florence which he entered into was inglorious for the Holy See and disastrous for Italy. D. in Aug., 1484. **SIXTUS V.** (Felice Peretti), one of the ablest of the Roman pontiffs, was born near Montalto, Dec. 16, 1521; entered the order of the Franciscans in 1544; became a teacher of canon law at Rimini and at Siena, acquired great reputation as a preacher, and became a cardinal in 1570. Arrived at this point, his ambition seemed to go no further. He was not anxious either to exercise influence on the papal government or to procure lucrative positions for his relatives. He lived quietly, and gave the impression of being a man easy to lead. After the death of Gregory XIII. (1585) the cardinals, thinking he would be a mild and indulgent pope, elected him to the Holy See, but to their astonishment he threw off all concealment of the natural energy of character, and at once began vigorous measures of reform. In all theological controversies he was cautious and tried to remain neutral. His great idea was to raise the papal see once more to its former splendor, and although his negotiations with the Emperor Rudolph II. of Germany and Stephen Báthori, King of Hungary, led to no permanent result, they show his ambition and his talent. He pronounced the ban upon Henry III. of France; and when that monarch was assassinated by the Dominican monk Jacques Clement he openly approved of the deed. The celebrated aqueduct Acqua Felice, the great dome of St. Peter's church, the obelisk in front of this church, and the library buildings of the Vatican, are among the public works that he successfully executed. He also suppressed the banditti, encouraged commerce and manufactures, and enforced the law in his states. He died suddenly at Rome, Aug. 27, 1590. See *Ranke's History of the Popes*. F. M. COCHRAN.

Sjöberg, *sjö bärj*, BARK (pseudonym *Vilhelms*): poet; b. in Södermanland, Sweden, Jan. 14, 1794. The son of a laborer, his life was a hard struggle with poverty and disease. He was a master of satire, and his ridicule of the excesses of the Pöplers had a wholesome influence upon Swedish literature. His style strongly resembles that of Byron. During the last years of his life he was a sincere Christian, and de-

voted himself to the study of Thomas à Kempis. D. at Upsala, Mar. 14, 1828. The complete works of Vitalis were published at Stockholm in 1878.

D. K. DODGE.

Skagerrak', or **Skager-Rack**: an arm of the North Sea, 80 miles broad, extending between Norway and the Danish peninsula of Jutland, and connecting the German Ocean with the Cattegat or Kattegat. The current generally sets E. along the coast of Jutland, where the depth varies between 30 and 40 fathoms, and W. along the Norwegian coast, where the depth generally is 200 fathoms. There is neither haven nor good anchorage on Jutland, but good harbors abound on the opposite coast.

Skaneateles, skān-ē-ā'lēez: village (settled in 1796, incorporated in 1833); Onondaga co., N.Y.; at the outlet of Lake Skaneateles; on the Skan. Railroad; 7 miles E. by N. of Auburn, 18 miles W. S. W. of Syracuse (for location, see map of New York, ref. 4-F). It is in an agricultural and teasel-growing region; derives good power for manufacturing from the lake; contains flour-mills, woolen-mills, iron-works, hydraulic lime-kilns, printing-paper mill, carriage-factories, Union School and Academy, public library (founded in 1877), a State bank with capital of \$60,000, a savings-bank, and two weekly newspapers, and is a popular summer resort. Pop. (1880) 1,669; (1890) 1,559; (1895) estimated, 1,700.

EDITOR OF "FREE PRESS."

Skate: a name given to certain species of fish of the family RAIIDÆ (q. v.). See also RAIDÆ.

Skeat, skēt, WALTER WILLIAM: clergyman and philologist; b. in London, England, Nov. 21, 1835; educated at King's College School and at Sir R. Cholmeley's school, Highgate; graduated at Cambridge University 1858; became a fellow of Christ's College 1860; took orders in the Church of England; curate 1860-64; became lecturer on mathematics at Christ's College Oct., 1864, and subsequently lecturer on English; was in 1873 one of the founders of the English Dialect Society. A prolific and useful writer and editor, he has published some forty works, among which are the following for the Early English Text Society: *Lancelot of the Laik, a Scotch Metrical Romance* (1865); *Parallel Extracts from 29 MSS. of Piers the Plowman* (1866); *The Romans of Partenay or Lusignan, otherwise known as the Tale of Melusine* (1866); *Pierce the Ploughman's Crede* (1867); *The Vision of William concerning Piers the Plowman* (3 parts, 1867-73); *The Romance of William of Palerne, or William and the Werwolf* (1867); *The Lay of Havelok the Dane* (1868); *The Bruce, by Master John Barbour* (part i., 1870); *Joseph of Aramathie, or the Romance of the Saint Graal* (1871); and Chaucer's *Treatise on the Astrolabe*. For several of these he prepared introductions, notes, and glossarial indexes. For the Philological Society he edited a *Mæso-Gothic Glossary* (1868), for the Oxford University Press 2 vols. of *Specimens of English Literature* and several of Chaucer's *Canterbury Tales*, and completed for the Cambridge University Press the variorum edition of the *Anglo-Saxon Gospels* left unfinished by John Mitchell Kemble. In a new edition of Chatterton's *Poems* he settled the question of authenticity by showing the precise sources of Chatterton's diction; is author of a *Hand-list of some Cognate Words in English, Latin, and Greek* (1871); *Questions for Examination in English Literature* (1873); an *Etymological Dictionary of the English Language* (1882); *The Principles of English Etymology* (2 vols., 1887-91); an edition of *Chaucer's Minor Poems* (1888); and *Complete Works of Geoffrey Chaucer* (6 vols., 1894).

Revised by BENJ. IDE WHEELER.

Skeleton [= Mod. Lat., from Gr. σκελετόν (sc. σώμα, body), dried body, mummy, skeleton, liter., neut. of σκελετός, parched, dried up, deriv. of σκέλλειν, dry, parch]: in its broadest sense, the structures serving to support and protect the more delicate tissues of the body of an animal. Among the invertebrates the skeleton is often represented by calcareous or siliceous plates or masses developed in connection with the integument, hence known as the exoskeleton, as distinguished from the more highly specialized supporting apparatus developed within the connective tissue as the cartilage or the true osseous substance which constitutes the endoskeleton. Ignoring the feeble attempts at the formation of a connective-tissue skeleton which are found among the lower animals, as the *Vermes* and the *Mollusca*, a true skeleton, composed of cartilaginous or osseous pieces forming a definite framework throughout the body, may be said not to exist except in vertebrate animals.

In addition to the endoskeleton, many vertebrates also possess in connection with the integument supplementary protecting structures which constitute an exoskeleton. Conspicuous examples of such structures are seen in the external skeletal plates of the sturgeon, the tortoise, or the armadillo. In other animals, again, a partial bony support is formed within the substance of certain organs, as, for example, the bony plates within the heart-walls of ruminants, the osseous rods within the tongue of certain lizards, or the slender bone within the male copulative organ of many carnivora, rodents, bats, and some monkeys. Such osseous structures occurring within the substance of the viscera constitute the splanchno-skeleton.

The first framework formed within the immature animal is the primary cartilaginous skeleton which is developed by the specialization of parts of the connective tissue of the embryo. This framework of cartilage in a general way outlines the bony skeleton, although much simpler than the latter in its details. Among the higher vertebrates the cartilaginous structures are only temporary, and after affording support to the delicate softer tissues of the developing organs for a limited time are replaced by the permanent bony skeleton. While such substitution is almost complete among the higher animals, some of the lower vertebrates, as the sharks, retain the primary cartilaginous framework throughout life as their permanent skeleton. Usually, however, after a time, at certain points called centers of ossification, the cartilage becomes invaded by true bone-producing tissue, and the substitution of osseous for cartilaginous structures is effected. For the details of the process of bone-formation, see the article HISTOLOGY.

Every vertebrate, whether fish, amphibian, reptile, bird, or mammal, possesses in the spine or vertebral column a fundamental axis in regard to which the remaining portions of the endoskeleton are symmetrically arranged. This axis is not necessarily bony in character, since in some fishes it never develops beyond the cartilaginous condition. In the lancelet, or amphioxus, it never attains even to the cartilaginous stage, but represents the primitive embryonic axis, the notochord. See EMBRYOLOGY.

The vertebrate axis is formed by a series of disks, the bodies of the vertebrae extending from the base of the skull to the caudal pole and including a variable number of segments, as few as fifteen or as many as 365. From this fundamental axis two series of very unequal dorsal and ventral arches extend. The dorsal arches are formed by the union of short vertebral plates—the lamina—which thus form a tube extending from the cephalic to the caudal pole of the animal. This tube is the vertebral canal and contains the spinal cord. At its anterior, or cephalic extremity, the tube usually widely expands into the cranial cavity containing the brain. The brain-case, or cranial portion of the skull, may be considered in a qualified sense as being composed of enlarged and modified vertebral segments. The dorsal or vertebral canal is distinguished therefore as containing and protecting the great cerebro-spinal nervous axis.

The ventral arches proceeding from the vertebral axis, on the other hand, are less constant, varying greatly in their number and position. The ventral arches are principally represented by the ribs, thoracic or abdominal, and by the variable series of branchial bows, or gill-arches, placed at the base of the head. The ventral arches inclose the thoracic and abdominal organs, affording them protection and support.

The osseous framework of man, in common with that of other high vertebrates, consists of two parts—the axial and the appendicular skeleton. The former includes the more constant and essential portions of the vertebrate framework, namely, the vertebral column, the skull and the ribs, with the breast-bone. The appendicular skeleton depends for its development upon the presence of limbs, since it includes the bones of the extremities, together with those forming the skeletal connection between the framework of the limbs and the spine. These connections are known respectively as the shoulder-girdle and pelvic girdle.

The shoulder-girdle in man consists of the collar-bone or clavicle, and the shoulder-blade or scapula, by means of which the bones of the upper limb are indirectly connected to the axial skeleton, an arrangement favoring the great latitude of motion enjoyed by the upper extremities. The pelvic girdle is much more fixed, consisting of the hip-bones or innominate, which give firm support to the thigh-bones and transmit the weight of the upper portions of the body. In animals, as the whales, where the hind limbs are wanting, the pelvic girdle, and hence the pelvis, is absent.

The individual osseous pieces composing the skeleton are so related that usually more or less extended movement is possible between the several bones. These latter are united by fibro-elastic bands—the ligaments—and the structures of the joints. The apposed surfaces of bones may be so inti-



The human skeleton.

mately united that only a thin membrane intervenes. This may undergo absorption at a later period, in which case the earlier distinct bones become fused and the original line of articulation disappears. The bones of the skull afford examples of such union, followed by the obliteration of former lines of contact of the sutures.

The more usual relation between the bones allows of a certain amount of movement, the surfaces of contact and motion being inclosed within the structures of the joints. The articulations at the shoulder, the elbow, the knee, and the hip afford striking examples of the wide latitude of movement enjoyed by the bones of the extremities. For the details of the joints, see articles *JOINTS* and *SYNOVIAL MEMBRANES*.

In addition to affording support and protection to the viscera and the organs of the body, the skeleton supplies the points of attachment for the numerous voluntary muscles. These latter, with very few exceptions, have at least one extremity, and more usually both ends, attached to portions of the skeleton, acting upon the more movable parts from the fixed points. The leverage afforded by the long bones of the skeleton is an important factor in many movements essential to the proper use of the limbs.

The exact number of separate bones composing the human skeleton varies with age, since many bones which at middle life consist of a single piece in early infancy are represented by several distinct segments, as instanced in the sacrum and innominate bones forming the pelvis. Again each fully formed bone in very many cases is the product of the fusion of several segments, which before maturity become united by the substitution of true osseous tissue for the layer of cartilage connecting the pieces. Thus the thigh-bone as found represents the fusion of at least five distinct segments, the union not being fully completed until about the seventeenth year. The adult human skeleton consists of 206 distinct bones, as follows:

The skull, including 22 vertebrae, the sacrum, and the coccygus	81
The ribs, 12 pairs, the sternum, and the hyoid	31
The scapulae, 2, together with the 6 ear bones	26
The upper extremities, each 27	104
The lower extremities, each 26	102

At birth their number is 278; at the age of twenty-five, 324; and in advanced old age, 104. About 600 segments are needed in the formation of the 206 permanent bones.

Notwithstanding the great diversity in size, shape, and proportions, the general groups of long, short, broad, and irregular bones suffice for the usual purposes of classification of the constituents of the skeleton. A description of the individual bones is contained in the article *OSTEOLOGY*, while their chemical composition and structural peculiarities are given in the articles *BONE* and *HISTOLOGY* respectively. See also *FIBRO*, *BANDS*, and *SEVERAL* *CHANGES*.

G. A. PIERCE.

Skeleton Leaves: See *CELASTRACEAE*.

Skelton, John; poet; b. probably in Norfolk, England, about 1455; graduated at Cambridge about 1492; was incarcerated at Oxford University about 1499; was ordained deacon 1499 and priest 1499; was tutor to Prince Henry (afterward Henry VIII.); held a nonresidential position at court, by some considered equivalent to king's poet, by others to post-laureate; became rector of Diss, Norfolk, and vicar of Trimpington, Cambridge, 1504; subsequently became royal orator; was suspended from his bench by the Bishop of Norwich, having concealed the fact of his marriage; incurred the resentment of his former patron, Cardinal Wolsey, by his satirical verses; was obliged to take sanctuary at Westminster, and died there June 21, 1529. Skelton was one of the earliest English poets whose writings are easily intelligible to modern readers. Most of his verses are coarse, but were highly esteemed by Erasmus and the wife of the day. His best-known poems are *Philip Spurne* and *Churl's Complaint*; he also enjoyed fame as a writer of Latin epigrams. The only good edition of his complete works is that of Rev. Alexander Dyce (2 vols., 1845). Revised by H. A. BEARS.

Skene, skene, ALEXANDER JOHNSTON CHALMERS, M.D.; gynecologist; b. in the parish of Fyvie, Aberdeenshire, Scotland, June 17, 1837; studied medicine at King's College, Scotland, the University of Michigan, and at Long Island Medical College, where he graduated in 1863; served as acting assistant surgeon in the Union army 1863-64; returned to Brooklyn in the latter year, and was appointed adjunct professor and instructor in medicine in Long Island Medical College; subsequently was appointed Professor of Gynecology in that institution, and for a time occupied the same chair in the Post-Graduate Medical School, New York. He is a member of various domestic and foreign scientific societies. His best-known works are *Diseases of the Bladder and Urethra in Women* (New York, 1878) and *Diseases of Women* (New York, 1888). S. T. ARMSTRONG.

Skene, PHILIP; soldier; b. in London, England, in Feb., 1725; entered the British army 1759; served in the taking of Portofello and Cartagena in South America, at the battles of Fontenoy and Culloden, and in the American campaigns against Ticonderoga and Havana; received in 1759 a large grant of land on Lake Champlain, and with a view to strengthening the hold of the British on Canada founded Skenesboro (now Whitehall), N. Y.; was made governor of Crown Point and Ticonderoga, with rank of colonel in the army; was arrested as a loyalist in Philadelphia June, 1775, and exchanged Oct., 1776; accompanied Burgoyne in his invasion of Northern New York; was taken prisoner at Saratoga; was attainted by the Legislature of New York 1779, his estate being confiscated; was granted a pension by the British Government, and spent the remainder of his life in England. D. near Stoke Goldington, Bucks, June 10, 1810.

Skene, WILLIAM FORBES, LL.D.; historian; b. at Inverurie, Kincardineshire, Scotland, June 7, 1809; educated at the High School and University of Edinburgh, also at that of St. Andrews, and in Germany; became a lawyer, a distinguished archaeologist, an officer of several learned societies; and in 1851 historiographer for Scotland. He was the author of *The Highlanders of Scotland, their Origin, History, and Antiquities* (2 vols., 1857), and editor of *The Dean of Lismore's Book, a Selection of Ancient Gaelic Poetry* (1861); *Chronicles of the Picts and Scots and other Early Memorials of Scottish History* (1868); *The Four Ancient Books of Wales* (2 vols., 1869); *The Pictish Stone* (1869); *John of Fordun's Chronicle of the Scottish Nation* (2 vols., 1871); and *Celtic Scotland* (3 vols., Edinburgh, 1876-80).

Skepticism: See *SCPTICISM*.

Skimmer, or Scissors-bill: any bird of the genus *Rhycolopus*. These birds skim over the sea with the lower mandible.

ble, which is much longer than the upper and compressed like a knife-blade, cutting through the water. They are related to the terns, but belong to a distinct family. The black skimmer (*R. nigra*) is black above, white below. The spread of wing is 3½ to 4 feet; length, 16 to 20 inches. It ranges northward to New Jersey, but *R. albicollis* is Indian and *R. flavirostris* African.

F. A. L.

Skin: See HISTOLOGY.

Skin Diseases: diseases affecting the skin. These diseases appear as primary or secondary eruptions. The following are the primary forms: (1) The *macule* or *spot*, a change of the normal color of the skin without elevation, arises from hyperæmia, hæmorrhage, or inflammation, sometimes from anomalies of the distribution of the coloring granules of the skin. (2) The *papule* or *pimple*, a projection above the surface, varying in size from that of a millet-seed to that of a lentil, is produced by diseases of the cutaneous glands, inflammation, and new growths of the papillary layer. (3) The *tubercle* is a solid projection of the size of a lentil up to that of a hazel-nut. (4) The *wheel* is slightly raised above the surface, and greatly exceeds the thickness in horizontal extension, varying in size from that of a finger-nail to that of the palm of the hand. (5) The *tumor* forms a solid projection of the size of a walnut to that of a man's fist. (6) *Vesicles* are elevations of the epithelial layer of the skin produced by a transparent or milky fluid, corresponding in size to that of papules, and as such never being of a long duration; while (7) *blebs* surpass the size of vesicles up to that of a goose's egg, and (8) *pustules* always contain pus, and therefore form superficial abscesses of the skin. Vesicles, blebs, and pustules almost always are surrounded by inflammatory areas.

Secondary forms of eruptions are (1) the *excoriation*, a flat abrasion of the epithelial layer of the skin, arising from destruction and rupture of primary eruptions, very often through scratching with the finger-nails. They always heal without the formation of a scar. (2) The *ulcer* presents a loss of substance penetrating into the derma, which heals slowly and with formation of a cicatrix. (3) *Fissures* are elongated cracks in the skin on parts liable to much stretching. (4) *Scales* are produced by detached epidermis. (5) *Crusts* result from drying of an exuded fluid or of extravasated blood. (6) *Scars* or *cicatrices* are connective-tissue formations which replace deeper losses of substance of the derma.

The causes of diseases of the skin are either rooted in the whole organism, or they are local ones, by which the skin is primarily or chiefly attacked; hence the division into symptomatic and idiopathic affections of the skin. Certain rashes occur in variola, scarlet fever, measles, syphilis, in typhoid fever, in purulent infection of the blood, so-called pyæmia, in scrofulosis, scorbutus, etc. Moreover, diseases of internal organs may involve the skin, especially affections of the intestinal tract, of the liver and spleen, of the internal genital organs, of the urinary apparatus, of the nerve-centers. There are, lastly, normal processes—dentition, menstruation, pregnancy—which lead to various kinds of cutaneous affections. Besides general injurious influences—heat and cold, dryness and moisture, different arts and trades—merely local diseases are caused by the operation of caustic substances, neglect of cleanliness or exaggerated washing and rubbing with strong kinds of soap, long-continued pressure upon certain parts, and parasitic organisms which penetrate the skin. The scratching of the patient himself who suffers from itching is an important cause for producing mechanically lesions of the skin. Thus parasites give rise to such affections by irritating the skin directly or by exciting the sensibility of the cutaneous nerves by producing the sensation of itching.

The changes of the skin, by too great an afflux of blood (hyperæmia) or lack of blood (anæmia), as such do not produce diseases of their own, being always of a transient character or rooted in diseases of the whole organism, and are therefore omitted in the following enumeration.

1. *Diseases due to Perverted States of the Secretions of the Cutaneous Glands.*—The sweat-glands of the skin (see HISTOLOGY) produce a fluid, the perspiration, which contains 99.3–99.5 per cent. of water, the residue consisting of solid matters, among which are chloride of sodium, phosphate of lime, hydrochlorate of ammonia, and traces of iron and of fatty matters. Even in the normal state each individual diffuses a special odor. There are persons with a peculiar rancid odor of their perspiration, a disease called *bromidrosis*, either universal or local—for instance, lasting in the

armpits, on the feet—in spite of the most scrupulous cleanliness. This disease is always dependent on too copious perspiration (*hyperidrosis*), and curable by repeated treatment with diachylon ointment. The secretion of a colored perspiration is termed *chromidrosis*. The sebaceous glands, which secrete a fatty mass, may produce the sebum in excessive quantity, there being no impediment to its secretion—the so-called *seborrhœa*. The disease is very common on the scalp (dandruff), and always leads to loss of the hair. It yields readily to certain preparations of tar, and a new growth of hair can very often be obtained. If, on the contrary, the excretion of the sebaceous mass be interfered with, the result is its accumulation within the glands or their ducts, the so-called flesh-worm—*comedones*. In the mass of a flesh-worm there is often found a mite, the *Acarus folliculorum*. The flesh-worms, again, are the most common causes of pimples, as they act upon their neighborhood like foreign bodies.

2. *Diseases due to Inflammation.*—Inflammatory affections of the skin may be acute or chronic. The acute contagious inflammations, so-called *exanthemata*, are due to diseases which attack the whole organism, are attended with febrile symptoms, present certain definite appearances on the surface of the body, and run a course the duration of which can be computed beforehand. In these diseases—*measles*, *scarlet fever*, and *smallpox*—the sympathy of the entire organism is manifested by symptoms of various kinds, both while the rash is present and also after its disappearance. The acute, non-contagious inflammations have a definite typical course, as their symptoms succeed one another in regular order. If the inflammation be manifested mainly by redness, with a slight exudation of the fluid part of the blood, fugitive rashes are produced, which, when spread over large parts of the surface are termed *erythema*, but when presenting isolated red spots are termed *roseola*. Extended and isolated superficial inflammations, accompanied with stinging or itching sensation, receive the name of *urticaria*, the latter being always characterized by the development of wheals. Diseases of this kind often are produced by disturbances of the stomach or by local irritations of the skin. They usually disappear after a short time without special treatment, but are very liable to recurrences. Lastly, there exist acute inflammations with accumulation of fluid beneath the epidermis, leading to the formation of vesicles and blebs, with short duration and no liability to return. The *herpes zoster* (shingles) is the most important of the forms of HERPES (*q. v.*). Shingles attack the individual, in most instances, only once during life. The chronic inflammations, such as PSORIASIS, LICHEN (*qq. v.*), and *pityriasis rubra*, are characterized by a tendency to repeated relapses and the protracted course which they run. Psoriasis is a very common disease, characterized by white, rough patches on a dark-red ground, dispersed all over the body, mainly on the elbow and knee. The patches are not liable to any further change, such as supuration and ulceration; they leave no scars, though they are sometimes followed by persistent pigmentation. Sensations of pricking or itching are complained of only when the patches first come out; afterward there are no subjective symptoms. The disease occurs often on otherwise healthy and strong individuals.

A second group of inflammatory affections is characterized by intense itching, and besides the primary form of eruption they irresistibly provoke scratching in consequence of the itching; this, again, gives rise to further changes in the skin known as excoriations. To this group belong ECZEMA (*q. v.*) and *prurigo*.

A third group of chronic inflammatory diseases embraces those pimply and pustular affections which arise from inflammation of the hair-sacs and sebaceous glands. They include *acne*, *sycosis*, and *rosacea*. Acne on the face, the chest, and the back—one of the most disfiguring diseases—is always produced by accumulation of sebaceous masses in the glands (flesh-worms), and is entirely curable by repeated emptying of the glands.

To the fourth group of chronic inflammations belong the eruptions in shape of blebs, termed PEMPHIGUS (*q. v.*). Chronic inflammations of the skin of very variable but characteristic forms are produced by a general disease, *syphilis*; here the skin is merely symptomatically attacked, besides different other organs. With traumatic lesions of the skin, as well as with its inflammatory diseases, hæmorrhage is very often combined. Hæmorrhage is furthermore a symptom of universal disease in *scorbutus* and in *purpura rheumatica*. See PURPURA.

4. Diseases due to Hypertrophy.—Two explain production of any disease of the skin may be a consequence of a chronic inflammatory process, or it may occur without the symptoms of irritation as a consequence of anomalous congenital productivity. The *corns* and the *tyloma*, for instance, are products of a long-continued local irritation of the skin, but instances are known in which tyloma, the hardening and hypertrophy of the skin of the palms and the soles, must be considered as a congenital disease. The *Exanthematous* (q. v.), an immense hypertrophy of all constituting tissues of the skin, is doubtless due to chronic inflammation of the lymphatics; while *Ichthyosis* (q. v.), the exuberant growth of epidermis, is due to the congenital hypertrophy of the papillae. *Warts* and *papillary growths* of the skin may be produced by either kind—local irritation as well as anomalous function of papillae. *Horns* of the skin, hypertrophy of the nails and the hairs—*polytrichosis*—always are dependent on congenital anomalies in the formation of the tissues of the skin. The pigment-granules of the rete mucosum are very often hypertrophied, leading to formation of brown spots, *ephelides* (freckles), *adrenas* (liver-spots), while long-continued irritation of the skin leads to universal dark discoloration—*melasma*.

5. Diseases due to atrophy are based on the same principles as hypertrophy. Inflammation often produces first hypertrophy, afterward ulceration, loss of substance, and atrophy. Hypertrophy of the pigmentation is not rarely combined with its partial atrophy in *vitiligo*, *leukopilia*, etc. Mostly to atrophy are due the senile changes of the skin, the white color of the hairs, the early falling out of the hairs without visible cause, the localized atrophy of hairs in *alopecia areata*. (See BALDNESS.) A plain atrophy is also the *anorexia*. Very little can be done with regard to the cure of these diseases.

6. Diseases due to New Growths.—New growths or tumors either belong to the connective-tissue formations of the skin, the *derma*, or are products of an anomalous epithelial growth. Tumors of the former kind may be benign or innocent, viz., painless, not ulcerating, not recurring after excision, and not infecting the organism, such as *fibroma*, a variety of which is the formation of scars without preceding lesion, the so-called *chloïd*; furthermore, *papilloma*, growth of the papillary layer, embracing most of the *warts* and *naevi*; lastly, *myxoma*, erectile tumors produced by enormous new formation of blood-vessels. Or the connective-tissue tumors are malignant, viz., painful, ulcerating, producing new growths around the first-formed tumor, and easily recurring after excision, even leading to secondary formations of identical tumors in the lungs, the liver, etc., such as *scirrhus*, one variety of which, the *pigmented* or *melanotic scirrhus*, forms the most malignant kind of tumors of the organism. Cancer is considered to be essentially an epithelial formation, which always is malignant. In all tumors the radical extirpation is the only reliable means of curing the disease, very often of saving the life of the patient.

7. Diseases due to Anomalous Innervation.—*Neuroses*.—Many of the already named diseases of the skin can be looked upon as being disturbances of the nerves in the first instance *urticaria*, *herpes zoster*, *leprosy*, *atrophy of pigment*. Disturbances in the property of sensation of the skin are lowered sensibility—*anesthesia*—and excited sensibility—*hyperesthesia*. To the latter kind belongs the itching of old persons, *pruritus senilis*.

8. Diseases due to Parasites.—The *Scabies* (q. v.) is produced by the presence of the itch-insect within the epidermis. The disease is readily curable by local application of preparations of sulphur. Analogous is the action of the flea, the bedbug, and the louse. By vegetable parasites are produced slightly swelling and itching brown spots, *pityriasis versicolor*; furthermore, *herpes tonsurans* (ringworm), a very common disease, appearing first in the shape of small vesicles or ring-like red eruptions, which, when situated on the parts provided with hairs, lead to baldness; lastly, *Favus* (q. v.), a disease limited to ringworm. If the parasites are killed locally, a perfect cure can be obtained; but on the scalp and the beard, where the parasites advance deeply into the root-sheaths of the hairs, these diseases usually are very obstinate.

Revised by G. H. Fox.

Skink : any one of the lizards of the family *Scincidae* (q. v.).

Skin-moths : beetles of the family *Dermestidae*, which attack skins, etc., and are often very destructive in museums. The most notable species are (1) *Dermestes lardarius*, (2)

Dermestes vulpinus, and (3) *Anthrrenus venosus*. The first is for the most part blackish, with a broad brownish-gray band on the elytra, relieved by three black spots on each side. Both the larva and the larva are very destructive. The second is totally black above, but the sides of the thorax and the under part of the body are covered with white scales. It is less common and less generally distributed than the preceding, but almost equally to be dreaded. Both the preceding attain about a quarter of an inch in length. The third species has three transverse wavy lines on the elytra. It is often very destructive to museum specimens, and especially to collections of pinned insects. It has become a household pest, and is known as *buffalobug* or *carpet-beetle*. It is only about a tenth of an inch in length. All these species may be killed by applications of benzoin; and this remedy is perhaps the most efficacious, although camphor and turpentine are also used. Specimens for museums should be prepared for resistance to the attacks of these insects by applications of arsenic, carbolic acid, corrosive sublimate, and boracic.

H. S. Huxar.

Skinner, JOHN SEYMOUR; editor: b. in Maryland, Feb. 12, 1758; was admitted to the bar 1809; settled at Baltimore 1813; was postmaster of that city 1808-17; began in 1819 the publication of *The American Farmer*, the first periodical exclusively devoted to agriculture in the U. S.; afterward edited several other periodicals of similar character, including *The Turf Register* and *The Plough, Loom, and Anvil*; was the first organizer of agricultural shows and fairs in the Middle and Southern States; wrote several works on farming and sporting topics, and was third assistant postmaster-general 1841-45. D. in Baltimore, Mar. 21, 1851.

Skinner, STEPHEN, M. D.; etymologist; b. in London, England, in 1623; graduated at Christ Church, Oxford, 1646; studied philology and medicine on the Continent, especially at Heidelberg; became a physician at Lincoln; was an earnest student of many languages, and devoted his life to the preparation of a vast work on English etymology, which he left incomplete at his death, which occurred at Lincoln, Sept. 5, 1667. Fortunately his MSS. fell into the hands of Thomas Henshaw, who edited them under the title *Etymologicon Linguae Anglicanae* (London, folio, 1671), a work of great value to the critical student of English.

Skipjack : any one of several fishes having a tendency to leap from the water, as the *Bostry* (q. v.), the *Bufo* (q. v.), the *Saur* (q. v.), and a fresh-water herring, *Clupea chrysocloria*.

Skipper : (1) the *Saur* (q. v.); (2) any one of several small dark-colored butterflies of the family *Hesperidae*.

Skirret : the *Sium sisum*, an umbelliferous parsley-like plant, a native of Asia, long cultivated in Europe, and rarely in the U. S., for its root, which is very nutritious and palatable. Skirret affords a good percentage of alcohol when distilled, owing to the large amount of sugar present.

Skittagetan Indians [*Skittagetan* is derived from Skitket, the name of a chief, and was first employed by Gallatin in 1848] : a linguistic family, also well known as the *Haida*. They are in two divisions, the *Haida* proper and the *Kaigani*. The former are confined to the Queen Charlotte Islands, Northwestern America; the *Kaigani*, who form an offshoot of the *Haida* proper, emigrated to Forrester and Prince of Wales islands, probably since 1750. In the *Haida* division there are thirteen villages, besides eleven that have been abandoned, and in the *Kaigani* division there are seven occupied villages and three abandoned ones. Five other villages, which can not be identified with any of the preceding ones, were named by Krause in 1855.

General Characteristics.—Investigations into the native languages by Dr. Franz Boas render it quite probable that the family should be merged into the neighboring *Koluschan* family. (See *KOLUSCHAN INDIANS*.) They are larger, better proportioned, and of lighter complexion than the *Salish* and other southern coast-tribes. The *Haida* are essentially maritime Indians, and derive their subsistence from the rivers and sea. Shellfish are much used, as are all edible roots and berries. The first rude beginnings of agriculture are discernible among them in the cultivation, from a remote period, of tobacco, either the true plant or one of the several substitutes employed. The dog was their only domesticated animal. The *Haida* live in permanent villages, but they scatter more or less at different seasons in pursuit of food. The houses, which are the large structures common to the northwest coast, are occupied continually, several

related families dwelling under one roof, the household being governed by an elder or sub-chief. There is nothing in the nature of a confederacy of the several villages. The chieftaincy was hereditary, and, as descent was through the female line, it passed, on the death of a chief, to his eldest brother, or, there being no brother, to his sister's son. Customs came to have the force of laws, and persons were restrained from injury to the person or property of a fellow tribesman by the custom of reprisals. In some respects, apparently, the tribes of the northwest coast, especially the Haida, had advanced beyond the condition of the eastern Indians, as partially shown by the extent to which they possessed personal property, and by the establishment of personal ownership in land. The Haida appear to have been of martial character, internal warfare having been common, as also forays upon distant tribes for the purpose of procuring slaves. The institution of hereditary slavery seems to have been intimately woven into the social system of the Haida, and slaves were regular objects of barter. The Haida are skillful workers in wood, and to some extent in metal, particularly copper. Their great skill at carving is seen, perhaps at its best, in the well-known carved totem-posts which adorn each village. Tattooing was formerly universal; labrets were worn by the females. The institution of the potlatch—the free distribution of property on certain ceremonial occasions—exists among the Haida, as among all the tribes of the northwest.

Population.—Dawson estimates the present number of the Haida to be from 1,700 to 2,000; Petroff gives the number of the Kaigani as 788. These figures indicate a marked decrease of population since 1850.

Authorities.—H. H. Bancroft, *Native Races* (1882), iii., 564, 604; J. C. E. Buschmann, *Spuren der aztek. Sprache* (1859), 673; Dawson, *Queen Charlotte Islands* (1880); A. Gallatin, in Schoolcraft's *Indian Tribes* (1853), iii., 402; Krause, *Thinkit Indianer* (1885), 304; L. H. Morgan, *Ancient Society* (1878), 176; I. Petroff, Tenth Census, Alaska (1884), 32; Poole, *Queen Charlotte Islands* (1872), 195, 309; H. R. Schoolcraft, *Indian Tribes* (1855), v., 489; Tolmie and Dawson, *Comparative Vocabularies* (1884), 15, 26. See **INDIANS OF NORTH AMERICA**.

JAMES OWEN DORSEY.

Skittles: See **BOWLS AND BOWLING**.

Sko'beleff, MICHAEL DMITRIEVITCH: Russian general; b. in 1841; served in the army against the Polish insurrection in 1863; was called to join the general staff in 1866; and in 1869 was sent to Turkestan, where he secured much valuable geographical information, which he afterward employed to great advantage in the expedition against Khiva in 1873. In this expedition he won great distinction. He afterward crushed the rebellion in Khokand, and became governor of the territory he had subdued. In the Russo-Turkish war he showed a degree of valor and skill in marked contrast to the inefficiency at the Russian military headquarters. He commanded the left wing at Plevna, captured the so-called Shipka army, Jan. 9, 1878, and took Adrianople. D. suddenly in Moscow, July 7, 1882. See Ossipovitch, *Michael Dmitrievitch Skobelev* (Hanover, 1887).

Skoke: See **GARGET-ROOT**.

Skowhegan: town; capital of Somerset co., Me.; on the Kennebec river, and the Maine Central Railroad; 35 miles N. by E. of Augusta, and 50 miles W. of Bangor (for location, see map of Maine, ref. 6-C). It derives excellent water-power from the river, which has here a perpendicular fall of about 30 feet, and has manufactories of woolen goods, scythes and edged tools, shoes, oilcloth, pulp, lumber, and flour. There are electric-light and power plants, water-works, 7 churches, free public library (founded in 1867), 2 national banks with combined capital of \$275,000, a savings-bank, and 2 weekly newspapers. The town was originally known as Canaan; was incorporated under the name of Milburn in 1823; has been called Skowhegan since 1836. It was enlarged by the annexation of the town of Bloomfield in 1861. Pop. (1880) 3,869; (1890) 5,068.

J. O. SMITH, EDITOR OF "SOMERSET REPORTER."

Skua, or Skua-gull: See **JAEGER**.

Skull [M. Eng. *skulle*, loan-word from Scand.; cf. *icel. skál*, bowl; Germ. *schale*; cf. *hirsnschale*. Eng. *scale* (of balance) is a doublet, of native origin]: the hard framework of the head of vertebrates. It consists of two portions, the cranium which forms the protecting case for the brain, and the facial structures. These may all consist of cartilage throughout life, as in the sharks, or entirely of bone, as in

adult birds and mammals, or of both bone and cartilage, as in many fishes and amphibians. In the lower forms no separate cranial elements can be recognized, the brain-case forming a continuous structure, with openings here and there for the passage of nerves, blood-vessels, etc. In the higher vertebrates distinct elements or bones can be recognized in the cranium, and these arise either by ossification of the cranial cartilage or by the formation of bone in the membranes outside the cartilage cranium. A similar distinction can be drawn between the cartilage-bones and the membrane-bones of the face. For the details of the bones of the skull, reference should be made to works upon comparative anatomy. The following are the bones more frequently found in the skull, arranged according to their origin and position:

Cranium.

Cartilage-bones:

Floor. Basisphenoid, basisphenoid, presphenoid.

Sides. Exoccipital, bones of the ear-capsule (otic), orbitosphenoid, alisphenoid.

Roof. Supraoccipital (part).

Front. Mesethmoid, lamina cribrosa.

Membrane-bones:

Floor. Parasphenoid.

Sides. Temporal or squamosal, parietal, supra- and post-orbital.

Roof. Supraoccipital (part), frontal, pre- and post-frontal.

Face.

Cartilage-bones: Palatine, pterygoid, quadrate, and articular.

Membrane-bones: Premaxillar, maxillar, vomer, nasal, lachrymal, jugal, and quadratojugal, and in the lower jaw the dentary, splenial, and angular.

It is rarely that all these bones are present in one and the same form. Usually there is an over-development (hypertrophy) of one and an under-development (atrophy) of its neighbors, or a fusion of two or more may occur. Still other bones may exceptionally appear (e.g. in the suspensory apparatus of fishes), which are properly not to be regarded as belonging to the skull. Although the subject of an enormous amount of study, the skull is yet far from thoroughly known. The best general account will be found in Parker and Bettany's *Morphology of the Skull* (London, 1877).

In the human skull but twenty-two bones exist, eight in the cranium and fourteen in the face. This is largely due to the fusion of bones distinct in the embryo as well as in the adult of lower forms.

J. S. KINGSLEY.

Skull-cap [so called from the helmet-like appendage to the upper lip of the calyx]: any one of a genus (*Scutellaria*) of perennial herbs found over a wide range of climates in America, especially in Mexico and the sub-tropical regions, though several species grow in northern parts of the U. S. and in Europe. They derive their name from an envelope around the fruiting calyx, have little aroma, and—especially for the cure of hydrophobia—enjoy a popular reputation which is entirely undeserved.

Skunk [from Abenaki (Amer.-Ind.) *sekan'ku*, skunk]: a musteloid carnivorous mammal of the sub-family *Mephitinae*. The body is moderately elongated and arched backward; the legs comparatively short; the feet sub-plantigrade; the tail rather long and very bushy; the color is particolored, black and white being contrasted. Their anal glands, according to Chatin, are essentially like those of the badgers and rats, and are in a single pair and of large dimensions; their outer walls are formed by a thick fleshy tunic formed of two layers of interlaced fibers, capable of sudden strong compression of the receptacles; these are enormous reservoirs, with a dense resisting fibrous coat, always containing a considerable quantity of the follicular product. The glandular substance is not spread all over the central pouch, but is restricted to a particular portion, and contrasts by its dark color with the white ground of the envelope of the pouch. The receptacles contain a nauseous liquid, which the animal, on being alarmed, discharges with such force that the jet is carried to a distance of from 8 to 12 feet. The voiding of the liquid must be sudden; and it does not suffice that the receptacle is large and powerfully muscular; the offensive liquid must be directed far backward, so as to flow as little as possible upon the rectal muscular membrane; so the opening is large and upon the summit of an umbilicated papilla, around

which vents a cutaneous fold which in a measure directs the discharge. The skunks are distributed throughout America, North as well as South, except the colder parts, and are found in no other portion of the world. The species are all active, carnivorous animals, feeding on small quadrupeds and birds as well as reptiles. They burrow in the ground, and in the northern parts of North America remain torpid during the winter. They bring forth from six to nine young at a birth. The mephitic fluid has been employed medicinally to some extent as an antispasmodic in hysteria, asthma, etc. The bite of the animal is in some quarters much dreaded, and is said to induce hydrophobia. *Mephitis mephitis* is the common large skunk; *Mephitis putorius* is the little striped skunk; *Conopatus macrurus* is about the size of *Mephitis mephitis*, and extends into the southwestern parts of the U. S. (Texas, etc.), from Mexico. Although they vary much in color, they can generally be distinguished as follows: The common species is black, with the crown white and with two white streaks diverging thence; the little striped skunk is black, with a spot on the forehead and one on each temple, and a number of white but interrupted longitudinal streaks on the back; *Conopatus macrurus* is black, but with a broad white dorsal median band.

Revised by F. A. Lucas.

Skunk-cabbage: the *Symplocarpus foetidus*, a large marsh-plant of the arum family, common in the U. S. from Maine to South Carolina, distinguished by the unpleasant smell of its large, broad, and veiny leaves. It is a monocotyledon, producing early in the spring its four-petaled flowers in a globose cluster upon a short stem within a shell-shaped spathe or hood, of a dark purplish, or with yellow and purple stripes and spots, variegated with patches of red or green. The fruit is oval and fleshy, inclosing large purple seeds. The roots and leaves have been used as stimulants.

Revised by CHARLES E. HENRY.

Skye: an island of Scotland, the largest of the Inner Hebrides, belonging to the county of Inverness, from the mainland of which it is separated by the channel of Kyle Rhea, half a mile broad. Area, 365 sq. miles. The surface is mountainous and rugged; the coast-line is steep, abrupt, and wild, but often strikingly picturesque on account of its smaller basaltic formations, its caves, and waterfalls. The soil is not unproductive, but, on account of the extreme dampness of the climate, it is unfit for agriculture. The name of the island, *Skye*, means cloud in the old Scandinavian tongue, and is very appropriate, as the days during the year on which no rain falls are very few. Turnips and potatoes grow well, however, and sheep-breeding is carried on with some success. Fishing is the principal occupation, and large quantities of salt and dried cod, herring, ling, and salmon are exported. The inhabitants, who are of Gaelic descent, interspersed with Norse settlers, and who still use the Gaelic language, are poor, and their number decreases, as many emigrate. Pop. (1851) 21,521; (1891) 15,795.

Sky-lark: the *Alauda arvensis*, an Old World bird, noted for its song. It has the feathers of the occiput slightly prolonged, the first primary very small, the second and third (which exceed the fourth) equal, and the external tail-feathers margined with white; the upper parts are variegated with blackish and reddish gray; the lower parts white on the abdomen, but with the neck, breast, and sides tinged with reddish and spotted with brown. The length is about 7 inches, the tail being 3. The skylark is found all over Europe, as well as in Northern Africa and the corresponding parts of Asia. It frequents meadows, and does not perch. It feeds chiefly on the seeds of various plants and herbs. Its nest is formed on the ground. It lays four or five eggs of a whitish gray. It is almost equally esteemed for the delicacy of its flesh and the melody of its song.

Skyros, or **Neyros**: Greek island; in the Egean Sea; N. E. of Kuba. It consists of two mountains, the valley between forming a narrow isthmus. It has two good harbors, is well watered, and has fine forests of oak and pine. Its once lucrative silver mines and quarries of various-colored marbles are no longer worked. The inhabitants are supported by their vineyards and flocks of sheep and goats. Hence, according to mythology, Theseus was treacherously killed, and here Achilles concealed himself before the Trojan war. Pop. 2,198. See STRABO.

E. A. G.

Slag: from Swed. *slagg*, from, slag, or Dutch *slagge*; cf. Germ. *schlacke*, from, slack, borrowed from like source; also to *schlagen*, strike—i. e. the splinters struck off in forg-

ing; the imperfect glassy or vitrifiable compounds which are produced during the collection of metallic ores by various fluxes. The slags produced in metallurgical operations should have the following properties: They should fuse at the right temperature; be of such fluidity and specific gravity as to allow the metal or scale (*regulus*) produced to sink easily through them; have such a composition that they will not attack the desired product or the furnace-walls, and will not allow undesirable bodies to separate from themselves; must be able to take up foreign substances, and must be in sufficient quantity to protect the desirable products from the hurtful influence of the blast or other agencies. It is seldom the case that all of these conditions can be fulfilled, and therefore the efforts of the smelter must be directed to securing as advantageous a combination as possible. The slags of ordinary occurrence are siliceous, combinations of silicic acid with bases already present in the charges or formed during the operation; but they frequently contain partly sulphides and fluorides, as well as particles of metal and matte. Sometimes they may be looked upon as single chemical compounds, at other times they appear to consist of mixtures, but in normal slags the amount of silicic acid is always within certain limits.

Frequently, by judicious mixtures of ores, the proper slag can be obtained without adding any flux; at other times a basic flux, like limestone, will be absolutely necessary. Occasionally there will be an excess of alumina, and it is then to be regarded as playing the part of an acid, but aluminas without silicates do not serve as slags. The most infusible silicates, like silicate of zinc or tin, can be made to fuse when combined with other silicates. A slag should not fuse before the desired effect has been produced in the furnace, such as the reduction of an oxide, absorption of carbon by iron, sulphurization of roasts, etc. Slags are often affected by the manner in which they solidify; rapid cooling producing a glassy, brittle slag, while slow cooling tends to produce a stony, tough slag, provided the chemical constitution is right. For this reason the slags when used for paving or building are slowly cooled. Slags have also been used to manufacture cement and alum, for fertilizers, and for ornament. The slag from the basic Bessemer-steel process is used as a substitute for phosphates.

The color of slags is very various. Generally a dark slag will owe its color to metallic oxides, dark green or black indicating iron oxides, and dark brown manganese; light green indicates protoxide of iron; red or reddish brown, sesquioxide of copper. Some very dark slags from iron furnaces, however, owe their color probably to sulphur, and contain little iron oxide. The peculiar blue of some blast-furnace slags has been referred to the presence of vanadium, molybdenum, cobalt, and titanium. While each or all of these may be present in blue slags, and may possibly cause their color, especially the cobalt oxide, Bontemps has shown that oxide of iron alone can impart all colors to glass; while Fourcet refers the blue shades of most of these slags to their physical constitution. The blue color of old zinc retorts has been also referred to the presence of titanium; and Wöhler considered that certain blue slags from blast-furnaces owed their color to a compound like ultramarine, but containing sulphide of calcium in place of sulphide of sodium. Among the minerals closely imitated by certain slags in composition and crystalline form may be mentioned amphibole, pyroxene, wollastonite, diopside, gabbroite, and labradorite.

Revised by C. KIRCHHOFF.

Slander: See LIBEL AND SLANDER.

Slate [M. Eng. *slat*, *selat*, from O. Fr. *selat*, a shiver, splinter, deriv. of *scaler*, shiver, chip (> Fr. *schaler*, burst, break forth)]; a rock, consisting largely of silicate of aluminum, which is easily split into slabs or plates. It is supposed to have been formed by the consolidation, under heat and pressure, of clay deposited in still water. It is known also as clay-slate and argillite. It weighs from 170 to 180 lb. per cubic foot, and its most extensive use is for roofs. The output of slate in the U. S. in 1892 was valued at \$4,117,125, of which \$2,529,000 worth was quarried in Pennsylvania and \$1,914,000 worth in Vermont. In 1894, owing to business depression, the output was much less. See Merrill's *Slates for Building and Decoration*, and articles on *The Strength and Weathering Qualities of Roofing Slates*, in *Transactions of the American Society of Civil Engineers* for Sept., 1892, and Dec., 1894.

M. M.

Slaters: town; Saline co., Mo.; on the Chi. and Alton Railroad; 12 miles W. of Glasgow, 96 miles E. of Kansas

City (for location, see map of Missouri, ref. 3-F). It is in an agricultural region, and contains 2 State banks with combined capital of \$150,000, a public high school, and a daily and 3 weekly newspapers. Pop. (1880) 771; (1890) 2,770.

Slater, SAMUEL: manufacturer; b. at Belper, Derbyshire, England, June 9, 1768; was apprenticed at the age of fourteen to Jedidiah Strutt, partner of Arkwright in the business of cotton-spinning; saw in a newspaper in 1789 the law passed by the U. S. Congress in that year for the encouragement of manufactures, and a notice of the bounty offered by the Pennsylvania Legislature for the introduction of the Arkwright patents into the U. S., the communication of the models of the new machinery to foreign countries being then forbidden by English law under severe penalties. Believing himself able to construct new machinery from memory, he sailed for New York. He entered into a contract with William Almy and Smith Brown, of Pawtucket, R. I., to construct and work the new cotton-spinning machinery, and started at Pawtucket, Dec. 21, 1790, a mill with three carding-machines and seventy-two spindles, which was the virtual beginning of the manufacture of cotton in the U. S. He erected cotton-mills at Oxford (now Webster), Mass., in 1812, to which he added woolen-mills 1815-16, the nucleus of the village of Slatersville. D. at Webster, Mass., Apr. 21, 1835. See Rev. George S. White's *Memoir of Samuel Slater* (Philadelphia, 1836; 2d ed. 1846).—His nephew, JOHN FOX SLATER (1815-84), became a manufacturer, and in 1882 gave \$1,000,000 for the education of freedmen in the South.

Slatington: borough (incorporated in 1864); Lehigh co., Pa.; on the Lehigh river, and the Lehigh Val. and the Phila. and Reading railways; 16 miles N. W. of Allentown, the county-seat (for location, see map of Pennsylvania, ref. 5-1). It has 9 churches, 14 public schools, including a high school with college preparatory department, extensive slate-quarries, rolling-mills, steam-boiler works, large school-furniture factory, a national bank with capital of \$100,000, and a weekly newspaper. Pop. (1880) 1,634; (1890) 2,716; (1895) estimated, 3,500. EDITOR OF "NEWS."

Slave Coast: old geographical name for that part of the coast of Upper Guinea which is about the Bight of Benin, so named because formerly a favorable place for obtaining slaves. It is now in part Dahomey, under French protection, and in part (to the E.) the territory of the Royal Niger Company. See DAHOMEY and NIGER TERRITORIES.

Slave Lake and River: See GREAT SLAVE LAKE.

Slavery (deriv. of *slave*, of like source with Germ. *sklave* < M. H. Germ. *sklave*, *slave*, Dutch *slaaf*, Fr. *esclave*, originally a Slave, a Slavonian. The word acquired its meaning in Italy in the eighth or ninth century): a state of bondage in which one human being is in complete subjection to the will of another. In its usual sense it is restricted to chattel slavery, in which the slave may be bought and sold like ordinary property, and it thus excludes the milder forms of bondage, such as serfdom or villanage. In its origin it was the sign of advancing civilization, in that it arose from the practice of sparing the lives of captives, who in the period of primitive savagery were generally slain by their captors. The arts of production must have reached the point at which a man's labor produced a surplus over what was necessary for his own support, for among barbarians clemency toward captives sprang from the perception that an economic benefit might be gained by their enslavement. The slavery of the industrial classes has characterized the early history of all civilized races, and as forcing men to labor, despite the natural reluctance inherent in barbarous tribes, seems to have been a necessary element of progress. It existed among all the races of antiquity of whom there is historic record, but in some its rigors were mitigated by peculiar laws and customs, as among the Hebrews, whose slaves became free after seven years had elapsed from the beginning of their servitude, while every fiftieth year, on the occasion of the jubilee, all slaves were emancipated.

Greek Slavery.—The Homeric poems bear witness to the antiquity of the practice of holding slaves among the Greeks. In the historic period the supply seems to have been kept up by capture in war, and by purchase from the slave-owners of Asia Minor and Thrace. Kidnapping, the sale of children by their parents, and enslavement for debt were also sources of supply. The rearing of slaves was never an abundant source in Greece, as it was cheaper to purchase those who had already reached the age of labor. They were employed in domestic service, in agriculture, and even in

commerce, manufactures, and occupations in which the risk and responsibility were great. As to the relative numbers of the slaves in Greece reliable statistics are lacking, but it is probable that in the cities they were greatly in excess of the free population. It is estimated that in Attica the slaves bore to the free native population the ratio of three to one, and in Sparta the Helots are said to have numbered 220,000, while the Spartans numbered only 32,000. Their treatment differed greatly in the different cities. In Sparta the Helots suffered cruel treatment at the hands of their masters, despite their kinship of race, while the Athenian masters were noted for their mildness. By the Athenian law a slave who had just grounds for complaint against his master could demand to be sold; he had a right to asylum in the temples and sacred places, and his death could be avenged like that of a free citizen. He could purchase his freedom with the money that he had saved during servitude, and could be liberated by the act of his master. As a reward for fidelity or honorable services emancipation was frequent. No consciousness of the injurious moral effects of slavery seems to have been felt by the greatest thinkers of classic Greece. Aristotle and Plato both regarded the institution as necessary, the former holding it to be beneficial to both parties if practiced with justice.

Roman Slavery.—In Rome slavery became more highly developed, and formed a more essential part of the social and political system than in any other ancient state. As in Greece, the sources of supply were wars and commerce with the slave-producing countries of the East, the latter being by far the more important source in the latter years of the republic and under the empire. The proportion of slave to free population is estimated by Blair at three to one in the period from the middle of the second century B. C. to the reign of Alexander Severus (222-285 A. D.), and the number of slaves owned by a single master was often very large. A freedman in the reign of Augustus is said to have left by his will over 4,000, and families of 200 or 300 slaves were not uncommon. As to the legal status of the slave, he was under the complete dominion of his master, against whom he had no legal redress. The marriage of slaves had no legal recognition, and their union (*contubernium*) was terminable at the will of the master; nor could a slave legally acquire property, though it became customary to permit him to enjoy a share of his earnings, known as his *peculium*. In general, punishments for crime were more severe against slaves than against free men. Their harsh treatment is attested by several servile insurrections, of which the most formidable were that of Eunus in Sicily in 133 B. C. and that of Spartacus in 73 B. C. By the second century, however, when the period of conquest had closed and the policy of the state aimed at peaceful development within existing limits, a greater humanity began to display itself in dealing with the slaves. This was furthered by the spread of Christianity, which, though it did not expressly forbid slavery or brand it as a crime, rested upon premises which must lead inevitably to its destruction. Accordingly, when the Teuton invaders settled within the Roman empire, they found the condition of slavery greatly modified. A system of caste or heredity in occupation had developed in both private and public business. The *coloni* on the landed estates were personally free, but could not leave the lands of the proprietors, and the prædial slaves in the course of time approached the condition of the *coloni*. Upon contact with the Roman civilization the Germanic tribes were naturally affected by the system of agricultural labor which they found in operation. Almost the only form of slavery known among them had been the slavery of the cultivator of the soil, and this gradually conformed to the condition of the Roman agricultural laborer. The resulting system was serfdom (see SERF), the effect of which was to lower somewhat the position of the old *colonus* while it raised that of the class of agricultural laborers as a whole.

Mohammedan Slavery.—During the Middle Ages slavery was still practiced, but among Christian races the enslavement of Christians was opposed by the Church. No such scruple applied to the enslavement of Mohammedan captives, many of whom were held as slaves throughout Europe, while numerous Christian slaves were left in the hands of the Turks and Saracens in the course of the many conflicts between Christianity and Mohammedanism. Many Moslem slaves were introduced into Europe by the great commercial cities of Italy, which carried on an extensive slave-trade with the East. On the other hand, the corsairs of Barbary carried off thousands of Christians into slavery, even pene-

leading into the interior of Spain and Southern France, and selling the peasants in their homes. Charles V. is said to have set free 20,000 Christian slaves after his expedition against Tunis in 1535, and 10,000 Christian galley-slaves were liberated after the battle of Lepanto in 1571. White slavery still exists among the Mohammedans, but the slaves are on the whole humanely treated. The traffic in black slaves, however, is marked by every form of atrocity, and has continued despite the prohibition of the Pope.

Yugoslav Slavery.—Though black slaves were to be found in Europe in the time of the Roman empire, African slavery on an extensive scale was not practiced by Europeans till after the discovery of America, when a great demand arose for Negro labor in the West Indian colonies of Spain. The Portuguese, who had introduced slaves into Europe some fifty years before, had at first a virtual monopoly of the slave-trade, but the English subsequently took part in supplying the Spanish demand. The rise of the North American colonies opened up another source of profit to the slave-traders. The first slaves sold to the English colonists were brought by a Dutch vessel to Jamestown in 1619, but the English afterwards supplied the greater number, and continued the trade throughout the eighteenth century, despite the increasing opposition to it on both sides of the Atlantic. The Quakers had from the first opposed it, but they lacked numbers and influence. Kinned, however, by Lord Mansfield's decision in the Somerset case in 1772, the enemies of slavery at last succeeded, through the labors of Clarkson, Sharp, Witherforce, and others, in bringing the matter before Parliament. After repeated failures to secure legislation against the slave-trade, they triumphed at last under the auspices of Fox and others, and an act abolishing the slave-trade was passed in 1807. They then turned their attention to the suppression of slavery itself. On Aug. 28, 1833, a law was enacted fixing Aug. 1, 1834, as the date for the emancipation of all slaves within the British empire, and providing for the payment of £20,000,000 to the masters, who, however, were to retain their slaves as apprentices till Aug. 1, 1840. The apprenticeship system was found to work badly, and was discontinued in 1848.

In the U. S. the slave-trade was forbidden by law in 1808. For many years before that time the abolition of slavery had been favored, not only by the Quakers, but by some of the leading statesmen. Franklin, Jefferson, Madison, and Jay were among the advocates of emancipation, and in the North this policy was so far carried out that by 1831 slavery had ceased to be a power in that region. The ordinance of 1787 prohibited slavery in the Northwest Territory. In the South, however, Eli Whitney's invention of the cotton-gin caused an ever-increasing demand for slave-labor, and the Southern States were growing more tenacious of slavery while the abolition sentiment was developing in the North. The more moderate opposition to slavery confined itself to attempts to restrict its sphere, and did not aim at unconditional abolition, but the latter policy was favored by radical reformers like Benjamin Lundy and William Lloyd Garrison, who represented a small and discredited but aggressive party. The story of the contest on the slavery question belongs to the history of the U. S., and is discussed under that title. In the Missouri Compromise (q. v.), in the struggle over the Wilmot Proviso, resulting in the formation of the Free-soil Party (q. v.), in the Kansas-Nebraska difficulty (see KANSAS), and finally in the formation of the REPUBLICAN PARTY (q. v.), the question of the extension of slavery became the leading issue in national politics. When civil war followed the secession of the Southern States from the Union, the expediency of the emancipation of the slaves as a war measure began to be seriously considered, and on Jan. 1, 1863, President Lincoln issued a proclamation granting immediate and unconditional emancipation. F. M. COLAR.

Slave-trade: dealing in slaves; in particular, the business of capturing or purchasing human beings, transporting them to another country, and selling them as slaves.

Slavery as a status is repugnant to the principles of the modern international law. In the Congresses of Vienna, 1815, Aix-la-Chapelle, 1818, and Verona, 1822, the contracting parties agreed to unite in suppressing the slave-trade. Several states forbade their subjects to engage in it; such were Denmark, Great Britain, and the U. S. Nevertheless it may exist, if recognized by the laws of individual states, within their jurisdiction only. The traffic in slaves carried on in the ships of such states could not be restrained without their consent, expressed by treaty. Accordingly, under the

influence of the agitation carried on by Zachary Macaulay, Sir Thomas Fowell Buxton, Witherforce, and others, the British Government, in the early part of the nineteenth century, began to make treaties with a number of states for the suppression of the slave-trade. To be effective, these treaties required one of two provisions: either (1) a reciprocal right to search the merchant ships of the contracting parties, or (2) cooperation by their naval forces. Such treaties were made by Great Britain with a great variety of powers, Spain and Portugal, the chief offenders, among them. As these treaties proved ineffective, they were amended or superseded by further negotiations. Most of these extended to British vessels the right to search ships flying the flag of the other nationality on suspicion of being engaged in the slave-trade, with provision for trial, either by mixed courts or by a court of the defendant. Two treaties with France and the U. S. bound the parties to maintain squadrons on the coast of Africa. The gradual success of these efforts has been in its field almost complete.

It was very natural that the efforts of Great Britain to draw the U. S. into an agreement to permit a mutual right of search should have been unsuccessful, for in the earlier half of the nineteenth century the memory of British pretensions in searching U. S. ships for British seamen and then impressing them was still fresh. The first treaty which concerned the slave-trade between the two countries is that of 1814. In it (Art. X.) both parties agreed to "use their best endeavors" to bring about its abolition, but no definite plan was arranged. By several acts during 1818, 1819, and 1820 the penalties for engaging in the slave-trade were increased; authority was given for the maintenance of ships on the African station; and for all persons under the jurisdiction of the U. S. the slave-traffic was declared to be piracy, that is, to be put into the same category with piracy by statute, and visited with the same penalty. Statutory piracy does not, however, warrant arrest and trial at the hands of any state, so that these statutes alone proved insufficient, and the British Government earnestly tried to persuade the U. S. to consent to a reciprocal right of search. This the latter steadily refused. The national sentiment against it was too strong; but the detestation of the slave-trade was strong also, and led to a resolution of the House, in 1820, in favor of an international agreement making it piracy. Nothing came of this, nor of negotiations in England the next year which provided a modified right of search, but the cases to be tried in the defendant's courts. In fact, it was not until 1842 that any joint arrangement was made, and this, avoiding the reciprocal right of search, provided that each country should maintain a squadron on the African coast, the two to act in concert. Finally, in 1862, the mutual right of search within certain limits, and under conditions, was conceded. Mixed courts were established at the Cape of Good Hope, Sierra Leone, and New York. The limits were extended a little by an additional article in 1863, and in 1870 the mixed courts were abolished, the ordinary prize-courts of the two countries taking cognizance of slave-trading cases.

It has been said that the slave-traffic off the African coast has been for the most part broken up, but the vast interior is given over to it, the hunting being carried on largely by Arab adventurers, and a market being found in the Mohammedan countries in the northeastern quarter of the continent. To check this traffic the civilized powers have addressed themselves, still under the lead of Great Britain. Thus in 1877 a convention was signed between Great Britain and Egypt, by which the slave-trade into or across the latter country was prohibited, with penalties for the parties implicated; the tribal wars having the making and selling of slaves as their object were to be discouraged; and a mutual right of search was granted on the Red Sea, the Gulf of Aden, the African and Arabian coasts, and in Egyptian waters. Another treaty with Portugal, in 1878, was aimed at the slave-trade within Portuguese jurisdiction in South Africa, and in 1884-85 the Berlin Congo conference decreed the abolition of the slave-trade within the Congo Free State. To make this abolition effectual, an important "General Act" was agreed upon in 1890, the parties to it including Turkey, Persia, the Congo Free State, Zanzibar, all the European maritime powers, and the U. S. This act begins by declaring the "most effective means of counteracting the slave-trade in the interior of Africa to be"—

(1) A civilized protectorate over the administration of the African territories.

(2) The establishment of strong stations by each power in its own territory to repress slave-hunting.

(3, 4, 5) The development of the country—Central Africa—by roads, railways, steamboat service supported by fortified posts, and telegraph lines to unite them.

(6) The organization of expeditions and flying columns to protect the communications and "support repressive action."

(7) The restriction of the importation of modern firearms and ammunition throughout the entire region in which the slave-trade is carried on.

This is a most attractive programme, if it can be carried out. Without good weapons the Arabs and their slave-hunting auxiliaries would not venture to attack the native tribes. Armed boats on the great lakes and fortified stations on the great highways would break the trade up effectively, while the growth of missions, of civilization, and of civilized trade would narrow its operations. To the carrying out of this programme the signatories pledged themselves with much detail and many provisions. At sea also, along certain stretches of coast, on the Indian Ocean and off Madagascar, the powers agreed to combine to put down slave-trading in small vessels.

Finally, those of the signatory powers whose domestic institutions recognized slavery agreed to forbid the importation of slaves, their transit, their departure, and the trade in them; while Zanzibar, Persia, and Turkey have bound themselves to assist actively in the suppression of this traffic. The provisions of the act to secure all these objects run through 100 articles.

THEODORE S. WOOLSEY.

Slavic Languages: a group of Indo-European languages which embraces Russian, Polish, Servian, etc. 1. Whether there ever was a unitary Slavic language is still a problem of philology. Theoretically, it is proper to speak, within the field of the Indo-European languages, of a unitary Slavic type, intimately related to the Baltic; and these two are often grouped as a Lithu-Slavic or Balto-Slavic branch of Indo-European, just as Sanskrit and Iranian are comprehended under Indo-Iranian. And the branch thus constituted undoubtedly stands in many characteristic phenomena nearer to the Indo-Iranian than to the Germanic, Celtic, Italic, or Greek. The Balts (i. e. the Lithuanians, Letts, and Prussians) have in common with the Slavs as against the remaining Indo-Europeans a richly developed vocabulary, similar formative suffixes, and noun and pronoun declensions closely related, especially in the formation of the so-called compound declension of the adjective with the pronoun stem *ja-*; e. g. *raū* *dydau* is in Lith. *gero-jo* (gen. of *geras*, good, and *jis*, he), in Slav. *dobra-jego*. In conjugation there are fewer points of contact, but the Lith. infin. in *-ti*, *-ti*, and the Slav. in *-ti* come close together: *dūti, dati*; likewise the supines in *-tum*: *tū*: *dūtum, datū*. In the consonant system Baltic shares with Slavic the loss of aspirates: Lat. *fero*, Gr. *φίρω*, Lith. *beriu*, Slav. *berq*; Lat. *fumus*, Gr. *θυμός*, Lith. (pl.) *dumai*, Slav. *dymū*; also the change of the palatal explosives to spirants somewhat as in Indo-Iranian: Gr. *ἐκάρω*, Lat. *centum*, Goth. *hunda-*, Lith. *szimtas* (*sz* = Slav. *š*), Slav. *sūto*; Lat. *hiems*, Gr. *χειμῶν*, Lith. *žiema*, Slav. *zima*; Gr. *γυμνάσιον*, Lat. *gymnaseo*, Lith. *žinoti*, Slav. *znati*. In syntax may be noted as common to both the use of the

genitive object in negative sentences, e. g. Lith. *nesa jis ne*
neg. acc. eum. voc. aetern. eum. cognoscetis
reg nej pažysta jos; bel jis je pažystate, Slav. *jako ne vidit*
jego ni znajetj jeho, vy že znajete i. Here *jos* and *jego* are objects in the genitive.

2. The Slavic type differs from the Baltic in two marked peculiarities: (a) the change of diphthongs into monophthongs; (b) by the finely organized laws of palatalization, i. e. by the regular change of *k, g, ch* to *č, ž, š* before the palatal vowels *e, ē, i, ī*, and by the later change of *k, g, ch* to *c, z, s* before the vowels *ē, i* which result from *oi, ai*. Here follow illustrations of both these typical phenomena: (a) Lith. *ai* corresponds to Slav. *ē* (a long, broad sound); *baisus*, terrible: *bēsiniū*, angry; *dailinti*, decorate: *dēlati*, carve; *mainyti*: *mēniti*, exchange; *raižyti*: *rēzati*, cut. Lith. *au* corresponds to Slav. *u* (orig. long); Lith. *ausis*: Slav. *ucho*, ear; *draugas*: *drugū*, friend; *jaunas*: *junū*, youth; *kaupas*: *kupū*, heap. Sometimes Lith. *au* corresponds to Slav. *y* (a deep guttural long *ū*); Lith. *au* is here plainly a resultant of *eu*; *krauti*: *kryti*, cover; *grauzti*: *grysti*, gnaw; *mauti*: *myti*, wipe; *raudoti*: *rydati*, moan. Lith. *ei* and *iē* correspond to Slav. *i*: *eiti*: *iti*, go; *mielas*: *milū*, dear; *teisus*: *tichū*, still; *pietūs* plur. dinner-time: *pišta* (from *pišta*), food. (b) The Slavic palatalization may be illustrated by the following parallels: Lith. *keturi*: Slav. *četyre*, four; *kibiras*:

šibiris, jug; *kirvarpa*: worm-hole: *šrūt*, worm, cf. Lith. *kirmis*: Lat. *vermis* for **kvermis*; *geidauti*, yearn: *o-šidati*, wait for; *gerli*, *geriu*, drink: *žrėti* (for *žerli*), *-žirg*, devour: *sarginti*, nurse: *stražiti* (for *storžiti*), watch over; vocat. *nebože*: *nebože* (from *nebogū*, poor). While this form of palatalization shows itself in all the Slavic languages and dialects, and consequently is their common property, dating from the time of their linguistic unity, there has been developed in one of the Baltic languages, viz., the Lettic, after the time of the division into the three chief branches, Lithuanian, Lettic, and Prussian, a phenomenon analogous to the Slavic palatalization, so that a *c* and *dz* correspond to the Slavic *č* (from *k*) and *ž* (from *g*); e. g. Slav. (Serv.) *čitarū*, whole: Lett. *ceeli*, firm (Lith. *kūlas*); Slav. *čirta*, mark: Lett. *cērtu*, cut, but Lith. *kertu*; Slav. *šrūt*: Lett. *cērms*, worm, but Lith. *kirmis*; Slav. *živū*: Lett. *dziwa*, vivus, but Lith. *gyvas*. With the primitive Slavic phenomena of palatalization belongs also the change *ch* (= Gr. *χ*) > *š*. The Slav. *ch* is, however, itself a product of *s*. Cf. Slav. *suchū*: Lith. *sausas*, to which the verbum causat. is Lith. *sausinti*: Slav. *sušiti*: Lith. *daušos* plur. air: Slav. *duchū*, but Lith. *daušinti*: Slav. *dušiti*.

A later palatalization, but one which nevertheless falls within the boundaries of the Slavic group, is the change of *k* > *c*, *g* > *dz* (*z*), *ch* (*s*) > *s* or *š*, which occurs in the special case where a guttural comes before an *ē* or *i*, resulting from original *ai, oi*. Cf. Goth. *haila*, which would be **kailas* in Lith. if it existed, and Slav. *čelū*, salvus; Lith. *kaina* (Lat. *poena*) and Slav. *cēna*, price; Lith. *gailus*, sharp: Slav. *dželiū*, violent. This appears prominently in suffixes and case-endings or verb inflexions; nom. plur. of *stogas*, roof, Lith. *stogai*: Slav. *stodzi* from *stogū*; dat. sing. Lith. *rankai* from *ranka*, hand: Slav. *račē* from *ranka*; imper.-optat. from *teka*, flow: *tici-ticēle*. The commonest appearance is in the Slav. suffixes *-ici*, *-ica*, *-ice*, *-ica*, which are used so widely as to give the impress of peculiarity to the entire body of the language. The corresponding Lith. suffixes show always *k*. Cf. Slav. *vēntci*, garland: Lith. *vainikis*; Slav. *juntci*, steer: Lith. *jaunikis*.

3. Another strong characteristic of the Slavic as against the Baltic type is the uniform loss of final *-s*. And as final *-ū* (< I.-E. *-ō, -ū*) and *-i* (I.-E. short *-i*) became silent at an early date, present Slavic word-forms often appear mutilated to the extent of the entire final syllable. Cf. Slav. *drugū* (now *drug*): Lith. *draugas* (usually *draugs*); Slav. *osilū* (now *osel*, *osiel*, *osai*): Lith. *asilas*; cf. also the casus obliqui, Slav. gen. sing. *nošti* (< *notji*): Lith. *nakties*, Slav. acc. sing. *nošti*: Lith. *naktį*. But as an offset to its poorer noun declension, Slavic has a fuller and clearer development of verb forms—a difference which constitutes one of the most difficult problems of philology. Cf. Lith. 3 pers. pres. *tekis*, 3 pers. *teka*: Slav. *tečēti*, *tečēt*, pl. *tekašt*; Slav. aorist formation *tekū-tekomū*, *tēchū-tēchomū*, *tekočū-tekočomū* and imperf. *tečaachū-tečaachomū* (also *tečēchū-tečēchomū*): Lith. perf. *tekėjau* and habitual imperf. *tekėdavau*. Lith. opt. *tekėtumei* (: supine *teketum + bei*) corresponds with change of category to Slav. condit. *tekū bi*. On the other hand, the Slavic language type lacks all except a few traces of the *s*-future: *tekēsū* must be expressed in Slav. either by the pres. *teka* (compounded with various prepositions to complete its meaning) or by the inf. *tekti* (= *teiji*, *tefi*, *teci*, *teci*) with the vb. *choštq*, will, *imamš*, have, or *bađq*, become. This last-mentioned distinction between the two language types is closely connected with the fine distinctions of the Slavic verb as regards the aspects of time-duration, which are not developed to the same degree in Baltic. In contrast to the Slavic use of the opt. as impv., *tici-ticēle* (where *i* and *ē* are parallel to Gr. opt. endings *-ous, -eure*), Lithuanian has a new formation from the true infinitive stem with *-k*: *tek-kikite*, *tekēkile*. A trace of the optative remains in *te-tekū*.

4. The separation of the Slavic from the Baltic must have been many centuries before our era. Many new acquisitions of sounds and vocabulary fall in the subsequent period of separation. The lexicographical material common to Slavic and Baltic shows no great or long-continued advance in culture from the primitive Indo-European period. The common Slavic vocabulary, on the contrary, is characterized by a great wealth of words important for the history of culture, and testifies to so long a period of common development and so rich and varied a community of life that the separation of the Slavs into various branches and peoples must be a comparatively very recent matter, and a result merely of local expansion. Especially worthy of notice is the borrowing of culture-words from the Teutonic, usually

reflected in the names given it. At the outset Dobrowský recognized in it a southern dialect, which he called at first Old Servian, later Bulgaro-Servian or Macedonian. Kopitar advanced the hypothesis of a Pannonian-Carantanian origin, which Miklosich followed with slight modifications. From these two scholars comes the name Old Slovenian. Šafařík defended the Old Bulgarian hypothesis, more on historical than on linguistic grounds. The name Old Slovenian is still used because in native sources the language was so called, *slověnskū* (*slovenica lingua*), but it is now known to have been a South Slavic dialect spoken somewhere in Macedonia in the ninth century, having the most points of contact not with modern Slovenian, but with Bulgarian, and some also with the present Servo-Croatian dialects. In location it probably formed a frontier between Bulgarian and Servo-Croatian; not necessarily in Northern Macedonia, however, for Constantine Porphyrogenitus speaks of Servians near Salonica. Aside from its philological importance, Church Slavonic is indispensable for the history of mediæval literature, serving beside the Christian Greek and Latin as the third international literary language. From the tenth century to the seventeenth a wealth of patristic literature, including lives, legends, and homilies, was assiduously translated—from the tenth to the fourteenth centuries especially in the South, but later also in Russia. It was also the state language in Bulgaria, Serbia, Bosnia, Russia (including Lithuania), Moldavia, and Wallachia; and while its supremacy, like that of Latin in the West, ceased with the end of the seventeenth century, yet even to-day the Russian literary language rests on centuries of Church Slavonic traditions as to forms, vocabulary, and orthography. See RUSSIAN LANGUAGE.

INDIVIDUAL SLAVIC LANGUAGES.

7. The southern Slavs, who in Byzantine times migrated in larger or smaller bands into the regions of the Hæmus, the Adriatic, and the Alps, are all called by Byzantine historians (Procopius, Menander, Theophanes, Theophylactus) by the name *Σλαβηνοί*, equivalent to Slav. *Slověne*, adj. *slověnskū*, a name continually met with in all historical periods in the Slavic South. The Bulgarians were originally called *Slověne* both by themselves and others, and their language *slověnskū*. The inhabitants of Styria, Carinthia, Carniola, and the coast around Trieste and Gorz are still called *Slovenet*, and their language Slovenian. The republic of Ragusa also, in spite of the identity of its language with the inland Servo-Croatian, held in its rich poetical literature of the fifteenth to the eighteenth centuries to the name of "Slovinian." Hence the Byzantine name *Σλαβηνοί* must have designated the whole of the southern Slavs. These tribes have never attained to a political or cultural unity. In Carinthia, Styria, and Carniola they early submitted to the Germans, and their closely resembling dialects formed the basis of the present Slovenian language. The dialect of Carniola forms the basis of the literary language. Slovenian was first treated grammatically by Kopitar (1808), later by Metelko, Dainko, Murko, and more recently by Miklosich, Levstik, and Šuman. A complete dictionary is (1895) being edited by Pleteršnik.

Nearest related to the Slovenian is the language of Slavonia in the old sense of the term, that is, of the region between the Save, Drave, and Mur (including scattered areas N. of the Mur in South Hungary). It probably extended formerly much farther toward the E., but the populations driven out of the Balkan Peninsula by the Turks entered the present Slavonia in such numbers that the Old Slovenian of the former kingdom of Slavonia is now restricted to the counties of Warasdin, Kreuz (Križevci), Agram, nearly to Belovar and Wirowitic. Since the end of the seventeenth century, this region has been known as Croatia and its language as Horvatian. Its literature began with the Protestant movement, and furnished in the seventeenth and eighteenth centuries a series of important prose works (also dictionaries by Belosteneć and Habdelić). It continued as a literary language until the rise of Illyrianism in Agram, after 1830, led to its displacement by the richer and more extended Servo-Croatian. As a popular dialect it still continues. It is often called the *kaj* dialect, from its use of the word *kaj* (quid?).

8. The Croatians proper and Servians extend farther south, roughly from the river Kulpa throughout Istria, the islands, the Croatian coast, Dalmatia, Montenegro, and throughout the interior (Bosnia, Herzegovina, Old Servia, Servia), and northward beyond the Save throughout Slavonia, Syrmia,

and Southern Hungary. The popular language deviates more or less from the literary dialect according to locality. That of Southwestern Serbia and Herzegovina, together with the Bezirk of Ragusa, is nearest in character to the literary dialect. Montenegrin offers many peculiarities in pronunciation and syntax. As a result of ecclesiastical and political separation, the Servians and Croatians, so nearly related in language, have had a very diverse historical development. Though both were originally converted by Rome, and both accepted the Slavic liturgy in the ninth century, the separation of the Church into Eastern and Western soon afterwards divided them into two hostile camps, Servia holding firmly to Constantinople and to Church Slavonic, while in the West the influence of Rome in ecclesiastical and public matters constantly increased. Not only in the old Romance cities of Dalmatia, but in the independent principality of Croatia, Latin was the ruling language in Church and state, though Church Slavonic still had a limited use in private congregational matters. After the end of the fourteenth century the popular language was used with Latin characters, at first in prose works for Christian instruction, but by the end of the fifteenth century for a poetical literature which reached its richest development in Ragusa in the seventeenth century. In 1595 Faustus Verantius (Vrančić) treated the "Dalmatian" (for so he called it) lexicographically and proved the Slavic loan-words in Hungarian. In 1604 appeared the first grammar of the "Illyrian" language by Bartholomew Kassi, and in 1649 a valuable dictionary by Jacobus Micalia. The literary life of Dalmatia spread to Bosnia in the sixteenth century—at least among Catholic adherents—and in the seventeenth and eighteenth books were printed in the popular language for circulation in Bosnia, with both the Cyrillic and Latin alphabets. The true founder of the popular language as a literary dialect for the Servians is Vuk Stef. Karadžić, who published much popular material, principally songs, in the second and third decades of the nineteenth century, and based the Cyrillic orthography on phonetic principles. Since this Servian dialect of Vuk is the same as the Dalmatian of the fifteenth to the eighteenth centuries (later used also in Bosnia), which, as above mentioned, was introduced into Agram in 1835 under the name of Illyrian, these two long separated branches have at last been united again into the Servo-Croatian literary language. Though this still preserves a dualism in name (Servian and Croatian), and in the use of different alphabets (Cyrillic and Latin), it is one in grammar and vocabulary. Vuk prepared a small grammar and an excellent dictionary (2d ed. 1852). The great *Academic Dictionary of the Croatian or Servian Language*, begun by G. Daničić (1882), is being published by the South Slavic Academy in Agram.

9. Most peculiar in its development has been the language of the Bulgarians, who borrowed their name from their Turkish conquerors, the Bulgars. They live to the number of about 3,000,000, E. of the Servians on the lower Danube in the Balkan and Rhodope Mountains, in Roumelia nearly as far as Adrianople, and in a large part of Macedonia. They were originally composed of seven Slovenian tribes, whose branches may have extended to the south as far as Greece, and northward as far as Eastern Pannonia and Transylvania; the resulting dialectal differences are not yet wholly obliterated. Besides the use of a post-positive article, Bulgarian has lost the true Slavic declension, replacing it by prepositions with the general case, which gives it a strange appearance in comparison with all other, even southern, Slavic dialects, with which in other ways it has many points of contact. This phenomenon probably dates back to the fourteenth century, and may have been partly due to the influence of Roumanian, in which it certainly developed much earlier. The Slavic conjugation, however, except for the loss of the infinitive, has been retained in Bulgarian in its old form, agreeing with the eastern Servo-Croatian dialects even in the formation of the future by means of the auxiliary *šā* (from *chošag*), and with all South Slavic dialects in the use of the conjunction *da* with object clauses (instead of *že* *iz* in Northwest Slavic, and *čto* in Russian). As noted above, Bulgaria was for a long time the center of Church Slavonic literary activity (under the Emperor Simeon, 927 A. D., and his immediate successors). As a result, the popular language does not appear in literature before the seventeenth century, and must be gathered from fragments found scattered through the Church Slavonic texts. The language was made known to the literary world by Vuk Stef. Karadžić and Kopitar, having been scarcely known to Dobrowský, and has been investigated

The Polish language is characterized most strongly among all the living Slavic languages by retention of the original Slavic nasalization: cf. prim. Slav. *dǫbŭ-dǫba-dǫbu*, Polish *dąb-debu*; prim. Slav. *rǫka-rǫkǫ-rǫkŭ*, Polish *ręka-ręke-ręk*. The Polish is rich, almost too rich, in sibilants, the original Slav. groups *te-ti*, *de-di* being assibilated: *cie* (i. e. *čē*), *ci* (i. e. *čī*), *dzie* (i. e. *džē*), *dzi* (i. e. *džī*); so also *s*, *z*, before palatal vowels become *š*, *ž*; *siano* (i. e. *šano*) *ziemia* (i. e. *žēma*). Polish differs widely from Czech in the treatment of the old Church Slav. vowel *ě*, making it now *ie* (before soft sounds), now *ia* (before hard); thus *wiatr* (Czech. *větr*, genit. *větru*), but *wierny*, *wierzyć* (Czech. *věřiti*). Polish forms from *or* + cons. and *ot* + cons. not *ra-ta*, like Cecho-Slovak. and South Slav., but *ro-to*, like Lusatian-Servian; *er* + cons. and *el* + cons. do not yield *ré* + cons., *lé* + cons. as in Czech and South Slav., but *re* + cons., *le* + cons., e. g. Czech *březa* or *bríza*, Pol. *brzoza*. Polish has no *r*-, *l*-sonans. In the umlaut of *ie* > *io* Polish is akin to Russian. Polish has retained *t* (hard) and *l* (palatal), whereas Czech has in recent centuries entirely relinquished *ř*. Beside other peculiarities of the Polish is to be noted its constant accentuation of the penultimate syllable, as distinguished from Czech and Lusatian-Servian, which accentuate the first; also its lack of distinctions in quantity as contrasted with the many long syllables, notably final ones, in Czech.

14. The Casubian was regarded by Kryński, Biśkupski, and Pobłocki as a dialect of Polish, but by most scholars has been more correctly regarded as the last remnant of the language of those Slavs who formerly extended throughout Pomerania and beyond the Oder to the Elbe. The Casubians of to-day (also called Slowincians or Slowincians) are a poor fishing people around the Gulf of Dantzig and in some places in the provinces of West Prussia (Putzig, Neustadt, Karthaus, Dantzig, Berent, Konitz, Schlochau) and Pomerania (Lauenburg, Stolp, Bütov), and number over 150,000. A comparison of their language (treated by Cenowa, Hilferding, Biśkupski, and others) with Polabian (as set forth by Schleicher) shows conclusively that Polabian and Pomeranian had much in common that can not be found in Polish. A most serviceable dictionary of Casubian by Ramult was published by the Cracow Academy in 1893.

15. For an account of the Russian dialects, see RUSSIAN LANGUAGES.

V. JAGIĆ.

Slavo'nia [= Late Lat., deriv. of *Slavus*, Slav; cf. O. Bulg. *Slavie nini*; Russ. *Slavya nini*, Slav, Slavonian; perhaps connected with O. Bulg. *slovo*, word, *slava*, glory]: a territory of Austria-Hungary, forming with Croatia a province attached to Hungary; bounded N. by the Drave and S. by the Save, and E. by the Danube. Area, 9,106 sq. miles. A branch of the Carnian Alps enters Slavonia from the W., and traverses it in its whole length, forming the watershed between the Drave and the Save, and terminating somewhat abruptly on the banks of the Danube. These mountains, which nowhere rise above 2,700 feet, are rich in copper, iron, lead, and beautiful marble, and their slopes are clothed with fine timber-yielding forests, vineyards which produce a sweet, strong, richly flavored wine, and orchards in which apples, pears, cherries, and peaches, figs, oranges, and walnuts ripen to perfection. Along the rivers extend low, rather marshy, but very fertile plains, where large crops of wheat and maize are raised and immense herds of cattle and swine reared. Of manufactures there are almost none; some linen fabrics are made from the excellent flax and hemp which are raised, but only for home use. The inhabitants, who call themselves *Slavonatz* and their country *Slavonska*, are at once warlike and dreamy, fond of music, poetry, and dancing, excelling in all kinds of horsemanship, and preferring the life of the shepherd to that of the tiller of the soil. They are deeply attached to their fatherland and proud of their nationality, and of late political ideas and passions have begun to play a conspicuous part in their lives. See CROATIA.

Revised by M. W. HARRINGTON.

Slavs [from Germ. *Sklave*, *Slave*, from the Slavic forms. See SLAVONIA]: a race of Indo-European relationship, characterized chiefly by their speech and constituting three-tenths of the population of Europe, and divided into three main branches—Eastern, Western, and Southern. To the first belong the Russians and Ruthenians; to the second, the Poles, the Czechs, the Slovaks, and the Wends; to the third, the Bulgarians, the Servians and Croats, and the Slovenes. For the Slavic population of Austria-Hungary, Prussia, and Russia, see the articles on those countries.

No information is given, even by legends, as to the first appearance of the Slavs in Europe. In the fourth century they were found in great numbers in the neighborhood of the Carpathians, and that is supposed to have been one of their earliest homes. Thither point the legends of many Slavonic peoples, especially the Poles and Czechs, and thence the Slavonic settlers appear to have spread northward to the Baltic and southward to the Adriatic. The earliest authentic records of the Slavs are given by Procopius, Jordanes, Agathias, the Emperor Maurice, and other writers during the second half of the sixth century. These authors all lived in Byzantium or in Italy, and were personally acquainted only with the Southern Slavs, who dwelt on the lower Danube and spread through ancient Mœsia and Pannonia. The Northern Slavs they knew by report only. No political unity seems ever to have existed among these early Slavs, but their different bodies consolidated at various periods between the seventh and eleventh centuries into monarchies, of which most have virtually disappeared. To the early Slavs, Jordanes and some other writers give the name of Wends, by which name the Slavonic inhabitants of Lusatia are still known to their German neighbors. This designation, under various kindred forms, appears to have been applied to Slavs by foreigners, just as that of Welsh (*Wâlsh*) was given by the Teutonic to the Latin-speaking peoples.

Of the ancient Slavs little information can be obtained except from the writings of Greeks, Germans, Arabs, and other foreigners. They appear to have differed but little in the various lands which they occupied, everywhere bearing the character of being a brave and hardy race, given to agriculture, and of a peaceable nature, except where they were influenced by more martial neighbors. Some modern writers suppose that the Slavs formed into clans, others that the foundation of Slavonic society was the family community. Among the Western Slavs, at least, a cluster of such communities formed a *jupa*, or district, at the head of which was a *jupan*, or chief, and in its center a *grad*, or town. The mode of life among all the Slavonic tribes was patriarchal, the father ruling his family with despotic power. Polygamy prevailed among them in heathen times, and also a kind of sutteeism, but women do not seem to have occupied an altogether degraded position. Of Slavonic heathenism not much is known, but its deities appear to have been for the most part personifications of nature-forces. Vague recollections survive of Svarog, the heaven-god, answering to the Greek Ouranos, the Vedic Varuna. He appears to have given place, in some parts, to a solar deity, Dazhbug, together with whom, as the representative of the sun, a Khors is mentioned. Another solar deity was Volos or Voles, the special protector of cattle, surviving in Christian times as St. Blasius or Vlasy. Kupalo and Garilo are supposed to have been representatives of the summer sun, the fertilizer of the earth. Fire is said to have been worshiped under the name of Ogon, answering to the Vedic Agni, and there was a wind-god, Stribog; but the chief deity of the Northeastern Slavs was Perun, the thunder-god, answering to the Teutonic Thor, and supposed to be the European representative of the Vedic Parjanya. Among the Western Slavs other deities were worshiped, such as Radigost and Sviatovit, and the three-headed Triglav, of whose images detailed accounts are given by old writers. These Western Slavs appear to have had temples and priests, but it is doubtful whether this was the case among their Eastern brethren. Of inferior deities the memory is still preserved in the belief of the common people of all Slavonic lands in Rusalkas, Vilas, and many other supernatural beings supposed to haunt woods, waters, and pastures. The Western Slavs appear to have been the first to accept Christianity, many of the Moravians, for instance, having been converted as early as the seventh century, their religious teachings coming from the West; but the submission of the great body of Slavs dates from the mission of the Greek monks Cyril and Methodius in the ninth century. See SLAV LANGUAGES.

Revised by M. W. HARRINGTON.

Sleep [O. Eng. *slēp*; O. Sax. *slāp*; O. H. Germ. *slāf* (> Mod. Germ. *schlaf*); Goth. *slēps*; cf. Lat. *la'bi*, *lapsus*, glide, slide, fall down, whence Eng. *lapse*]: a condition of the organism, normal, and occurring generally periodically, in which there is a more or less complete suspension of consciousness and the power of voluntary motion. It is somewhat difficult to analyze the various phenomena which go to make up the condition called sleepiness. The most

preconscious sensations are an impression of weight in the upper eyelids, and of a general relaxation of the muscles of the body; but there is besides an internal feeling of surprise and horror, to describe which is by no means easy. Along with this languor there is a general consciousness of all the senses, which increases the separation of the mind from the external world. The idealist seems loose to engage the attention, and the most exciting conversation no longer interests. For a time, indeed, such circumstances may dissipate the inclination for sleep, but eventually nature claims her ascendancy and consciousness is lost. Before this even there is usually yawning—a phenomenon strongly indicative of a wearied attention—the head nods and droops upon the breast, and the body assumes that position which is most conducive to muscular inactivity. The order in which the muscles lose their power is in general well marked, and leaves a distinct relation, as Lavoisier has pointed out, to the importance of their functions. The muscles which move the arms and legs become relaxed before those which support the head, and the latter before those which maintain the symmetry of the back. This, however, is not always the case.

During sleep the respiration is slower, deeper, and usually more regular than during wakefulness. The vigor of the processes is lessened, and therefore there is a diminution of the pulmonary exhalations. Owing to the general muscular torpor which prevails, mucus may accumulate in the bronchial tubes and require to be expectorated on awakening. The circulation of the blood is slower. The heart beats with more regularity, but with diminished force and frequency. As a consequence, the blood is not distributed to distant parts of the body so thoroughly and rapidly as during wakefulness, and accordingly the extremities readily lose their heat. Owing to the reduction in the activity of the respiratory, circulatory, and heat-producing functions, the temperature of the whole body falls, and richness of the atmosphere is less easily resisted. The functions of the several organs concerned in digestion indirectly have their activity increased during sleep. The blood which is thus directed from the brain goes, as Durham has shown, to the stomach and other abdominal viscera, and hence the quantities of the digestive juices are augmented, and the absorption of the nutritious elements of the food promoted. The urine is excreted in less quantity during sleep than when the individual is awake and engaged in mental or physical occupation, because the wear and tear of the system is at its minimum.

The nervous system continues in action during sleep, though generally with somewhat diminished power and sensibility. The reflex functions of the nerve-centers are still maintained, and thus various movements may be executed without consciousness being awakened. Somnambulism is a condition of exaltation in the functions of nerve-centers, without the controlling influence of the cerebrum being brought into action; but aside from this rather abnormal phenomenon, there are others which are entirely within the range of health. Thus, if the position of the sleeper becomes irksome, it is changed; if the feet become cold, they are drawn up to a warmer part of the bed; and cases are recorded in which individuals have risen from bed and emptied a distended bladder without awaking, as well as performing many other complicated and apparently voluntary acts.

The ability to be readily roused through the senses constitutes one of the main differences between sleep and stupor. Relative to the different faculties of the mind as affected by sleep great variations are observed. It has been thought by some authors that several of them are really excited above the standard attained during wakefulness, but this is probably a wrong view. The predominance which one or two mental qualities apparently assume is not due to any absolute exaggeration of power, but to the suspension of the action of other faculties which, when we are not asleep, exercise a governing or modifying influence. Thus, the *imagination*, as regards the imagination, which appears to be most lively in dreams, we find that, when we carefully study its manifestations in our own persons, although there is often greater brilliancy in its vagaries, uncontrolled as it is by the judgment, the pictures to which it gives rise are usually grotesques and silly in the extreme. Even though the train of ideas excited in the dream seems to be rational and coherent, we are fully conscious on awakening that we are capable of doing much better by intentionally setting the fancy in action and governing it by our will and judgment. Owing to the fact that these two faculties of the mind are

invariably acting normally during sleep, the imagination is left absolutely without controlling influence. Indeed, we are often cognizant in those dreams which take place when we are half awake of an inability to direct it.

That the imagination may in its flight during sleep strike upon fancies which are subsequently developed by the reason into solid and valuable ideas is very probable. It would be strange if, from among the innumerable absurdities and extravagances in which it utters something fit to be appreciated by the mind should not occasionally be evolved, and there are many instances of the starting point of important mental operations having been taken during sleep.

As regards the memory in dreams, it is undoubtedly exercised to a considerable extent. In fact, whatever sign of activity the mind may then exhibit is based upon events the recollection of which has been retained. But there is more or less error mingled with a small amount of truth. The unbridled imagination of the sleeper so distorts the simplest circumstances as to render their recognition a matter of no small difficulty, and thus it scarcely if ever happens that events are reproduced during sleep exactly as they would be recalled by the mind of the individual when awake. Frequently, also, recent events which have made a strong impression on our minds are forgotten, as when, for instance, we dream of seeing and conversing with persons not long dead. Yet there are many instances on record of knowledge which had passed out of the mind being re-acquired during sleep.

During sleep the power of bringing the judgment into action is suspended. We do not actually lose the power of arriving at a decision, but we can not exercise the faculty of judgment in accordance with the principles of truth and correct reasoning. An opinion may therefore be formed during sleep, but it is more likely to be wrong than right; and no effort that we can make will enable us to distinguish the false from the true, or to discriminate between the possible and the impossible.

As regards the will, very opposite opinions are entertained relative to its activity. In the course of his remarks on sleep, Darwin repeatedly alleges that during this condition the action of the will is entirely suspended, but he falls into the singular error of confounding volition with the power of motion. Thus he says: "When by one continued posture in sleep some uneasy sensations are produced, we either gradually awake by the exertion of the volition or the muscles connected by habit with such sensations alter the position of the body; but when the sleep is uncommonly profound and these uneasy sensations great, the disquieting member or members is produced. Here the desire of moving the body is painfully excited, but the power of moving it, or volition, is incapable of action until we are awake."

Duguid Stewart contends that during sleep the power of volition is not suspended, but that those operations of the mind and body which depend on volition cease to be exercised. In his opinion, the will loses its influence over all our powers both of mind and body in consequence of some inexplicable physical alteration in the system.

It seems, therefore, that during sleep the three great functions of the mind are differently affected. (1) Feeling, embracing sensation and emotion, is suspended in part so far as the first is concerned, but is in full action as regards the second. We do not see, hear, smell, taste, or enjoy the sense of touch in sleep, although the brain may be aroused into activity, and we may awake through the excitations conveyed to it by the special senses. The emotions have full play, unrestrained by the will, and governed only by the imagination. (2) The will or volition is entirely suspended. (3) The thought or intellect is variously affected. The imagination is active, and the memory may be exercised to a great extent, but the judgment, perception, conception, abstraction, and reason are weakened, and sometimes altogether lost.

As to the immediate causes of sleep, it was formerly almost universally attributed to an increase in the amount of blood in the brain, but others hold that sleep is the direct consequence of a diminished amount of blood in the cerebral blood-vessels, and that unless this diminution takes place sleep is impossible.

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series, vol. vi., 1860); Maury, *Le Sommeil et les Rêves* (Paris, 1865); Hammond, *On Wakefulness, with an Introductory Chapter on the Physiology of Sleep* (Philadelphia, 1865), and *Sleep and its Derangements* (Philadelphia, 1869); Czerny, *Untersuchung über den Schlaf* (Prag Med. Wochenschr., 1892, No. 4); Rosenbaum, *Warum müssen wir schlafen?* (Berlin, 1892); Weygand, *Production des Rêves* (Leipzig, 1893); Wundt, *Lectures on Human and Animal Psychology* (New York, 1894), p. 323.

Revised by J. MARK BALDWIN.

Sleeper: any one of several sharks or fishes: (1) Either one of the nurse-sharks. (See NURSE-SHARK.) (2) In some of the West Indian islands a gobioid fish of the sub-family *Eleotridinae*; these rarely exceed a foot in length, and are of an elongated form, with two separated dorsal fins, the first of which has six slender spines, and thoracic ventral fins, which have each a spine and five rays.

Sleep of Plants: the nocturnal condition of many plants. Many leaves assume a particular position at nightfall or when placed in a darkened room, as is notably the case with certain sorrels (*Oxalis*), clovers (*Trifolium*), sensitive plants (*Mimosa*), and other *Leguminosae*. Many flowers close at night and open again in the morning, as of species of *Portulaca* and *Oxalis*, and the dandelion and many other *Compositae*. C. E. B.

Sleepy Eye: village; Brown co., Minn.; on Sleepy Eye Lake, and the Chi. and N. W. Railway; 48 miles W. of Mankato (for location, see map of Minnesota, ref. 10-D). It is in an agricultural region, and contains 6 churches, a State high school, 2 parochial schools, 6 warehouses and grain elevators, flour-mill, brewery, creamery, electric lights, a State bank with capital of \$25,000, a private bank, and two weekly newspapers. The place was named in honor of Ish-a-hum-bak, an Indian chief who was friendly to the whites during the massacre of 1861, the name meaning "Man whose eyes have appearance of sleep." Pop. (1880) 997; (1890) 1,513; (1895) estimated, 2,200.

EDITOR OF "DISPATCH."

Sleidan, JOHANN, whose true name was PHILIPPSOHN; historian; b. at Schleiden, 42 miles S. W. of Cologne, 1506; studied at Louvain and Paris and jurisprudence at Orleans; was secretary to Cardinal du Bellay, minister to Francis I., King of France (1536-41), although at Louvain he had imbibed Protestant opinions; was the representative of Francis I. at the Diet of Regensburg; led a wandering life till 1543 when he settled in Strassburg, which thenceforth was his home. He was appointed historiographer by the princes of the Smalkaldian League; represented Strassburg at the Council of Trent (1551), and on his return became Professor of Law. D. in Strassburg, Oct. 31, 1556. His fame rests upon his great history, *De statu religionis et reipublice Carolo Quinto Cesare commentarii* (Strassburg, 1553-56; best ed. by Chr. C. am Ende, 3 vols., Frankfurt, 1785-86), which gives a history of the Reformation from 1517 to 1556, resting on documentary evidence. It remains "the most valuable contemporary history of the Reformation, and contains the largest collection of important documents." It was translated into French (Geneva, 1557; new trans. The Hague, 1787), Italian (Florence, 1557), English (*A famous cronicle of our time, called Sleidan's commentaries*, etc., translated by John Daus, London, 1560; same, edited by Edmund Bohun, under title *The General History of the Reformation, etc., 1517-1556, with continuation to 1563*, 1689), and German (Frankfort, 1567, n. e. Halle, 1770-73, 4 parts). Another famous work, often reprinted, was his *De quatuor summis imperiis, Babylonico, Persico, Graeco, et Romano* (Strassburg, 1556; n. e. Amsterdam, 1705; Eng. trans. *The Key of History*, London, 1627, new trans. 1695; French trans. Geneva, 1563). His *Opuscula* appeared at Hanau, 1608. See his *Life* by H. Baumgarten (Strassburg, 1878), who also edited his correspondence (*Sleidans Briefwechsel*, 1881).

SAMUEL MACAULEY JACKSON.

Slemmer, ADAM J.: soldier; b. in Montgomery co., Pa., in 1828. He graduated from the U. S. Military Academy July 1, 1850, and was appointed brevet second lieutenant in the artillery; first lieutenant 1854. Detailed for duty at West Point in 1855, he served as Assistant Professor of Geography and History a year, and of Mathematics 1856-59. In the latter year he was ordered to Fort Moultrie, S. C., and in 1860 was transferred to Florida, where, in 1861, he commanded the small body of U. S. troops in Pensacola harbor, occupying with them Fort Barrancas and the neighboring feeble barracks. When intelligence of the surrender of the

Pensacola navy-yard to the Confederates reached him, he transferred (Jan. 10) his command to Fort Pickens, opposite, which action prevented the seizure of that important work. In May, 1862, he was attached to Gen. Buell's army, and participated in the siege of Corinth and in the subsequent movement to Louisville, Ky., and to the relief of Nashville, Tenn. He was commissioned a brigadier-general of volunteers Nov. 29, 1862, and engaged in the battle of Murfreesboro Dec. 31, where he was severely wounded and incapacitated from further active service in the field. He was promoted lieutenant-colonel Fourth Infantry Feb., 1864, and in Aug., 1865, he was mustered out of the volunteer service, and breveted colonel and brigadier-general. D. at Fort Laramie, Kansas, Oct. 7, 1868.

Sleswick: another spelling of SCHLESWIG (q. v.).

Slickensides: a peculiar polished and striated surface found commonly on the wall-rocks of mineral veins or faults, and where slate, shale, coal, and other fine materials have been crumpled and folded by pressure. Not unfrequently a foreign body, such as a concretion, shell, or nut lying in an argillaceous rock of which the particles have been moved on each other with great force, shows the polished striated surface to which this name has been given.

Slidell, JOHN: statesman; b. in New York about 1793; graduated at Columbia College 1810; settled at New Orleans, where he became a distinguished lawyer; U. S. district attorney 1829-33; member of Congress 1843-45; appointed minister to Mexico 1845, but not received by the Mexican Government; was U. S. Senator 1853-61, but withdrew in consequence of the secession of his State, which he had done much to promote. Sailing from Charleston as commissioner of the Confederate government to France, he and his associate, James M. Mason, ran the blockade and embarked at Havana on the British steamer Trent. On Nov. 8, 1861, Capt. Wilkes, of the U. S. frigate San Jacinto, stopped the Trent, seized the two commissioners, and brought them back to the U. S., where they were held prisoners at Fort Warren in Boston harbor. Bitter denunciations of the seizure appeared in the British press, and the attitude of the British Government was for the moment very threatening, but the U. S. disavowed the act of Wilkes and released the prisoners Jan. 1, 1862, thus putting an end to the difficulty. After the war Slidell settled in London, where he died July 29, 1871.

Slide-rule: an instrument for solving arithmetical problems where approximate results are sufficiently accurate. The form invented by William Oughtred (1573-1660) is best known, and the more precise one introduced by Edwin Thacher in 1885 is much used by engineers. The principle is that of logarithms, the divisions on one scale being those of the logarithms of numbers from 1 to 100, or from 1 to 1,000, while the numbers themselves are marked at the divisions of the other; by sliding one scale along the other the products and quotients of two numbers may be read off by inspection.

MANSFIELD MERRIMAN.

Sligo: county in the province of Connaught, Ireland, bordering N. on the Atlantic. Area, 721 sq. miles. The surface rises from the coast toward the E. and N. E., reaching 1,778 feet in the Ox Mountains. The western part is level, the soil mostly consisting of a light sandy or gravelly loam, interspersed with patches of bog. There are, however, districts with a deep and rich soil well adapted for tillage. Agriculture is the principal occupation, especially cattle-breeding and dairy-farming. Some coarse woollen stuffs are manufactured, and fishing is carried on. Two members are returned to the House of Commons. Pop. (1891) 98,013. Principal town, Sligo, at the mouth of the Garvogue, 137 miles by rail N. W. of Dublin, at the head of the Bay of Sligo (see map of Ireland, ref. 6-F). It has a good harbor, and exports cattle, grain, butter, etc. Sligo has a Roman Catholic cathedral and a modern town-hall. Pop. (1891) 10,110.

Slime-moulds: the *Mycetozoa* or *Myxomycetes*, a group of organisms of doubtful affinity; when referred to the animal kingdom called by the former name, when to the vegetable kingdom by the latter. They have hitherto been commonly regarded as plants, but are more probably related most closely to the rhizopods among animals. In their growing stage they consist of a naked mass of protoplasm of indefinite size and shape, and here their resemblance to the rhizopodous infusorians is evident; but in their reproductive stage they are definitely circumscribed masses of dry spores, here reminding one of some of the puff-balls

Didymopogon among the higher fungi. This latter reconsideration, which is now known to be altogether superficial, caused the earlier botanists to group the slime-moulds with the higher fungi. They have been studied almost exclusively by botanists who have written mostly all the literature relating to them, and as a consequence the treatment described above here is necessarily belated rather than adequate.

The reproductive or growing stage of a slime-mould, known as the plasmodium (Fig. 1), varies in size from minute amoeba-like masses to those as large as one's hand or larger. They may be dactylid and continuous or loosely reticulated, and in consistency they vary from extreme wateriness to a considerable toughness and firmness.

They are usually yellowish or reddish. Numerous nuclei are present, although not easily demonstrated. Plasmodia are mostly saprophytic in habit, and are to be found in decaying bark and wood. They move freely with an amoeba-like motion, and thus come to the surface or move from place to place. Hildreth observed the rapidity of the mass-movement of the plasmodium of *Didymopogon verpa* to be at the rate of about 2 mm. per minute. In this way they are able to make considerable distances during favorable (damp and quiet) weather. They are often found upon living stems and leaves, to which they must have moved a foot or more from the decaying matter in which they grow.

When they have reached maturity they come to the surface, and, losing water by evaporation, they divide their protoplasm into minute rounded portions, each of which secretes a wall of cellulose around itself, thus constituting a spore. At the same time the general contour of the plasmodium assumes a definite and in some cases a uniform outline which is characteristic of this stage, while its hardened boundary is known as the peridium. Internally other changes have taken place. The protoplasm usually secretes a more or less extended mass of filaments—the capillitium—which serves to give strength to the sporangium. The substance of the filaments is cellulose, or nearly allied to it, and is often incrustated or rimmed with lime.

The spores germinate by the bursting of their walls and the escape of the protoplasm as amoeba-like bodies, each at length provided with a cilia, which grow in size and coalesce into plasmodia. At one time it was thought that this coalescing method of the nature of conjugation in some of the green algae (*Volvox*), but this has been shown to be erroneous. It is not conjugation at all, but the simple fusion of two or more soft masses of protoplasm.

About 400 species of proper slime-moulds have been recognized, and if some closely related forms (*Manduca*) are added the number will be increased by about fifty. They are classified almost entirely upon characters derived from their spore-bearing stage.

Hustedt in 1975 made a thorough revision of the group, and proposed an arrangement based largely upon the color of the spores. This was followed by Berlese. Zopf made

many changes in the system, standardizing the color of the spores for the principal characters. He also adopted a modification of Zopf's system. The following arrangement is based upon Berlese's, with some changes.

Class 5 (EXOCYSTES). Plasmodium internal and saprophytic, its surface eventually forming a membrane (peridium), its interior developing (1) spores, and mostly (2) a filamentous framework (capillitium). Spore-bearing stage ("fruit") either (1) of irregular shape, plasmodium-like or plasmodia-like, or (2) sporangia of uniform and regular shape, which may be (a) single (an orthosporangium) or (b) coalesced into a compound body (an athallium). From a millimeter to many centimeters in extent.

Order CHARADRIACEAE (EXOCYSTES). Spores external.

Family *Choristogonaceae*. Spores borne singly on pedicels.

The genus *Choristogon* of Schreier (*Choristogon* of other authors) is the sole representative of this family (Fig. 2).

Order CEBRIACEAE (EXOCYSTES). Spores internal, in capillitium.

Family *Lecanaceae*. Peridium uniformly thickened (no network), when ripe irregularly torn. "Fruit" a plasmodia-like, sporangium, or athallium. The four genera *Lecan*, *Protodermis*, *Tubulin*, and *Lecanodermis* are represented by species of mostly small organisms.

Family *Chlorophyllum*. Peridium with internal thickenings, the thin parts breaking away when ripe, forming irregular projections. "Fruit" consisting of numerous sessile, globose, or cylindrical sporangia coalesced into an athallium.

Two genera—*Enteridium* and *Chlorophyllum* (Fig. 3)—represent this family.

Family *Cerberiaceae*. Peridium with internal thickenings, the thin parts breaking away when ripe, forming a network. Orthosporangia stipitate.

The two genera are *Dictydium* (Fig. 4) and *Cerberia*.

Order TAREBIACEAE (EXOCYSTES). Spores internal, capillitium present, peridium or capillitium sometimes with incrustations of lime.

Family *Trichaceae*. Without lime (except in *Perichone*), capillitium of tubes, free or combined into a network, the tubes mostly with rough prickly, plicate, or spirally thickened walls; no columella. "Fruit" an orthosporangium, rarely an athallium or a plasmodium.

Arceuthobium (Fig. 5), *Lygogon*, *Trichum*, and *Hemitrypa* (Fig. 6) are the most common genera in the U. S.

Family *Reticulariaceae*. Without lime, capillitium of solid filaments combined into an intricate network; columella present. Sporangia naked, many coalesced into an athallium.

The three genera are *Reticularia*, *Amurensia*, and *Siphonoglyphum*.

Family *Stemonitaceae*. Without lime, capillitium a net of solid filaments springing from the columella. Sporangia simple.

The commonest genera are *Leptodermis*, *Leptotrichum* (Fig. 7), and *Stemonitis*.

Family *Sporangioaceae*. With lime in the peridium or columella (not in capillitium); capillitium a net of much-



FIG. 1.—Plasmodium of *Didymopogon verpa* (x 100).

The plasmodium of *Didymopogon verpa* is at the rate of about 2 mm. per minute. In this way they are able to make considerable distances during favorable (damp and quiet) weather. They are often found upon living stems and leaves, to which they must have moved a foot or more from the decaying matter in which they grow.

When they have reached maturity they come to the surface, and, losing water by evaporation, they divide their protoplasm into minute rounded portions, each of which secretes a wall of cellulose around itself, thus constituting a spore. At the same time the general contour of the plasmodium assumes a definite and in some cases a uniform outline which is characteristic of this stage, while its hardened boundary is known as the peridium. Internally other changes have taken place. The protoplasm usually secretes a more or less extended mass of filaments—the capillitium—which serves to give strength to the sporangium. The substance of the filaments is cellulose, or nearly allied to it, and is often incrustated or rimmed with lime.

The spores germinate by the bursting of their walls and the escape of the protoplasm as amoeba-like bodies, each at length provided with a cilia, which grow in size and coalesce into plasmodia. At one time it was thought that this coalescing method of the nature of conjugation in some of the green algae (*Volvox*), but this has been shown to be erroneous. It is not conjugation at all, but the simple fusion of two or more soft masses of protoplasm.

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Hustedt in 1975 made a thorough revision of the group, and proposed an arrangement based largely upon the color of the spores. This was followed by Berlese. Zopf made



FIG. 2.—*Choristogon* (x 100). Spore-bearing stage, enlarged five times.



FIG. 3.—*Enteridium* (a) and *Chlorophyllum* (b) (x 100). Spore-bearing stage, enlarged five times.



FIG. 4.—*Dictydium* (x 100). Spore-bearing stage, enlarged five times.



FIG. 5.—*Arceuthobium* (x 100). Spore-bearing stage, enlarged five times.

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Hustedt in 1975 made a thorough revision of the group, and proposed an arrangement based largely upon the color of the spores. This was followed by Berlese. Zopf made



FIG. 6.—*Hemitrypa* (x 100). Spore-bearing stage, enlarged five times.

Hustedt in 1975 made a thorough revision of the group, and proposed an arrangement based largely upon the color of the spores. This was followed by Berlese. Zopf made

branched threads extending from the columella to the peridium. Sporangia single or coalesced into an aethalium.

Diachea and *Spumaria* (Fig. 8) are the genera.



FIG. 8.—*Spumaria alba*, natural size.

Family *Didymiaceae*. With lime (mostly in crystals in the outer wall of the peridium); capillitium of delicate tubes or filaments, without lime, extending from the columella or base of the sporangium to the peridium. Columella none or short, hemispherical, or orbicular. "Fruit" an orthosporangium or a plasmodiocarp.

The more important genera are *Didymium* and *Chondrioderma* (Fig. 9).

Family *Physaraceae*. With lime in granules; capillitium a net of hyaline, thin-walled, broad tubes, usually filled with lime; columella usually wanting. "Fruit" mostly an orthosporangium, less commonly a plasmodiocarp or an aethalium.

The common genera of this large family are *Tilmadoche*, *Leocarpus*, *Physarum* (Fig. 10), *Badhamia*, and *Fuligo* (Fig. 11).

Allied to the slime-moulds proper are two other groups, the *Acrasieae* and *Phytomyxinae*—classes they may conveniently be called—which are to be regarded as simpler and lower than the foregoing. They may be noted as follows:

Class *ACRASIEAE*. With no true plasmodium, the amoeboid swarm-spores not fusing; saprophytic; in fruit consisting of rounded heaps of free spores.

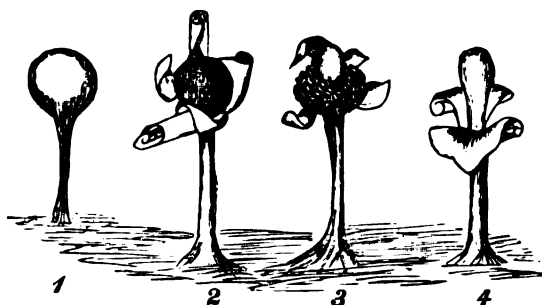


FIG. 9.—*Chondrioderma floriforme*, enlarged fifteen times: 1, unopened; 2, 3, ruptured, showing spores; 4, showing columella.

Several genera of these low organisms, falling into two groups, are known. They occur upon manure and other decaying matter.

Class *PHYTOMYXINAE*. With a true plasmodium, parasitic in the cells of higher plants, in fruit dividing into a mass of spores. The organisms here brought together are but obscurely known. *Plasmodiophora brassicae* (Fig. 12) occurs in the roots of cabbage, causing club-root. *Phytomyxa leguminosarum* causes the root-tubercles of clover and many other leguminous plants.

Zopf has added many other organisms to the slime-moulds, such as *Vampyrella*, *Bursulla*, *Colpodella*, *Protomonas*, *Protomyxa*, etc., whose animal nature has never been seriously doubted and whose affinities to the higher slime-moulds are evident.

As to their place in nature, the writer must agree with de Bary in placing them "outside the limits of the vegetable kingdom." If plants, they are so unlike all others that they must be regarded as belonging to a different genetic line. To set them off in a group by themselves would be merely an evasion of the question. Divesting one's self of prejudice and rightly esti-

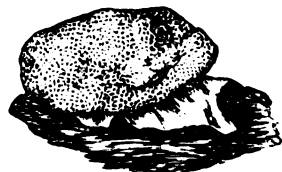


FIG. 11.—*Fuligo septica*, reduced one-half.

imating the value of their resemblance to and their differences from plants, one is compelled to admit that their resemblances to any plants are merely superficial (e. g. to some puff-balls), while their differences are profound. On the

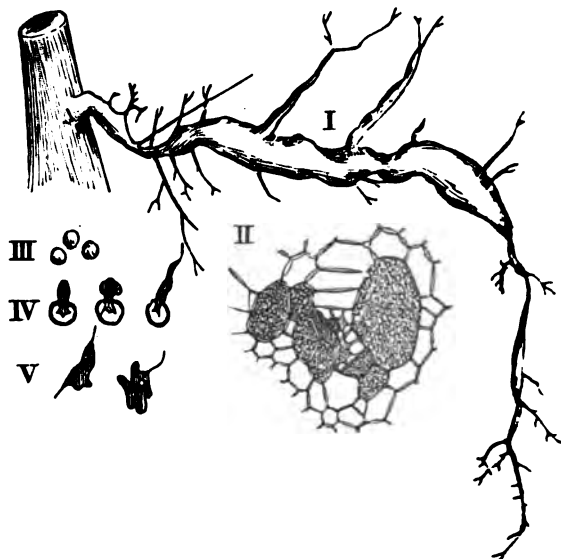


FIG. 12.—*Plasmodiophora brassicae*: I, cabbage-root, swollen, natural size; II, cells of affected cabbage, $\times 50$; III, spores, $\times 600$; IV, spores germinating; V, amoeboid masses.

other hand, in their structure, both in the vegetative and reproductive stages, they exhibit such striking similarity to the lower protozoans that one can not avoid the conclusion that their real relationship is with these lower animals rather than with plants. Among investigators who have placed the slime-moulds outside the vegetable kingdom are the following: de Bary (1858), Haeckel (1866), Allman (1879), Kent (1880), Zopf (1887), Rolleston and Jackson (1887), Bennett and Murray (1889), Lister (1890). On the other hand, those who have devoted themselves to a study of these organisms, systematically or descriptively, generally regard them as plants—e. g. Rostafinski (1875) probably, Cook (1877), Berlese (1888), Schroeter (1889), McBride (1892), Masee (1892).

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Sling: a simple contrivance for hurling missiles, consisting of a small disk of leather pierced by a hole and suspended by one, two, or three strings, say a yard long. A stone or other missile was placed upon the leathern disk, and then whirled rapidly about for a time, when one of the strings was dropped from the hand at the proper instant, and the missile sent with great force through the air. The ancient Greek light-armed troops in the Persian wars and afterward used the sling, often with a plummet of lead instead of a stone. These bullets are well known to antiquarians. They frequently bear the word *ΔΕΕΛ*—"Take this," or some similar word. The Persians, Achæans, Acarnanians, and especially the Balearic islanders, were famous slingers. The sling was also used by several half-savage peoples, as the Tahitians.

Sliv'no, or **Selim'nia** (Bulg. *Sliven*): town in Bulgaria (see map of Turkey, ref. 3-D); commanding on the S. the important pass in the Balkans called the Iron Gate; carries on an active trade in wool and arms. Pop. (1893) 23,210.

Stoane, Sir Hans (physician and naturalist); b. at Killybegh, County Down, Ireland, Apr. 15, 1699. He went to London in 1667 as physician to the Duke of Albemarle and after his return published a work on the natural history of the island in two vols. 1707-23. Subsequently he was appointed physician-general of the British army 1719, and physician to the King 1727. He was a prominent member of the Royal Society, succeeding Sir Isaac Newton as president in 1747; most of his numerous scientific publications were embodied in the *Philosophical Transactions* of that society. He was an indefatigable collector of objects of natural history, antiquities, coins, etc., and books, and being wealthy he was able to amass a large and very valuable museum. It in London June 14, 1792. In accordance with the terms of his will, his museum and library were sold to the government for £20,000—a price which was no more than what it was sold to the intrinsic value of the collection. This collection became the basis of the British Museum. H. H. S.

Stant, Jesse Drake, naval officer; b. in New York in 1789; entered the U. S. navy as a midshipman 1800; was engaged in the action between the United States and the Maestricht on Oct. 15, 1812; served in the expedition against West Indian pirates 1824-25; was commander of the Pacific squadron 1844-45; was next placed in charge of the Norfolk navy-yard; superintended the construction of the Stevens battery at Hoboken; became commodore (retired list) July 16, 1860, and rear-admiral in July, 1865. D. at New Brighton, Staten Island, N. Y., Nov. 28, 1867.

Stoane, Henry Wansan; soldier; b. at Pompey, Onondaga co., N. Y., Sept. 24, 1827; graduated at the U. S. Military Academy July 1, 1852; appointed second lieutenant of artillery; first lieutenant 1855. After a brief campaign in Florida against the Seminoles, he served in garrison at Fort Moultrie, South Carolina, until Oct. 31, 1859, when he resigned from the army to practice law at Syracuse, N. Y.; was a member of the New York State Legislature in 1859. On May 31, 1861, he was appointed colonel of the Twenty-seventh New York Volunteers, which regiment he led in the battle of Bull Run July 21. Early in August he was commissioned brigadier-general of volunteers; in September was assigned to command of a brigade in Franklin's division of the Army of the Potomac, and in the Virginia Peninsula campaign of 1862 was engaged in the siege of Yorktown and action of West Point, succeeding to command of the division May 15, on Franklin's assignment to the Sixth Corps. At the battle of Gaines's Mill, June 27, his command was sent to Porter's relief at a critical period, and rendered important service; at the battle of Glendale, June 30 it held the right of the main line, as at Malvern Hill July 1. He was made a major-general of volunteers July 4 and engaged in the second battle of Bull Run, at South Mountain, and at Antietam. In October he was assigned to the command of the Twelfth Corps, which he led at the battle of Chancellorsville and at Gettysburg, where he commanded the right wing of the army. Transferred, he served in the department of the Cumberland until Aug., 1864, when, his corps being consolidated with the Eleventh, he was assigned to the command of a division and of the district of Vicksburg. In Aug., 1864, he succeeded Gen. Hooker in command of the Twentieth Corps, which was the first to occupy Atlanta, Ga., Sept. 2. To Sherman's march to the sea he commanded the left grand division of that army. In Sept., 1865, he resigned, and resumed the practice of his profession in Brooklyn, N. Y., assuming in 1866 the appointment of colonel of infantry in the regular army. He was Democratic candidate for secretary of state of New York in 1865, but was defeated; was elected to the Forty-first, Forty-second, and Forty-eighth Congresses; president of board of public works, Brooklyn, N. Y., 1878-79. D. in Brooklyn, N. Y., April 14, 1894.

Stoe, the fruit of the blackthorn (*Prunus spinosa*), a small thorny plant native of Europe, sparingly naturalized in the southern parts of the U. S. The black stoe fruit is used for preserves, for making a luscious port wine, and for dyeing black. The marigold fruit yields German seed, a substitute for gun-cotton, and the wood is made into walking-sticks. Some botanists regard the stoe as the original fruit of the cultivated plum. There is a double-flowered form in cultivation. Revised by L. H. BAILEY.

Stoth (St. Eng. *stoth* < O. Eng. *stoth*, deriv. of *stith*, *stith*), any one of several species of the family *Bradyptidæ*, notable for sluggishness. The form somewhat recalls

that of the *Peromyscus* (mouse and musk-rat) in the freedom of the members from the constant abdominal integument, the length of the limbs, and especially of the fore ones, and the atrophy of the tail. The skull is oblong and compressed, with the rostral portion much abbreviated; the intermaxillary bones much extended, malar bones almost fused from the symphyseal processes of the maxillary bones, and each with a supratoral process; the lower jaw has a gutter-like symphysis; molar teeth 3, simple and rounded; canine moderate; posterior limb shorter than the anterior; toes in hindmost numbers two or three (fully developed) in front and three behind. The species differ considerably in other characters. All are confined to South and Central America. Numerous peculiar characters in addition to those



The stoth.

mentioned are exhibited by the skeleton, one of the most remarkable features being the number of cervical vertebrae. Almost without other exceptions the members form only mammals have seven cervical vertebrae, but in the stoths some (the *Bradyptidæ*) have as many as nine, while one (*Chelopus hoffmanni*) has only six, although its near relations (e. g. *Chelopus dufrenoyi*) have seven. The species are ill adapted for progression on the ground, the feet being bent inward, but are admirably fitted for life in trees. Unlike all other mammals, they cling to the branches by their feet with the back downward, and thus they progress, feed, and sleep. They rarely or never voluntarily descend to the ground, but when one tree is denuded of its leaves proceed from it to a contiguous one by means of interlocking or neighboring boughs. *Bradyptus* and *Arctophaga* belong to the sub-family *Bradyptidæ*, and *Chelopus* to the sub-family *Chelopidæ*. Revised by P. A. LACAR.

Slovak Language: See SLAVIC LANGUAGES.

Slovak Literature [*Slovak* is from Slav, *Slavak*; cf. SLAVONIA]; the body of literary productions in the language or dialect of the Slovaks, who, with the Moravians, belong to the Czech branch of the Slavic family. The Slovaks dwell in the mountainous northwest corner of Hungary, but extend beyond the Hungarian boundary into Moravia; besides, there are oases of Slovaks all through Hungary, hemmed in and intellectually as well as politically oppressed by the Magyars. According to the census of 1880, their number was 1,255,400, more than two-thirds professing the Roman Catholic faith, the rest belonging to the Augsburg Confession.

The Slovak dialect, which according to the consensus of the most eminent Slavists exhibits an earlier form of Czech, just as Slovene is older than Serbian-Croat, produced some weak specimens of literature in the Middle Ages; but the Reformation, introduced from Bohemia in the sixteenth century, interrupted a national literary development, and established Czech (in the narrow sense) as the literary language among the Slovaks. For nearly 300 years their own dialect was almost extinct; a considerable number of Slovak authors arose in the eighteenth century, but all of them employed the Czech language, as Malibow Bel (1684-1749), especially famous as historian of Hungary; Daniel Krizan (d. 1740); Stephen Laska (d. 1818), editor of the first Slovak newspaper; Georg Polkovsky, and others.

At the end of the eighteenth century Catholic writers originated a literature of their own in the revived Slovak dialect, as distinctly separated from the Czech language. (See CZECH LITERATURE.) Anton Bernolak especially was instrumental in the separation; he endeavored to settle definitely the Slovak language by his grammar, *Grammatika Slovenska* (Pressburg, 1799) (Germ. transl., Buda, 1817), and his *Lexicon Slovaco-Budavense-Latino-Germanico-Hungaricum* (8 parts, Buda, 1825-27).

The attempt to revive the old Slovak literary language

was strongly opposed by the Magyars and the Czechs alike, but Slovak literature nevertheless developed. Poets of repute were active: Holly wrote an epic on Svatopluk in twelve books in classical style and meter and a Cyrillo-Methodiad in six books. He died in 1849, just at the great outbreak of the Hungarian revolution against the house of Hapsburg. Ljudevit Štur (b. 1815; d. 1856), studied in Pressburg and Halle, wrote some German pamphlets against the Magyars as the oppressors of the Slovak people, and edited in 1845-48 the Slovak newspaper *Slovenské Noviny* with the literary supplement *Orol Tatranski*. The revolution drove him from Hungary, and he fled to Vienna, where he became one of the fiercest agitators against the Magyars, while his great countryman Kossuth, entirely Magyarized, led the Hungarian revolution against Austria. By his paper and personal influence Štur raised Slovak to the standard of the literary language of his people. He also wrote in Czech a critical work on the character of Slavic popular poetry (Prague, 1853), and left a manuscript in German *Das Slaventhum und die Welt der Zukunft*, the first great Slavophil work, translated by W. Lamanskij into Russian (Moscow, 1867).

A number of other poets have gained a good reputation in Slovak literature, which seems firmly established, even if the process of Magyarization should succeed in obliterating the nationality of the people.

The most important and influential modern educator, grammarian, and framer of the Slovak language is Martin Hattala, born in 1821, at Trstená, Hungary. Originally a Catholic priest, he wrote a *Grammatica linguae Slovenicae* (Schemnitz, 1840), which secured for him a call as Professor of Slavic Languages to Prague. His principal merit is the elaboration of the Slovak language in phonetics, form, syntax: *Phonology of the Old and New Czech and Slovak Languages* (Prague, 1854); *Comparative Grammar of the Czech and Slovak Languages* (Prague, 1857); *Antibarbarus of the Czech Language* (Brus jazyka českého, Prague, 1877); text-books for Slovak schools, etc. His polemical writings against Schleicher, and his defense of the genuineness of the Königinhof Manuscript (*Rukopis Kralodvorský*) are noteworthy. Besides him three men eminently contributed to the definite settlement of Slovak language and literature: J. Victorin, by his *Grammatik der slowakischen Sprache* (4th ed. by Loos, Budapest, 1876); J. Loos, by his *Wörterbuch der slowakischen, ungarischen und deutschen Sprache* (Budapest, 1871); and Šembera, by his excellent treatment of Czech-Slovak dialectology (*Základové dialektologie česko-slovenské*, Vienna, 1864).

The chief collections of Slovak popular poems are by Šufarik (2 vols., Pest, 1823-27); Kollar (2 vols., Buda, 1834-35; *Národné Zpíevanky*); and by the Slovak Matica (suppressed by the Magyars) *Sborník Slovenských národních piesní* (Collection of Slovak National Songs, 2 vols., 1870-74).

HERMANN SCHOENFELD.

Slove'nian Language: See SLAVIC LANGUAGES.

Slovenian Literature: the literature produced by that branch of the Slavic family which inhabits the southern portion of Carinthia and Styria, all Carniola (except the great German speech-island around Gottschee), Görz and Gradiska, a small part of Istria, the region around Radkersburg in Hungary and around Cividale in Italy—total population (1895), about 1,300,000.

This literature is most closely related to that of the Servo-Croats. It is written in a language the oldest form of which is held by some of the greatest and most authoritative scholars—Kopitar, Miklosich, Daničić and Jagić—to be the mother language of Paleo-Slavonic, as preserved to us. Great zeal has been exhibited in fixing the grammatical structure of the language. This labor has been performed by scholars like Kopitar, Metelko, Murko, Janežič, Lewstik, and, best of all, Suman (*Slovenska slovnica*, Klagenfurth, 1884).

The only literary monument of Old Slovenian is the liturgical manuscript of Freising (Bavaria). It is in Latin script, and belongs to the tenth century (ed. by Kopitar in *Glagolita Klotianus*, Vienna, 1836). Then, until the middle of the sixteenth century, there was nothing that can be classed as literature. With the Reformation literary interest revived. The Carinthian reformer Primus Truber (1508-86) and his associates translated the New Testament into Slovenian in 1557. The first complete edition of the Bible on the Protestant side appeared first in 1584 in Tübingen. Other spiritual and church books, too, were composed by Truber,

but he was driven into exile, and the incipient reformatory movement suppressed by the counter-reformation. Literary activity again practically ceased until the end of the eighteenth century. Only meager grammatical and bibliographical work was produced. The first Slovenian grammar appeared in 1584, the first dictionary in 1592.

Toward the end of the eighteenth century, however, self-consciousness began to awaken among the Slovenes, as well as in the entire South Slavonic world, stimulated especially by the longing for liberty and by the Roman Catholic Church. On the Catholic side a complete Bible translation, pre-eminently by Japel and Kumerdey, was issued 1791-1802. Secular literature, too, began to flourish; Valentin Vodnik (1758-1819) was its founder. When Carinthia was incorporated into the Illyrian provinces by Napoleon and belonged to France (1810-14), he published his *Ilirja oživila* (Illyria revived), which cost him his position as inspector of schools when Austria regained her provinces. He also wrote valuable poems (*Pesni*, 3d ed. Laibach, 1869), and edited the first Slovenian newspaper (1797-1800). The greatest modern Slovenian poet, however, is Francis Prešern (1800-49); his poems are mostly lyrics (complete edition, *Pesmi Franceta Prešerna*, Laibach, 1866; German trans. by Samhaber, *Prešernklänge*, Laibach, 1890).

Since the middle of the nineteenth century national life has steadily developed, and the political revival has been accompanied by an increase of literary productions of a varied character. Levstik, Valjavec, and Stritar are very good national poets. The Matica Slovenska (Slovenian Literary Society) is the center of the literary movement. The periodical *Ljubljanski Zvon* (The Laibach Bell) is the great organ in which the national productions mostly appear.

The principal collections of Slovene folk-song are *Slovenske pesmi krajnskago naroda* (5 vols., Laibach, 1839-44); *Narodne pesmi ilirske* (Styria, Carinthia, West Hungary), by Stanko Vrac (Agram, 1839); *Volkslieder aus Krain*, trans. by A. Grün (Count Auersperg), Leipzig, 1850; *Četleje slovenskega naroda*, by A. Janežič (Klagenfurth, 1852). See Child, *Ballads*.

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HERMANN SCHOENFELD.

Slows: See MILK-SICKNESS.

Sloyd: See MANUAL TRAINING.

Slug [from M. Eng. *slugge*, slothful; cf. Eng. *slack*, *slouch*, and *sluggard*]: any one of various naked terrestrial molluscs, mostly members of the family *Limacidae* (see PUL-



The red slug.

MONATA). The name is sometimes applied to other molluscs, and occasionally, but wrongly, to certain insects which occur as pests in gardens and greenhouses.

Slug-worms, popularly but incorrectly called **Slugs**: the larvæ of certain of the saw-flies (*Tenthredinidae*), belonging to the *Hymenoptera*. They are slug-like in form. In the U. S. the pear, rose, vine, raspberry, walnut, linden, and other trees are infested with the larvæ of species of *Salix-dria*, which are often very destructive. Decoctions of tobacco or quassia, whale-oil soap, a weak solution of carbolic acid, and petroleum are among the substances recommended for showering shrubs and trees infested with slug-worms. For small trees and shrubs hand-picking will generally prove sufficient.

Smalcald: See SCHMALKALDEN.

Small, JOHN: soldier; b. at Strathardle, Scotland, in 1726; served in the Scotch brigade, in the Dutch service, in the pursuit of the Jacobites of Scotland 1747, at Ticonderoga 1758, at Montreal 1760, and in the West Indies 1762; was in the battle of Bunker Hill; raised a corps of Highlanders in Nova Scotia, the Eighty-fourth Battalion, known as the "Royal Emigrants," which he commanded as major in the campaigns of New Jersey and Pennsylvania; became lieutenant-colonel 1780, lieutenant-governor of Guernsey 1783, and major-general 1794. D. at Guernsey, Mar. 17, 1796.

Small-arms: the projectile arm which since the invention of gunpowder has replaced the bow and arrow and musket. The original firearms, bombardards, were not portable, and it was not until the early part of the fifteenth century that lighter pieces came into use; even these, at first, required for their transportation and service several men, and were fired in the field from a tripod and from the fortress walls on a rest. Of such guns the Italian Orlando was reported to possess 4,000 in 1411; three years later they were employed at the siege of Avras, and in 1471 a number were transported into England by some Flemings that accompanied Edward IV. on his return from Flanders in that year. These hand-cannon, as they were called, could be carried by two men, had a straight stock of wood about a foot long, and were fired by a match applied on top of the breast.

The first improvement was the removal of the rest to one side and the addition of a pan to hold the priming; a sight at the breech was also added. The trigger of the cross-bow suggested to the English a similar arrangement for bringing the lighted match to the priming; the gun, after this modification, was called a matchlock.

In 1542 and again successive improvements received the names of snapnetter, snapnetter, and musquet; the stock was made curved, permitting aim to be taken from the shoulder instead of lying from the chest as formerly, and the weight was reduced to about 15 lb. The former tripod had now been replaced by a forked rest which the soldier carried as a cane. Green, in his *Military Antiquities*, describing the English musket, says: "He had besides the musketry weapon itself his course powder for loading, in a flask; his fine powder for priming, in a touch-box; his bullets in a leathern bag, with strings to draw to get at them; whilst in his hand were his musket-rest and his burning match, and when he had discharged his piece he had to draw his sword in order to defend himself."

In the Spanish army the musquetiers were a breed apart; the musket was a broad belt across the breast to which wood cases containing the proper charge of powder were attached; also a ball-pouch and a priming-flask. Six yards of slow-match for firing was wound about the stock. At the battle of Pavia the Spanish had a force of 2,000 arquebusers and 900 musquetiers, whose fire proved decisive in determining the issue of the battle, the balls readily penetrating the breast plates of the knights.

In the wheel-lock, snapnetter, flintlock, and finally the clicklock, names each marking an advance in design or construction, the match was replaced by some arrangement of flint and steel; the last-named piece was adopted by France in 1622, an example followed by all other nations within twenty years. In the flintlock the weight was brought down nearly to that of the modern rifle; in other respects too it marked the top wave of progress, and without material improvement remained during 150 years the arm of the infantry soldier, until early in the nineteenth century the invention of the percussion-cap, made of practical value about 1820, led to the gradual substitution in the next two decades of the percussion-musket.

Up to this date military small-arms were smooth-bored, and fired spherical balls between one-half and nearly three-fourths of an inch in diameter, and while the rifling principle had been known and used for many years it was not introduced for soldiers until early in the nineteenth century; to these rifles was then applied the percussion-cap. The breech-loading principle was also made a partial success for military arms at the same time, and some few soldiers were armed with them. In Prussia, where the needle-gun had been adopted, the boom began in 1841. Used with great success in the war with Austria in 1866, its merits were generally acknowledged, and in a few years different breech-loaders replaced in every country the muzzle-loading rifle, the change being induced not merely by the qualities of the

arms themselves, but in consequence of the introduction of the metallic cartridge, which, combining the cap, powder, and bullet in one receptacle, also served as a gas-check and prevented leakage at the breach, the main defect, at first of the new gun.



FIG. 1.—Hall's breech-loading musket, patented 1811.

In 1810 the first successful breech-loader was invented by Hall in 1811. Two years later he proposed its manufacture on the principle, which had previously failed in France, of interchangeable parts; and in 1817, a board of officers reporting favorably, he was employed to superintend at the U. S. arsenal, Harper's Ferry, the establishment of the necessary machinery and the manufacture of the gun. The system of interchangeable parts has since prevailed in the U. S. and has been adopted in Europe, but the arm itself met with only a qualified success. Part of the cavalry was armed with the carbines, but upon the death of the inventor in 1844 their manufacture was discontinued.

In 1854 Congress made an appropriation for breech-loading rifles and a board of officers recommended those of Sharps and Symmes for trial. Three years later another board reported in favor of the Burnside rifle, an opinion confirmed by a third board in the following year, but without recommending the adoption of the arm for service.

The civil war caused a suspension of experiments, all the energies of the ordnance department being then given to the production in sufficient quantities of the arms then in



FIG. 2.—Springfield.



FIG. 3.—Remington locking rifle, model 1871.



FIG. 4.—Rossian flintlock.



FIG. 5.—Martini Henry (British).



FIG. 6.—Mauser (German).

use. From Government and private factories and from abroad nearly 4,000,000 small-arms were obtained, including nineteen varieties of breech-loading carbines and eight of rifles, those of Burnside, Sharps, Maynard, and Henry (the latter a magazine-arm) being the best known.

After the war, boards of officers were convened in 1865,

1869, and 1872; they mentioned favorably the Peabody, Remington, Sharps, and Springfield, and finally recommended the adoption of the latter arm.

The same decade witnessed the adoption abroad of arms that remained for nearly twenty years in the hands of troops, and which, while differing in many particulars, can be placed in two general classes dependent upon the method of breech-closure—viz., by a hinged block and by a sliding bolt. Of the first class the Remington, the Springfield of the U. S., and the Martini-Henry of Great Britain, and of the second class the Mauser of Germany and Berdan of Russia, are the best known. As these, with those of other countries, marked the highest development of the single-loading rifled breech-loader, their principal features are given in the accompanying table.

TABLE I.—SMALL-ARMS OF DIFFERENT NATIONS, 1874.

NATION.	Name of gun.	When adopted.	Caliber, inch.	WEIGHT OF—					Initial velocity, foot-second.
				Gun, pounds.	Bullet, grains.	Powder, grains.	100 cartridges, pounds.		
Austria	Werndl	1874	0.421	9.88	386	77	7.83	1,410	
Belgium	Albini	1867	0.433	9.85	386	77	9.06	1,367	
Denmark	Remington	1870	0.450	9.08	386	60	8.75	1,300	
France	Gras	1874	0.433	9.25	386	81	9.52	1,465	
Germany	Mauser	1871	0.433	9.76	386	77	9.25	1,410	
Great Britain	Martini-Henry	1871	0.450	8.75	480	85	11.07	1,362	
Holland	Beaumont	1871	0.433	9.59	386	66	8.57	1,328	
Italy	Vetterli	1870	0.410	9.04	316	61	7.50	1,445	
Russia	Berdan	1871	0.421	9.23	370	78	8.62	1,400	
Sweden	Remington	1867	0.473	9.35	370	66	7.68	1,312	
Switzerland	Vetterli	1874	0.410	10.34	316	56	6.75	1,425	
Turkey	Peabody	1874	0.450	8.50	480	85	11.07	1,360	
United States	Springfield	1873	0.450	8.68	405	70	8.75	1,350	

Since 1885 there has been a great improvement in small-arms, the most important being the substitution of magazine-arms for the single-loaders (see MAGAZINE-GUNS), the decrease in the caliber of the barrel, and the adoption of smokeless powder in place of the powder formerly used.

As magazine systems were gradually developed the necessity of meeting the increased expenditure of ammunition with an augmented supply of cartridges became evident, but as the soldier's load was already at the limit considered practicable, this could only be accomplished by diminishing the weight of a single round, and that only by decreasing the diameter of the bullet and consequently of the bore of the rifle. This has resulted in the adoption in different countries of calibers between 0.315 and 0.256 inch, a decrease that probably has not yet reached its limit.

When gunpowder was used in these small bores, the fouling soon became excessive, unduly impairing the accuracy of fire. To overcome this trials were made which have led to the introduction of the so-called SMOKELESS POWDERS (*q. v.*). Many of these powders have been successfully developed and are in general use; their range of chamber-pressure varies from 14 or 15 tons per square inch, as with the powders used in the French Berthier and the Schmidt, to 20 tons in the Belgian Mauser and 21 tons in the German infantry rifle. This necessitates a strength and stiffness in the breech-mechanism of the new rifles that the old arms did not require, and also a corresponding increase of strength in the barrel. The modern barrels are therefore generally made of a superior grade of steel and of a little greater thickness of metal. Being of less interior diameter and also somewhat shorter, their weight, as compared with the old, has been diminished. With the augmented pressure also comes a great gain in the initial velocity, necessitating, in order to secure steadiness of flight for the bullet, a more rapid twist to the rifling, which now makes in all the new guns one turn in about 8 or 10 inches, instead of 18 to 24 inches as formerly. The majority of the barrels are rifled with four grooves (though some have only three and others six or seven), of a depth varying in the different countries from 0.003 to 0.006 inch, and more frequently of a width two or three times that of the lands.

As leaden bullets fired with high velocities through such barrels will not follow the rifling, but will strip and override the lands, it became necessary that the surface of the projectile be made of some harder metal; but to retain the high specific gravity of the lead, with the consequent ability of the ball better to overcome the resistance of the air, the greater portion of the bullet is made of a lead slug and then coated or jacketed with a covering, about 0.02 inch thick, of some harder metal, as steel, copper, nickel, or Ger-

man silver. These bullets have a length of about four calibers, are without the cannelures or lubricant of the lead ball, and weigh on the average about 220 grains.

The weights of the smokeless powder-charges vary with the particular powder, averaging about 30 to 40 grains.

The penetration of the bullet at all distances has been increased by the alteration in its shape, by its harder surface, and also, except at the extreme ranges where the air-resistance has overcome much of the velocity, by its more rapid initial movement. At the shorter ranges, 200 to 300 yards, protection is now obtained by about 0.2 inch of steel plate and about 0.3 inch of wrought iron. The penetration into earth at these distances is about 25 inches, into pine about 30 inches. As they have not been used to any extent in warfare their effect upon the living human body is yet to be fully determined; probably if striking no bone the bullets will inflict wounds on three or four men in file, but wounds less serious than those from the heavier lead ball.

With the greater number of the modern guns and powders the velocities are about 2,000 feet per second, running up for the smaller calibers, as the new guns of Italy, Holland, Roumania, and Norway, to about 2,300 feet per second. This gives a dangerous space in front of the muzzle of fully 600 yards, a maximum even exceeded by the extremely reduced calibers just mentioned, and a flatness of trajectory at all ranges compensating for errors when estimating the distance of the objective that would produce a miss with the old weapons.

The recoil is less than half that of the old single-loader.

The sights on all modern military arms are designed primarily for use in battle, rather than on the target-range; they are strong and simple in construction, with an open leaf that allows an unobstructed view when aiming, and generally without any arrangement giving drift or windage correction. The lowest adjustment is 300 meters (or yards), the leaf for that range being turned down on the base. Above that, on the leaf, the graduations are placed only for 100-meter (or yards) intervals, and with many of the sights it is impossible to obtain any closer adjustments than given by these limits, the slide engaging in notches that occur only at the graduation-marks. These latter generally extend up to 1,800 or 2,200 yards.

For the familiar triangular bayonet all nations except Russia have substituted knives with blades from 9 to 12 inches long and about an inch wide. The guards are short and usually straight, the handles of wood and steel, and about 4 inches long. The weights of the complete bayonets are from 8 to 15 oz.

The heat produced by discharge is much in excess of that formerly evolved; the barrels can not be freely handled after ten or twenty shots have been quickly delivered. To overcome this difficulty, the Germans have enveloped the barrel in a metallic case, and the Swiss have covered it with wood until it appears entirely surrounded by the forestock, but most of the other countries have limited the wooden hand-guard to the space back of the rear sight or else extended it only as far forward as the lower band. The latter provision is probably the best, affording all the protection required when firing or when carrying the piece afterward.

The breech-block of the single-loader has been replaced by a bolt having a sliding and generally also a turning movement. When closed it sustains the shock of discharge; moving it extracts the empty cartridge-case and recocks the piece for firing. In all countries these arms are also magazine-guns, that for the U. S., Fig. 8, having been chosen.

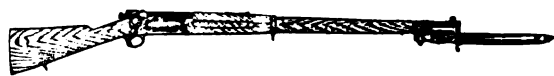


FIG. 8.—U. S. magazine rifle, model 1892.

the autumn of 1892. This arm was selected only after examination lasting nearly two years, careful consideration being given not only to the rifles used by the troops of Austria, Belgium, Denmark, Great Britain, France, Germany, Japan, Portugal, Roumania, Russia, and Switzerland, but also to those presented by the leading gun-inventors of the U. S. and Europe. The rifle finally chosen was the invention of Capt. O. Krag, director of the royal small-arms factory at Kongsberg, Norway, and E. Jørgensen, an armorer there employed.

The accompanying table gives the rifles and their ammunition forming (1895) the infantry armament of various countries.

it appear in the form of an epidemic. The treatment of smallpox is principally what is called symptomatic, that is, addressed to the individual conditions incident to the disease. Violent medication has been entirely abandoned. The patient is isolated, given digestible food, plenty of water, and cool and antiseptic applications are made to the skin.

CHARLES W. DULLES.

Smallwood, WILLIAM: soldier; b. in Kent co., Md., about 1732; raised a battalion of Marylanders 1776, which he commanded as colonel, and half of which perished in the battle of Long Island under another commander; was engaged in the battle of White Plains; was appointed brigadier-general Oct. 23, 1776; accompanied Gen. Sullivan in the Staten Island expedition 1777; raised a new battalion of militiamen from the Western Shore of Maryland, and led it at the battle of Germantown; was made major-general Sept. 15, 1780; was with Gates in his Southern campaign, but left after the defeat at Camden, refusing to serve under Steuben; was member of Congress 1785, and Governor of Maryland 1785-88. D. in Maryland, Feb. 14, 1792.

Smalt: See COBALT.

Smart, BENJAMIN HUMPHREY: grammarian and metaphysician; b. in England about 1785; was for more than fifty years from 1815 a successful teacher of elocution in London; was a voluminous writer upon grammar, logic, rhetoric, and metaphysics, in which last department he claimed to "assert, correct, and carry onward the philosophy of Locke." Among his works were *A Grammar of English Pronunciation* (1810); *Rudiments of English Grammar Elucidated* (1811); *A Grammar of English Sounds* (1813); *Practical Logic* (1829); *Accidence of Grammar, Principles of Grammar, Manual of Rhetoric and Logic, The Practice of Elocution, and Historico-Shakspearian Readings*, the five latter being issued as a complete series in 1858; *Outlines of Sematology* (1831), with a *Sequel* (1837) and an *Appendix* (1839), the three works being issued together as *The Beginnings of a New School of Metaphysics* (1839); *The Way out of Metaphysics* (1844); *The Metaphysicians, a Memoir of Franz Carvel, Brushmaker, and of Harold Fremdling, Esq.* (1857); *Thought and Language* (1855); and *An Introduction to Grammar on its True Basis* (1858). Smart also published in 1836 a *Pronouncing Dictionary*, based upon that of John Walker, issued an epitomized edition of the same in 1840, and an *Appendix* in 1846 (revised editions 1860), which figure among the authorities upon pronunciation most frequently cited in the later editions of Webster's and Worcester's dictionaries. D. about 1872.

Revised by B. I. WHEELER.

Smart, CHRISTOPHER: poet; b. at Shipbourne, Kent, England, Apr. 11, 1722; educated at Pembroke College, Cambridge, where he became a fellow 1745; settled in London as a writer, becoming intimate with Pope, Johnson, and Garrick; was noted for improvidence and a convivial disposition, which made him the inmate of an insane asylum and later of the king's bench prison for debtors, where he died May 18, 1770 or 1771. He translated the *Works of Horace* into English prose (2 vols., 1756), and into verse (1767); published *The Hilliad, an Epic Poem* (1753), being a satire on Sir John Hill, noted for his quarrels with Fielding and with the Royal Society, and *The Parables of Christ done into Verse* (1765); but his most remarkable production was the *Song to David*, written in a madhouse, published in 1763, and reprinted in full in Chambers's *Cyclopædia of English Literature*. See *With Christopher Smart, in Browning's Parleyings with Certain People of Importance*.

Revised by H. A. BEERS.

Smart, HENRY: organist and composer; b. in London, Oct. 26, 1813; after studying law took up music; in 1831 was organist of the parish church of Blackburn, and there composed his first important work, an anthem. In 1836 went to London, where he remained, playing, teaching, and composing. His works include an opera, *Bertha* (1855); cantatas, *The Bride of Dunkerron*, Birmingham festival, 1864; *King René's Daughter* (1871), *The Fisher Maidens*, both for female voices; and an oratorio, *Jacob*, Glasgow festival, 1873. D. July 6, 1879.

D. E. HERVEY.

Smeaton, JOHN: civil engineer; b. at Aunthorp, near Leeds, England, May 28, 1724; invented in 1751 an instrument for measuring a ship's progress; made several valuable inventions in hydraulic machinery, for which he received the Copley medal (1759); was noted as the builder of the Eddystone lighthouse (1756-59), an account of the con-

struction of which he published (1791); constructed Ramsgate harbor (1749-74), the Forth and Clyde Canal, the Greenwich and Deptford water-works, and many other important improvements. D. at Aunthorp, Oct. 28, 1792.

Smeety'm'nuus: a name compounded of the initials of the authors of a celebrated tract entitled *An Answer* (1641), written in reply to Bishop Hall's *Episcopacy by Divine Right Asserted* (1641). The names of its five writers are Stephen Marshall, Edmund Calamy, Thomas Young, Matthew Newcomen, and William Spurstowe.

Smell, Organ of: See HISTOLOGY (*Organs of Special Sense*).

Smelt [in allusion to the cucumber-like odor of the typical species]: a small salmoniform fish belonging to the genus *Osmerus*, or a related genus, of the family *Argentinidae*, and esteemed as food. These fishes have the teeth of the lower jaw stronger than those of the upper, and fang-like ones on the vomer and front of the tongue, and normally inhabit salt water. *Osmerus eperlanus* is the European species; *O. mordax*, the eastern North American, known also as frost-fish; *O. thaleichthys*, the California smelt. *Hypomesus pretiosus* is the surf-smelt of California and northward. The silver-sides (*Atherinidae*), structurally very unlike the *Argentinidae*, are also loosely called smelts, as the California *Atherinopsis californiensis*. Among other fishes locally and improperly known by the name are the cyprinoid *Ilybognathus regius*, the spawn-eater, and the Pacific tomcod.

Smelting [from M. Dutch *smelten*: O. H. Germ. *smelten* (> Mod. Germ. *schmelzen*), melt; cf. Gr. *μείδω*, melt, but probably not akin to Eng. *melt*]: in the more extended use of the term the entire process of reducing metals from their ores by fusion; in a more limited sense those particular metallurgical processes in which an ore or a product of other operations, such as roasting, treatment with acids, etc., is finally reduced to pure metal or some intermediate product. The fusions are conducted in shaft-furnaces, reverberatory furnaces, or crucibles. Metals ready for use or sale may be produced from ores by a single smelting operation, as iron; or they may require a series of smeltings, alternated with roastings, as copper when made from sulphuretted ores. The smelting process may be simply reducing, or oxidizing and reducing, or may be designed to volatilize certain bodies, to oxidize others, and to reduce still others. (Charcoal, coke, and anthracite are the fuels generally used in shaft-furnaces and for heating crucibles, and bituminous coal and wood for reverberatory furnaces; but peat, gas obtained from different materials in special generators and peculiarly constructed fireplaces, natural gas, petroleum, and waste gases from furnaces are used.)

To remove earthy matters and foreign oxides, and to facilitate the collection of the reduced metals, slags are produced, and, according to the nature of the effect to be obtained and the substance to be removed by scorification, the charges are so constituted as to yield more or less acid or basic slags by judicious mixture of the ores treated or by addition of various fluxes. Sometimes it is desirable to liberate some sulphur to combine with the metals and form a *matte* or *regulus*, and then iron pyrites is added. The general products of smelting are slag and metal, or slag and *matte*, or sometimes all three at once. The slags may have to be subjected to a reducing smelting to obtain the metal retained in them, the metal to an oxidizing and scorifying smelting to purify it, and the *matte* to Bessemerizing, to an oxidizing smelting, or, after roasting, to a reducing and scorifying smelting, during which some metals are partly removed by volatilization, as antimony, arsenic, and zinc; others by oxidation and scorification, as iron, zinc, and tin, while the desired metal is obtained in a nearly pure state or as a concentrated *matte*.

Shaft-furnaces are mainly employed for reducing fusions with coke, charcoal, and anthracite, although by a proper construction, good management of fluxes, and preparation of the ores, etc., a partial oxidizing action can be produced. The fusion is almost invariably effected by the aid of a blast. Reverberatory furnaces, with wood, coal, natural or producer gas, or petroleum, are generally used for oxidation; a very effective reducing action can also be obtained in them by excluding the air and keeping the hearth full of reducing gases. In crucibles the results of smelting depend entirely on the nature of the charge, oxidation and scorification being produced by certain fluxes; reduction by adding carbonaceous matters; scorification alone by using a simple

like like form; precipitation by adding metallic iron or some substance which will yield iron by reduction; and preservation by adding metallic sulphides, or alkaline sulphates with a reducing agent and a simple flux.

Revised by V. Kyrleberg.

SMITH, SIR GEORGE (1800-1891): brother of James, who, because of the strength of Smoother, was then back to him from Egypt. Shortly afterward Canby, having learned that Smoother was seated on the royal throne, sent him back to death secretly. A rebellion broke out in some because of the tyranny of Canby, who was still seated in Egypt, and the brother of the governor of the royal palace, because he resembled much the dead Smoother, was declared to be the real monarch, and proclaimed king. In 1891 Canby began his journey home to defend his throne, but he died on the way, and though the rebellion soon discovered the fraud that had been practiced on them, still the false Smoother was able to hold the throne for seven months. He was finally murdered by the nobles, who elected Charles (the) king.

J. R. S. Smith.

SMITH, PETER JOHN, D.D.: missionary; b. at Toronto, Ontario, Dec. 11, 1801; was trained in the seminary at Hamilton; sailed with five fellow students to the U. S. in 1827; became a Jesuit; assisted in founding the University of St. Louis, Mo., 1829; in 1838 was sent to labor with the Pawnee Indians, on sugar creek, and in 1840 was transferred to the Flathead mission, in the Rocky Mountains. Father Smith acquired a singular power of constraint over most all the Indian tribes, from the Sioux westward. He became procurator of the Indian missions, several times visited Europe in behalf of his missions, and wrote several works in French and English, among them *Letters and Sketches, and Residence in the Rocky Mountains* (Philadelphia, 1847); *Oregon Mission and Travels over the Rocky Mountains in 1845-46* (New York, 1847); *Western Missions and Missions in the Rocky Mountains* (1852); and many letters published in the *Annals of the Roman Propaganda*. He was a chaplain in the Utah expedition. D. in St. Louis, May 24, 1872.

Revised by S. M. Jackson.

SMITH: a mosswort, *Megacarpus albertus*, inhabiting the northern parts of the Old World. It is distinguished by the short narrow bill (considerably shorter than the head), whose margins are beset with short approximated lamellae. In the male the ground color is white (whence runs of the popular name, white moss); black pericarp around and in front of the eyes at the summit under the crest, at the front of the back, on the tail, and on the wings, but the scapulars and middle wing coverts, as well as secondaries and tertials, are white; in the female the head is of a reddish brown; the length is about 17 inches. Like its relatives, it is an excellent swimmer and diver. It makes a nest near the water, and lays between eight to ten eggs. T. G.

SMITH (= Lat. = Gr. *smith*, yew, also (with distinguishing adjectives) a kind of bean, a kind of birdseed): a large genus of monocotyledonous plants of the sub-family *Smithaceae* and family *Liliaceae*. They consist of herbaceous or woody plants, generally more or less climbing, with rotund leaves and bisexual or polygamous flowers, a six-petaled perianth, six stamens, a free three-celled ovary, with one or several seeds in each cell, three stigmas, and a round berry. There are about 200 known species scattered over the globe, though most numerous in the temperate and tropical parts of Asia and America. True *Smithaceae* and China root are among the products of the genus, the former from *S. officinale*, *S. peripetua*, and *S. aphylla*, of the West Indies and South America, and the latter from *S. China* of Japan, China, and the East Indies. The U. S. has numerous species, none of them important. The so-called China root is the most widely known of them. It is very frequent in the southern parts of the U. S., and extends northward to New Jersey. It has large, tuberos, brownish-red root-stocks, which contain a considerable amount of starch. Formerly the Smothers and the root-stocks for food in times of scarcity, either separating the starch or cooking the whole root. At present a kind of beer is made from them with molasses, yeast, and hops, and sometimes. Several plants of this genus are used in horticulture and garden culture. The related climbing plant, which under the name of *smith* is cultivated by the Chinese in the *Myrsiphyllum asperifolium*. It comes from the highlands of Great Hope, and is more closely allied to the yew. It has a fine thread-like stem, sometimes 20 feet long, and glaucous, strongly colored leaves which do not easily fall.

Revised by CHARLES E. BROWN.

SMITH, SAMUEL: author; b. at Haddington, Scotland, in 1812; educated for the medical profession; practiced some years as a surgeon at Leeds; became editor of the *Leeds Times*; was secretary to the Leeds and Thirsk Railway 1845-52, and to the Southwestern Railway 1853-55. Among his numerous works are *Self-Help, with Illustrations of Character and Conduct* (1840); *Workmen's Savings, Strides, and Struggles* (1841); *Lines of the Englishmen, with an Account of their Principal Works* (4 vols., 1851-55); *Character* (1871); *Perils* (1875); *The Huguenots in England and Ireland* (1876); *The Huguenots in France after the Revocation of the Edict of Nantes* (1874); *Life of a Scotch Naturalist* (1879); *George Moore, Merchant and Philanthropist* (1879); *Life of Robert Dick, Theologian and Botanist* (1879); *Italy, with Illustrations of Character, Politics, and Industries* (1880); *Men of Invention and Industry* (1884); *A Publisher and his Friends: John Murray* (1891); *James, the Barker just* (1891); *Isiah Wedgwood* (1892). Most of his works have been republished in the U. S.

SMITH, GEORGE HERVEY: landscape-painter; son of James Smith (1807-85), engraver; b. in New York, Dec. 26, 1840; pupil of James M. Hart; National Academian 1882; member of the American Water-color Society. Studies in New York. His brother, James Davis, also a landscape-painter, was born in New York, Jan. 10, 1833; studied under his father; became a National Academian 1876; member American Water-color Society. Studies in New York.

W. A. G.

SMIRKE, ROBERT, R. A.: painter; b. at Wigan, near Carlisle, England, in 1753; was brought up in the business of a painter of coach-paints; was admitted as a student at the Royal Academy 1771; became an associate 1791; his presentation picture being *Don Quixote and Sancho Panza*; painted many scenes illustrating the Bible, Milton, Thomson, and *The Arabian Nights*; was one of the contributors to Bayly's *Shakespeare*, and brought out a magnificent edition of his daughter Mary's translation of *Don Quixote*, with 74 engravings (4 vols., London, 1815). D. in London, Jan. 5, 1845.

SMIRKE, SIR ROBERT, R. A.: architect; eldest son of Robert Smirke; b. in London, England, in 1790; educated as an architect in England and on the Continent; was gold medalist at the Royal Academy 1799; published *Specimens of Continental Architecture* (1806); was architect of the new Court Garden Theater 1805-09, of the mint 1813, the post-office 1823-29, the Union, United Service, and Carillon clubs, most of them being examples of the so-called classical school, and built many other important private and public edifices. His latest rests chiefly upon the British Museum, built by him at intervals from 1825 to 1847. He was knighted 1851, and was thirty years treasurer of the Royal Academy. D. at Cheltenham, Apr. 15, 1867.

SMIRKE, SYDNEY, R. A.: architect; son of Robert Smirke; b. in England, 1799; studied architecture; gained the gold medal of the Royal Academy 1819; assisted his brother in designing the Oxford and Cambridge University Club-house in Pall Mall, London, 1815-17; superintended the restoration of the Temple church, of which he published an account (1842); in 1847 succeeded his brother as architect to the British Museum, in which capacity he built the reading-room 1855, the Russian, Assyrian, and other galleries, and was the architect of several other public edifices and of many splendid country-seats. His last achievement was the new Royal Academy in Burlington House, begun 1867 and completed 1874. He was chosen R. A. 1869; became Professor of Architecture at the Academy 1861, and its treasurer 1862; subsequently trustee of that institution and of the Science Museum. D. Dec. 11, 1877.

SMITH, ADAM: economist and philosopher; b. at Kirkcaldy, Fifeshire, Scotland, June 5, 1723. His education was carried forward in the grammar school of Kirkcaldy, the University of Glasgow, and Balliol College, Oxford, with a view to his taking orders in the English Church. In Glasgow he gave chief attention to mathematics and natural science, but at Oxford he turned to the study of languages, and took special pains to master English. Abandoning all thought of the clerical office, he returned to his native place, and in 1746 took up his residence in Edinburgh. There he first came before the public, delivering lectures on rhetoric and belles-lettres under the patronage of Lord Kames. In 1751 he was made Professor of Logic in the University of Glasgow, and the following year became Professor of Moral

Philosophy in the same institution. He resolved the science of morals into four parts, and accordingly discussed in his lectures, first, natural theology; second, ethics; third, justice with reference to specific rules and precepts; and fourth, political expediency as affecting the honor, power, and prosperity of the state. His lectures were delivered extemporaneously, and were, for both matter and style, very popular. His first published work was the *Theory of Moral Sentiments*, issued in 1759. It called forth a high encomium from Hume, and brought Smith at once a wide reputation. Incidentally, this publication led to his being selected, four years afterward, to accompany the young Duke of Buccleugh on his travels. He carefully improved the opportunity thus presented to become acquainted with the internal policy of other states, and to confer with distinguished economists on the Continent. He returned to England in 1766, and for ten years lived with his mother in partial retirement at Kirkcaldy. There he devoted himself to the earnest study of subjects which had occupied his attention for nearly twenty years. The result was given to the world in 1776 in his great work entitled *An Inquiry into the Nature and Sources of the Wealth of Nations*. Many principles laid down in that work were no doubt derived from the French economists, but the completeness of their compilation and the clearness with which they are set forth in this treatise fairly entitle Adam Smith to be regarded as the father of modern political economy. His book will continue to be, as it has been hitherto, a standard of reference. Smith's biographer thus defines the main feature of this work: "Its great object is to demonstrate that the most effectual plan for advancing a people to greatness is to maintain that order of things which nature has pointed out, by allowing every man, as long as he observes the rules of justice, to pursue his own interest in his own way, and to bring both his industry and his capital into the freest competition with those of his fellow citizens." After residing two years in London, he was appointed a commissioner of customs for Scotland, and removed to Edinburgh, where he spent the remainder of his life. In 1787 he was elected lord rector of the University of Glasgow. D. in Edinburgh, July 17, 1790. After his decease most of his manuscripts were destroyed, as he had directed, but a few were published in 1795 under the title *Essays on Philosophical Subjects*.
Revised by J. MARK BALDWIN.

Smith, ALEXANDER: poet; b. at Kilmarnock, Scotland, Dec. 31, 1830; was pattern-designer for a lace-factory at Glasgow; published a volume of poems, *A Life Drama* (1853), which attracted great attention; was appointed secretary of the University of Edinburgh 1854; wrote *Sonnets of the War*, along with Sydney Dobell (1855); *City Poems* (1857); *Edwin of Deira* (1861); *Dreamthorp* (1863); and the prose works *A Summer in Skye* (1865); *Alfred Hagart's Household* (1866); and *Miss Oona McQuarrie* (1866). D. at Wardie, near Edinburgh, Jan. 5, 1867. Smith has been classed with Bailey, the author of *Festus*, and others of "the spasmodic school" satirized in Aytoun's *Firmilian*. A *Memoir* by P. P. Alexander was published along with a posthumous volume of miscellanies entitled *Last Leaves* (1868).
Revised by H. A. BEERS.

Smith, ANDREW JACKSON: soldier; b. in Bucks co., Pa., Apr. 28, 1815; graduated at the U. S. Military Academy; appointed in the army a second lieutenant of the First Dragoons July, 1838, of which regiment he became major in May, 1861 (known as the First Cavalry Aug., 1861), and July, 1866, colonel of the Seventh Cavalry. Prior to 1861 he served almost continually with his regiment on the frontier. In Oct., 1861, he was commissioned colonel of the Second California Cavalry, and Mar. 17, 1862, a brigadier-general of volunteers. He was engaged in the assault of Chickasaw Bluffs (Dec. 27-29, 1862), and later in the assault and capture of Arkansas Post (Jan. 11, 1863). In command of a division of the Thirtieth Army-corps, he took part in the siege and assaults of Vicksburg and in the subsequent capture of Jackson, Miss. In the Red river campaign he commanded the force (composed of detachments of the Sixteenth and Seventeenth corps) which captured Fort De Russy, and was engaged in the battle of Pleasant Hill. Next ordered to Missouri, he aided in driving Price from that State, then was called to re-enforce Gen. Thomas at Nashville, and engaged in the battle of Nashville and pursuit of Hood's army. Recalled to Gen. Canby's command in Feb., 1865, he commanded the Sixteenth Corps in the reduction and capture of Mobile, Ala. In Jan., 1866, he was mustered out of the vol-

unteer service, and in May, 1869, resigned his commission in the regular army. The brevets of colonel, brigadier-general and major-general were bestowed on him for gallantry at Pleasant Hill, La., Tupelo, Miss., and Nashville, Tenn. He was reappointed colonel of cavalry Jan. 22, 1889, by act of Congress and placed on the retired list on same date.

Smith, BUCKINGHAM: bibliographer and historian; b. on Cumberland island, Ga., Oct. 31, 1810; graduated at the Cambridge Law School 1836; was elected to the territorial legislature at Florida; was secretary of legation at Mexico 1850-52, and at Madrid 1855-58; and subsequently settled in Florida, where he was a judge and a member of the State Senate. He made special and important researches in Mexican history and antiquities, Indian philology, and the early Spanish expeditions in North America. Besides aiding Bancroft, Sparks, and Parkman in their researches, he edited translations of the *Narrative of Cabeza de Vaca* (1851); *Letter of Hernando de Soto and Memoir of Hernando de Escalante Fontaneda* (1854); and translated, with copious notes, *Narratives of the Career of Hernando de Soto in the Conquest of Florida* (1868). In 1864 he published *An Inquiry into the Authenticity of Documents concerning a Discovery of North America claimed to have been made by Verrazano*. D. in New York, Jan. 5, 1871. A portion of his library was secured for the New York Historical Society.
HERBERT H. SMITH.

Smith, CHARLES EMORY, LL. D.: journalist; b. at Mansfield, Conn., Feb. 18, 1842; graduated at Union College in 1861; became editor of the *Albany Express* in 1865, of the *Albany Journal* in 1870, and of the *Philadelphia Press* in 1880. He was president of the New York State Press Association in 1874, a delegate to the national Republican conventions of 1876 and 1888, and U. S. minister to Russia 1890-92.

Smith, CHARLES FERGUSON: soldier; b. in Philadelphia, Pa., Apr. 24, 1807; graduated at the U. S. Military Academy in 1825, entering the army as a lieutenant of artillery. From 1829 to 1842 he served at the Military Academy in various capacities. In the Mexican war, as captain of artillery, he served with distinction, and received the brevets of major, lieutenant-colonel, and colonel. Appointed lieutenant-colonel of the Tenth Infantry in 1855, he commanded the Red river expedition in 1858, engaged in the Utah expedition in 1857-61, for a time was in command of the department of Utah, and was in command of the city and department of Washington Apr. 10-28, 1861. On Aug. 31, 1861, he was appointed a brigadier-general of volunteers, and ordered to Kentucky. In September he became colonel of the Third Infantry. In the operations about Forts Henry and Donelson he acquired a high reputation. In the fight for the possession of the latter stronghold he led the division which had held the left of the investing lines of the Union army, and which stormed and captured all the high ground on the Confederate right, which commanded Fort Donelson. Gen. Smith was then selected to command the movement up the Tennessee, and on Mar. 21 was promoted to be major-general of volunteers. D. at Savannah, Tenn., Apr. 25, 1862.

Smith, CHARLES FORSTER: professor of Greek; b. in Abbeville co., S. C., June 30, 1852; educated at Wofford College, Harvard and Leipzig Universities; Ph. D., Leipzig, 1881; Professor of Greek and German, Wofford College, 1875-79; Assistant Professor Ancient Languages, Williams College, 1881-82; Professor of Modern Languages, Vanderbilt University, 1882-83; Professor of Greek, Vanderbilt University, 1883; Professor of Greek, University of Wisconsin, 1894; author of *Thucydides: Book III. and Book VII.* of College Series of Greek Authors; vice-president American Dialect Society 1891.

Smith, Sir DONALD ALEXANDER, D. C. L.: member of Canadian Parliament; b. in Morayshire, Scotland, in 1821, and educated there. He was for many years in the service of the Hudson Bay Company, and is resident governor and chief commissioner of that corporation in Canada; is president of the Bank of Montreal, and a director of the Canadian Pacific Railway. He was appointed a member of the Executive Council for the Northwest Territories in 1870; represented Winnipeg and St. John in the Manitoba Assembly 1871-74; Selkirk in Dominion Parliament 1871-78; and Montreal West in that body 1887-95. He was knighted in 1886 for his services in connection with the construction of the Canadian Pacific Railway.
NEIL MACDONALD.

Smith, EDMUND KIRBY: soldier; b. at St. Augustine, Fla., May 15, 1824; graduated at the U. S. Military Acad-

1845) and entered the army as brevet second lieutenant of volunteers. In the war with Mexico he distinguished himself, and was promoted first lieutenant and captain for gallantry at Cerro Gordo and Contreras. From 1849 to 1862 he was Assistant Professor of Mathematics at West Point, transferred to the Second Cavalry in 1855 with the rank of captain, he acted on frontier duty, and was severely wounded in a fight with the Comanche Indians in Texas, May 23, 1861. In Jan., 1861, he became major of his regiment, but resigned Apr. 6; was again after appointed a brigade-major in the Confederate army, and served under Gen. Joseph Johnston in Virginia. At the battle of Bull Run, July 21, 1861, he arrived on the field with Elzey's brigade toward the close of the action, but was soon disabled by a shot, then Elzey assumed command. Made major-general in 1862, he was transferred to East Tennessee, and placed in command of that department. Under Bragg he led the advance in the invasion of Kentucky; he routed the Union forces at Richmond, Ky., Aug. 30, and advanced to Frankfort. Promoted to the grade of lieutenant-general, he was captured at the battle of Perryville, Oct. 8, and in the battle of Mary's Landing, Dec. 31, 1862-Jan. 3, 1863. He was soon after made general, and in command of the Trans-Mississippi department, opposing Banks in the Red river campaign, and engaged in the battle of Jenkins's Ferry, Apr. 30, 1864. He was the last to surrender the forces under his command, May 26, 1865. He filled the positions of vice-president Pacific and Atlantic Telegraph Company 1866-68, president Western Military Academy 1869-70, chancellor of the University of Nashville, Tennessee, 1870-74, and Professor of Mathematics in the University of the South from 1873 till his death at Sewanee, Tenn., Mar. 28, 1901.

Revised by JAMES MARCH.

Smith, Eli, D. D.; missionary; b. at Northford, Conn., Sept. 15, 1801; graduated at Yale College 1821, at Andover Seminary 1824; went to Malta as superintendent of a missionary operation establishment 1826; traveled with Dr. Anderson through Greece 1829, and with Dr. Harrison G. O. Dwight, of Constantinople, through Armenia, Georgia, and Persia 1830-31—a tour which resulted in the establishment of the American Armenian and Nestorian missions of the American Board; visited the U. S. and published *Ministry Researches in Armenia* (2 vols., Boston, 1833); settled at Beirut (1834); accompanied Dr. Edward Robinson in his geographical explorations of Palestine, to which he largely contributed, 1838 and 1852; resided in the U. S. 1839 and 1855; introduced an elegant font of Arabic type, cast under his supervision at Leipzig, for the mission press, 1839, and was engaged from 1847 upon a new translation of the Bible into Arabic, completed by Dr. C. V. Van Dyke. D. at Beirut, Jan. 11, 1857.

Revised by G. P. FORD.

Smith, Elizabeth Gares (Prince); author; b. at Uxbridge (then North Yarmouth), Me., Aug. 12, 1806; resided from infancy in Portland, Me.; married there in 1823 Seth Smith, editor and humorist, whom she aided in his journalistic enterprises; obtained a considerable local reputation as a writer of prose and verse, but never appeared publicly as an author until after the loss of her husband's fortune in 1839; settled in New York 1842. Her contributions to the magazines were partially collected in several volumes, of which the best known was *The Sinless Child and Other Poems* (1847). She also published two tragedies, *The Roman Tribune* and *Isaac Leiser* (1853); *Riches without Wings* (1858); *The Western Captive* (1859); *Woman and her Needs* (1854); *The Newberry* (1855); *The Two Wives* (1856); *Kitty Howard's Journal* (1871); and other books. She lectured before lyceums, occasionally preached, and was a prominent advocate of woman's rights. D. at Hollywood, N. Y., Nov. 4, 1893.

Revised by H. A. DAVIS.

SMITH, EMILY ANNAN (Phill); scientist; b. at Marcelus, N. Y., Apr. 26, 1837; educated at Mrs. Willard's seminary at Tarry, N. Y.; married Simon H. Smith, of Jersey City, in 1855; while educating her sons in Europe studied in Germany mineralogy, geology, crystallography, and other branches of science; also visited and investigated the amber-burrows on the coast of the Baltic Sea. She was the first woman elected fellow of the New York Academy of Sciences, and the first woman appointed an officer in the American Association for the Advancement of Science, being at the time of her death secretary of the section of anthropology. In 1889 Mrs. Smith became one of the salaried members of the board of ethnology, Smithsonian Institution, and was elected to study the language, customs, myths, and prehistoric

history of the Iroquoian Indians. She spent two summers among the Tuckermans in Canada, who adopted her as a member of the tribe, and compiled an Iroquois-English dictionary. In 1885 she was appointed by Gov. Abbott commissioner of the department of woman's work to represent the State of New Jersey at the New Orleans Exposition. D. in Jersey City, June 6, 1892.

J. W. POWELL.

Smith, FRANKS HENRY, A. M.; soldier; b. at Norfolk, Va., Oct. 18, 1812; graduated at the U. S. Military Academy in 1836, and entered the army as a brevet second lieutenant of artillery; second lieutenant Nov. 30, 1838. In 1838 he resigned from the army, and in 1847 was appointed Professor of Mathematics at Hampden-Sydney College, Virginia. Upon the organization of the Virginia Military Institute at Lexington, Va., in 1880, he was appointed its superintendent and principal professor of mathematics, the duties of which positions he performed until Jan. 1, 1890. Resigning professor until his death. Soon after the outbreak of the civil war the professors and assistants went into the Confederate army, and Smith, as colonel of a Virginia regiment, was stationed at the city of Norfolk and in command of the fort on Craney Island. The institute was subsequently reopened. He was the author of various educational works. D. at Lexington, Mar. 21, 1890.

Smith, FRANCIS HENRISSOT; landscape-painter and author; b. in Baltimore, Md., Oct. 24, 1855. He is by profession a civil engineer, and has built a number of public works, some for the U. S. Government. As a painter he is self-taught, paints principally in watercolor, and is a member of the American Water-color Society. He is an accomplished writer of fiction and descriptive articles, and well known as an illustrator. His water-colors of scenes in Venice are freely and cleverly painted.

W. A. C.

Smith, Sir FRANCIS PETER; inventor; b. at Hythe, Kent, Feb. 9, 1802; constructed in 1834 a model of a steam-vessel to be propelled by a screw driven by a spring; made a larger boat on the same principle, which he successfully used in the English Channel 1837; constructed for the British navy the screw steamer *Archimedes* of 237 horse-power (finished 1840), the success of which led to the rapid introduction of screw-vessels into the navy and the mercantile marine. He was knighted in 1871. D. in London, Feb. 11, 1874.

Smith, GEORGE; Assyriologist; b. in London, England, Mar. 26, 1840. He became interested in Assyriology by having to engrave some cuneiform signs for publication. Appointed to a position in the Assyrian department of the British Museum he rapidly became, by his industry, insight, and remarkable memory one of the greatest promoters of Assyriology. In connection with Sir Henry Rawlinson he edited vols. III-IV of *The Cuneiform Inscriptions of Western Asia* (1870, 1875), a monumental work. In 1872 he discovered among the clay books in the British Museum fragments of a story of the Deluge similar in the biblical version. *The Daily Telegraph* newspaper then sent him to Nineveh to make further search for clay books in the ruins of Ashurbanipal's palace. This expedition was successful, and was followed by two others for the museum. On the third expedition he died of fever at Aleppo, Aug. 19, 1876. The Deluge story proved to be part of a great poem written on twelve tablets. The whole was published, so far as recovered, in *The Chaldean Account of Genesis*, of which there have been several editions. His other works are *Assyria, from the Earliest Times till the Fall of Nineveh* (London, 1875); *Assyrian Discoveries* (1875), an account of his own travels and researches; *The Assyrian Epigraphic Canon* (London, 1876); *History of Babylon*, ed. by A. H. Sayce (1877); *History of Sennacherib*, ed. by A. H. Sayce (London, 1878); a work similar to the *History of Ashurbanipal*; and numerous articles in the *Transactions of the Society of Biblical Archaeology*, etc.

D. G. LLOYD.

Smith, GEORGE ANAN, D. D.; clergyman and author; b. in Calcutta, India, Oct. 19, 1836; was educated at the University and New College, Edinburgh, and the Universities of Tübingen and Leipzig; traveled twice extensively in Egypt and the Holy Land; was assistant to Brechin Free church 1860; in charge of the chair of Hebrew in Free Church College, Aberdeen, 1880-82; first minister of Queen's Cross church, Aberdeen, 1882-82; since 1892 Professor of Hebrew and Old Testament Exegesis in Free Church College, Glasgow. Dr. Smith has published *The Book of Isaiah in The Expositor's Bible* (London and New York, vol. I,

1888; 7th ed. 1894; vol. ii., 1890; 3d ed. 1894); *The Preaching of the Old Testament to the Age* (London and New York, 1893); *The Historic Geography of the Holy Land* (London and New York, 1894); with Bartholomew, the Scottish cartographer, *Historical Atlas of the Holy Land* (1895); and many articles for reviews. C. K. HORT.

Smith, GERRIT: philanthropist; b. at Utica, N. Y., Mar. 6, 1797; son of Peter Smith, a proprietor of vast tracts of land in Central and Northern New York; graduated at Hamilton College 1818; took up his residence at Peterboro, Madison co., N. Y., devoting himself to the management of his great landed estate; became a member of and liberal contributor to the Colonization Society 1825, but withdrew from it 1835, when he connected himself with the American Anti-Slavery Society, of which he was thenceforth one of the leading members; was elected to Congress 1852, but resigned after a single session; was a liberal contributor to the Free-soil campaign in Kansas; gave pecuniary aid to John Brown 1859 when preparing the attack on Harper's Ferry, though, it is believed, without a knowledge of that project; was nominated for Governor of New York in 1840 and in 1858, at the latter time on a platform of abolition and prohibition; joined Horace Greeley in signing the bail-bond of Jefferson Davis 1867; wrote, printed, and distributed many pamphlets on slavery and other reforms; built a non-sectarian church at Peterboro, in which he sometimes preached. D. in New York, Dec. 28, 1874. Author of *Speeches in Congress* (1855); *Sermons and Speeches* (1861); *The Religion of Reason* (1864); *The Theologies* (1866); and *Nature the Base of a Free Theology* (1867). See his *Biography*, by Frothingham (New York, 1878).

Smith, GOLDWIN, LL. D., D. C. L.: author; b. at Reading, England, Aug. 13, 1823; educated at Eton and at Oxford, where he graduated in 1845, and became a fellow of University College in 1847; called to the bar in 1847, but never practiced law. In 1850 he was appointed by the Government assistant secretary of the royal commission on the state of Oxford University; was secretary of the second Oxford commission; a member of the popular education commission in 1858; Regius Professor of Modern History in Oxford University 1858-66, and Professor of English and Constitutional History in Cornell University 1868-71. He ably championed the cause of the U. S. Government during the civil war; visited the U. S. in 1864 to deliver a series of lectures, and was given the degree of LL. D. by Brown University. In 1871 he removed to Toronto, Canada; was for a time a member of the senate of Toronto University; edited *The Canadian Monthly* 1872-74, and subsequently founded *The Week* and *The By-stander*, the latter of which is not now published. Since his removal to Canada he has persistently advocated the annexation of that country to the U. S. In addition to numerous magazine articles he has published the following among other works: *Lectures on the Study of History* (1861); *Irish History and Irish Character* (1861); *The Empire* (1863); *Three English Statesmen* (1867); *Couper* (English Men of Letters Series, 1880); *A Trip to England* (1888); *Jane Austen* (Great Writers Series, 1890); *Canada and the Canadian Question* (1891); *The Moral Crusader, William Lloyd Garrison* (1892); *The United States: an Outline of Political History, 1492-1871* (1893); *Bay Leaves: Translations from the Latin Poets* (1893); and *Essays on Questions of the Day* (1894). N. M.

Smith, GREEN CLAY: soldier; b. at Richmond, Ky., July 2, 1830; served as a volunteer in the Mexican war, gaining the rank of lieutenant of cavalry; graduated at Transylvania University 1850, and at Lexington, Ky., Law School; became a lawyer at Covington; was a member of the Kentucky Legislature 1861, and a decided Union man; became colonel of the Fourth Kentucky (Union) Cavalry Mar., 1862, and brigadier-general of volunteers June, 1862; resigned Dec. 1, 1863; was a member of Congress 1863-66; a delegate to the Baltimore convention 1864; Governor of Montana Territory 1866-68; entered the Baptist ministry, being ordained in 1869. In 1876 he was the candidate of the Prohibitionists for the presidency.

Smith, GUSTAVUS WOODSON: soldier; b. in Scott co., Ky., Jan. 1, 1822; graduated from the U. S. Military Academy July 1, 1842; appointed to the Engineer Corps, and for two years engaged in the construction of fortifications at New London harbor; Assistant Professor of Engineering at West Point 1844-46; commanded the sappers, miners, and pontoniers during the siege of Vera Cruz and during the subsequent operations of the war with Mexico, receiving the

brevets of first lieutenant and captain for gallantry at Cerro Gordo and Contreras. He was principal Assistant Professor of Engineering at West Point 1849-54, when he resigned from the army. He was subsequently employed in the construction of various Government buildings and in the iron-works of Cooper & Hewitt at Trenton, N. J. In 1858 he became street commissioner of New York city; early in 1861 he entered the Confederate army, and in August was appointed a major-general. On May 31, 1862, Gen. Johnston having been severely wounded that day at Fair Oaks, Gen. Smith succeeded to the temporary command of the Army of Northern Virginia, and subsequently commanded at Petersburg, Va. In 1864-65 he was commander of the State forces of Georgia, and was captured at Macon, Ga., Apr. 20, 1865. From 1866 to 1870 he was in charge of the Southwest Iron Company's works at Chattanooga, Tenn., and from 1870 to 1876 was insurance commissioner of Kentucky. He is the author of many works on life-insurance, Confederate war-papers, and criticisms on Confederate battles and leaders.

Smith, HANNAH: author; b. at Wellington, Shropshire, England. Under the pseudonym of *Heba Stretton* she has been a prolific author of novels and stories, including *Jessica's First Prayer* (1866); *The Clives of Burcot* (1867); *Paul's Courtship* (1867); *Healer Morley's Promise* (1875); and *Bede's Charity* (1882). H. A. B.

Smith, HENRY BOYNTON, D. D., LL. D.: theologian; b. at Portland, Me., Nov. 21, 1815; graduated at Bowdoin College 1834; was a tutor there 1836-37, and again 1840-41, between which periods he studied theology at Andover, Bangor, Halle, and Berlin; was pastor of the Congregational church at West Amesbury, Mass., 1842-47; Professor of Mental and Moral Philosophy at Amherst College 1847-50; was Professor of Church History in Union Theological Seminary, New York, 1850-54, and of Systematic Theology 1854-74; after that professor emeritus; was moderator of the General Assembly of the (New School) Presbyterian Church 1863-64; delivered at the meeting of that body at Dayton, O., an address on *Christian Union and Ecclesiastical Reunion*, which was directed toward that union with the "Old School" Church which was afterward consummated, and for which he prepared an essay on the doctrinal basis, *The Reunion of the Presbyterian Churches* (1867); was appointed delegate in 1867 to the meeting of the Evangelical Alliance in Amsterdam, for which he prepared a report *On the State of Religion in the United States*; was the founder and editor of *The American Theological Review* (1859-71), consolidated with *The Presbyterian Review* in 1862, and united with *The Princeton Review* in 1872; and Prof. R. D. Hitchcock in the *Life, Character, and Writings of Edward Robinson* (1864). He published in 1859 a *History of the Church of Christ, in Chronological Tables* (following); was translator in part, and editor, of Gieseler's *Church History* (4 vols., 1859-63; vol. v. published posthumously in 1880); editor of revised translations of Hagenbach's *History of Christian Doctrine* with large additions (2 vols., 1861-62), and Stier's *Words of the Lord Jesus* (1864-65). D. in New York, Feb. 7, 1877. In that same year his friend Dr. Prentiss edited a collection of his discourses and essays entitled *Faith and Philosophy*. In 1881 his *Memoirs* appeared, edited by his wife, and a briefer biography, by his pupil Prof. Lewis French Stearns, appeared in Boston, 1882. Another pupil, Prof. William S. Karr, of Hartford, edited his *Apologetics* (1882), his *Introduction to Christian Theology* (1883), and his *System of Christian Theology* (1884).

Revised by S. M. JACKSON.

Smith, Sir HENRY GEORGE WAKELYN, usually known as Sir HARRY SMITH: soldier; b. at Whittlesea, Cambridgeshire, England, in 1788; entered the army as second lieutenant in the rifle-brigade in 1805; served as assistant quartermaster-general in the campaign of Waterloo; commanded a division in the Kaffir war 1834-35; was appointed adjutant-general to the forces in India 1839; was distinguished at the battles of Gwalior and Maharajpur, being knighted for the latter service 1844; took a prominent part in the war against the Sikhs in the Punjab; was sent to the relief of Ludhiana, and took Aliwal at the point of the bayonet Jan. 28, 1846, capturing sixty-seven guns; re-enforced Lord Gough in time to enable him to win the decisive battle of Sobroa, Feb. 10, 1846; received the thanks of Parliament on the proposal of the Duke of Wellington, and was made a baronet; became governor of the Cape of Good Hope 1847; conducted the Kaffir war of 1851-52, and was made lieutenant-general 1854. D. in London, Oct. 12, 1860.

Smith, Hosea: lawyer and journalist; b. at Litchfield, Conn., N. C., Sept. 3, 1833; son of H. H. Smith, a native of New Hampshire; for several years a professor in the University of North Carolina; educated at the University of Georgia; went to Atlanta 1872 to study law; also taught school at Warmersburg, Ga.; admitted to the bar at Atlanta 1874; expressed Northern Georgia 1875, urging the removal of the state capital from Milledgeville to Atlanta; organized and became president of the Atlanta Evening Journal Company 1887; made the paper very popular in the State through his advocacy in its columns of a low tariff. In 1888 he became Secretary of the Interior.

Smith, Horace: humorist and poet; b. in London, England, Dec. 31, 1779; became a member of the Stock Exchange, in which business he acquired a fortune; was associated with his brother James in writing for several periodicals and in the production of a celebrated volume of poetical narratives entitled *Repected Addresses* (1812); was author of numerous novels which had but moderate success; and of an anonymous volume of humorous prose sketches, *The Two Tricenters* (1836). A collection of his poems was published at London in 1846. D. at Tunbridge Wells, July 19, 1849. A selection from the poetical works of both brothers, including the *Repected Addresses*, and accompanied by a *Memoir*, was published by Epps-Sargent (New York, 1857).

Revised by H. A. Betts.

Smith, James: signer of the Declaration of Independence; b. in Ireland about 1720; was taken to Pennsylvania by his parents, who settled on the Susquehanna 1729; was educated at the College of Philadelphia; became at first a surveyor near Shippensburg; afterward a lawyer at York; raised in 1774 the first volunteer company in the State for the purpose of resistance to Great Britain; was a member of the convention called to consider the expediency of abstaining from importing British goods, and one of the committee to prepare instructions for the representatives; published an *Essay on the Constitutional Power of Great Britain over the Colonies in America*, which gave a powerful impetus to the Revolution; was elected to the Continental Congress 1775-78; signed the Declaration of Independence and was elected to the General Assembly of Pennsylvania 1780. D. at York, July 11, 1806. He was a man of great wit and his odd gestures and drawling utterances added to the effect of his droll speeches.

Smith, John: adventurer; b. at Wiltshire, Wiltshire, England, in Jan., 1579; spent four years of his early manhood in military service in the Netherlands; was afterward, according to his own account, engaged in wars against the Turks in Hungary and Transylvania, but there is reason to believe that his wonderful adventures in the East are wholly or in part fictitious. Returning to England, by way of Barbary, he was induced by Capt. Bartholomew Gosnold to take part in the colonization of Virginia (1606), then being carried into effect, and brought to bear with such effect his military renown upon the directors of the "London Company" that his name was placed on the secret list of seven persons appointed members of the council. During the long voyage to Virginia (1607) Smith was placed under arrest on an accusation of sedition, and, though liberated on arrival at Jamestown, Va., where the colony was located, he was excluded from his place in the council. He accompanied Capt. Newport in his voyage of exploration up James river as far as the present site of Richmond; was on their return admitted as a member of the council; took part in the disturbance which resulted in the removal from office of Wingfield, the president of the colony, against whom he successfully brought a suit for slander; was intrusted with the command of several expeditions into the interior, partly for the purpose of exploration, but chiefly with the object of obtaining food. He repressed with severity the proposals of some of the settlers to return to England, upon which charge he caused Capt. George Kendall to be condemned and executed. Upon one of these expeditions in Dec., 1607, Smith was taken prisoner, and detained for some time, though kindly treated by the Indian chieftain *Waucombec* (incorrectly called by many writers the "emperor" Powhatan). The famous incident of the preservation of his life by Pocahontas (or Amoras) was related of this captivity, but there is little doubt that the whole adventure is fictitious. On being carried back to Jamestown by the Indian chieftain, Smith was tried by his fellow countrymen for the death of two of his companions, said to have been killed by the Indians through his imprudence,

and was condemned to be executed the next day, but his life was saved by the opportune arrival of Capt. Newport with reinforcements and provisions. In the following year Smith made two extended surveys of Chesapeake Bay and its tributary waters, of which he made a map, became president of the council 1609; had several skirmishes with hostile Indians, who at one time mutilated the destruction of Jamestown. His departure from Virginia, to which he never returned, took place in Sept., 1609, and was attributed by himself to his having been burned by an explosion of gunpowder, but another account states that he was sent to England a prisoner. In 1614 he explored with two ships filled out by some London merchants a large portion of the North American coast, to which he gave the name of New England, and of which he formed a tolerably accurate map, and made a handsome profit by fishing and fur-trading. In 1615 he undertook another voyage to New England for the purpose of founding a colony, but was captured by a French man-of-war and taken to Rochelle. Afterward he claims to have been engaged in "sea-fights for the French against the Spaniards," and to have experienced several remarkable adventures. About 1616 he received the title of admiral of New England, and was thenceforth much engaged in promoting American colonization by means of a series of publications on America, written either by or for him, in which romantic versions of his career in many lands were put forth; but many of the details are contradicted by conclusive proofs, and his several books and pamphlets are not consistent with one another upon some important points. D. in London, June 21, 1631, and was buried in the choir of St. Sepulchre's church. Under the name of Thomas Watson, Smith sent from Virginia a *True Relation of such Discoveries and Accidents of Note as hath happened in Virginia, etc.* (London, 4to, 1608), which was printed in black letter, accompanied by a map, and is the earliest tract published on the subject. It was reprinted, with an introduction and notes, by Charles Deane (Boston, 1867). He was also author of *A Map of Virginia, with a Description of the Country, the Commodities, the People, Government, and Religion, etc.* (Oxford, 1612); *A Description of New England, or the Observations and Discoveries of Captain John Smith (Admiral of that Country) in the North of America in the Year of our Lord 1614, etc.* (London, 1616; reprinted in vol. vi. of series of the *Collections of the Massachusetts Historical Society*, and in *Wines's Tracts: New England's Trials, etc.*, 1620 and 1622); *The General History of Virginia, New England, and the Summer Isles* (1626)—a work including the substance of its predecessors; two treatises on seamanship (1630 and 1637); *The True Travels, Adventures, and Discoveries of Captain John Smith in Europe, Asia, Africa, and America from 1598 to 1629, etc.* (1630); and *Advertisements for the Unexperienced Planters of New England, etc.* (1631; reprinted at Boston, 1855); and was engaged at the time of his death upon a *History of the Sea*, no part of which has been preserved. The *General History* and *True Travels* were republished together at Richmond (2 vols., 1829). A *Letter of John Smith to Lord Bacon*, written in 1618 to recommend to the chancellor's attention the fisheries of New England, was first printed in the *New York Historical Magazine* for 1861. There are biographies by George S. Hillard (in Sparks's Series, vol. 11), W. G. Simms (1846), and George C. Hall (1858). Much light was thrown upon his career by the Hakluyt Society's publication of Strachey's *History of Travels into Virginia Britannia* (1849) from the original MS., and by Charles Deane's notes to his edition of Wingfield's *Discourse of Virginia* (Boston, 1859), in which publications the falsity of the Pocahontas legend was first exposed. In Bryant and Gay's *Popular History of the United States* (vol. 1, 1876) judicious use has been made of the materials above mentioned.

Revised by C. F. Adams.

Smith, John Lawrence, M. D., M. N. A. S.: chemist; b. near Charleston, S. C., Dec. 17, 1818; graduated at the University of Virginia, and at the Medical College of the State of South Carolina 1840; acted as civil engineer on the Charleston and Cincinnati Railroad; pursued his professional studies in France and Germany; began in 1844 the practice of medicine at Charleston, S. C., where he delivered lectures on toxicology; mining engineer (1846-51) to the Turkish Government; aided in the development of cotton-growing in Asia Minor; was instrumental in the discovery of deposits of emery and corundum in the U. S.; invented in 1851 the inverted microscope; was elected in that year

Professor of Chemistry in the University of Virginia; removed to Louisville, Ky.; became a professor in the Medical University of that city; was U. S. commissioner to the Universal Exposition of Paris (1867), Vienna (1873), and Philadelphia (1876); was in 1872 president of the American Association for the Advancement of Science; was a member of the National Academy of Science and of numerous associations; received from the Emperor Napoleon III. the cross of the Legion of Honor; was author of a report to the U. S. Government on *The Progress and Condition of Several Departments of Industrial Chemistry* (1867), as seen at the Paris Exposition, and *Mineralogy and Chemistry* (Louisville, 1873). D. in Louisville, Ky., Oct. 12, 1888.

Smith, JOHN PYE: clergyman and author; b. at Sheffield, England, May 25, 1774; studied at the Independent Academy at Rotherham; became a Dissenting (Independent) minister, and in 1800 resident classical tutor in the theological academy at Homerton; exchanged that post in 1813 for the divinity tutorship, which he filled until 1843; was again classical tutor, and also principal, from the latter date until 1850. For forty-three years he was pastor of the Gravel Pits Chapel, Homerton; took great interest in science, and was elected a fellow of the Royal Society. D. at Guildford, Surrey, Feb. 5, 1851. He was the author of *The Scripture Testimony to the Messiah* (2 vols., 1818-21); *The Mosaic Account of the Creation and Deluge illustrated by the Discoveries of Modern Science* (1837); *Scripture and Geology* (1839); and other works. See *Memoirs of the Life and Writings of John Pye Smith*, by J. Medway, 1853.

Smith, JOHN WILLIAM: legal writer; b. in London, England, Jan. 2, 1809; educated at Trinity College, Dublin; began practice as a special pleader 1831, and was called to the bar at the Inner Temple May 8, 1834; was made a revising barrister in 1840. He was gifted with a remarkable memory, and powers of nice discrimination and lucid exposition. D. in London, Dec. 17, 1845. Besides a *Compendium of Mercantile Law* (1834) and *A Selection of Leading Cases in Various Branches of the Law* (2 vols., 1837-40; 9th ed. 1889), which are of the highest authority, he wrote *An Elementary View of the Proceedings in an Action at Law, Law of Landlord and Tenant*, and other less important works. See *Memoirs in Blackwood's Magazine* (Feb., 1847), *Law Magazine* (Feb., 1846), and *Albany Law Journal* (Dec., 1872).

F. STURGES ALLEN.

Smith, JOSEPH, JR.: Mormon prophet; b. at Sharon, Vt., Dec. 23, 1805; removed while a child, with his parents, to Palmyra, N. Y., where he grew up almost without education, leading an idle and rather disreputable life. According to his own account, he began to have visions at the age of fifteen, and on Sept. 21, 1823, the angel Moroni appeared to him, announcing that God had a work for him to perform, and that buried in the earth in a certain spot a few miles distant was a record inscribed upon gold plates, giving an account of the early inhabitants of America and of their fate; and with this record would be found a kind of spectacles through which alone the writing could be read. Four years after, the angel placed the plates in his hands, together with the spectacles. Smith described the plates as being about 8 inches long, 7 wide, and connected by rings so as to form a volume about 6 inches thick. The plates were inscribed on both sides with hieroglyphic characters in a language no longer extant, but which he was able to decipher and understand by the use of the miraculous spectacles, which he called the Urim and Thummim. Smith professed to have dictated in English the contents of these plates to Oliver Cowdery, who acted as his amanuensis, the plates themselves mysteriously disappearing as they were successively transcribed. The manuscript thus prepared was printed at Palmyra in 1830 under the title, *The Book of Mormon, an Account written by the Hand of Moroni upon Plates taken from the Plates of Nephi. By Joseph Smith, Jr., Author and Proprietor*; and to it was prefixed a certificate signed by Cowdery and two others to the effect that they had seen and handled the plates. Subsequently, all three of the witnesses fell out with Smith, and declared the whole matter to be a hoax. Smith was soon joined by Sidney Rigdon, a printer by trade, who had also aspired to found a new religion, and the two gained a small body of followers, and in 1831 went to Kirtland, O., where they built a temple and set up a fraudulent bank. They were driven away by the citizens in 1838. Smith had in the meantime fixed upon a place in Missouri as the site of his New Jerusalem, and here his adherents had begun to gather; but becoming obnoxious to

the surrounding inhabitants, they abandoned their settlement, and took refuge in Hancock co., Ill., where in 1840 they established themselves in a fine location at the bend of the Mississippi, calling their new home Nauvoo; the town increased so rapidly that in six years the population numbered 15,000. Here Smith soon began to put forth, as occasion demanded, a succession of new revelations, among others one establishing polygamy as an essential feature of the Church of the Latter-Day Saints, and combining in his own person all civil, military, municipal, and sacerdotal authority. A newspaper was set up to oppose him; the presses were destroyed by Smith and his adherents May 6, 1844; warrants were issued for his arrest and that of his brother Hyrum and some others; they refused to obey the writs; the State militia were called out; the Mormons armed themselves, and a conflict was imminent. The Governor of Illinois at length induced the Smiths to surrender and submit to trial, guarantying their personal safety in the interval. They were committed to jail at Carthage, the county-town, and a guard was placed for their protection. On the evening of May 27 a mob assembled, dispersed the guard, and began firing into the door and window of the jail. Hyrum Smith was shot dead; Joseph returned the fire with a revolver until his charges were exhausted, when he endeavored to make his escape by the window, but was shot in the attempt, and fell dead to the ground. See *MORMONS*.

Revised by S. M. JACKSON.

Smith, JOSHUA TOULMIN: author; b. in Birmingham, England, May 20, 1816; educated in the public schools of Birmingham; devoted himself to the Scandinavian languages and literature, in which he became proficient; resided in the U. S. 1837-42; published at Boston his *Normanmen in New England, or America in the Tenth Century* (1839), which was chiefly a translation from the *Antiquitates Americane* (1837); devoted himself, on his return to England, to the study of constitutional and Old Saxon law; was called to the bar 1849; wrote several able legal treatises, especially *The Parish, its Obligations and Powers, its Officers and their Duties* (1854); illustrated in several publications the antiquities of Birmingham, and undertook the preparation for the Early English Text Society of a *History of English Guilds*, a work of immense labor, which, as well as a projected *History of Birmingham*, was left incomplete at the time of his death, which occurred at Lancing, Sussex, Apr. 28, 1869. The *History of English Guilds*, edited by his daughter, Lucy Toulmin Smith, appeared in 1870.

Smith, JUDSON, D. D.: clergyman; b. at Middlefield, Mass., June 28, 1837, graduated at Amherst College 1859, and at the Oberlin Theological Seminary 1863. He was Professor of Latin in Oberlin College 1866-70, and of Ecclesiastical History in Oberlin Theological Seminary 1875-84. In 1884 he was made a secretary of the A. B. C. F. M., Boston, Mass. He is the author of two volumes of historical lectures (privately printed) and of various articles in reviews and other journals, and since 1882 has been one of the editors of the *Bibliotheca Sacra*.

G. P. FISHER.

Smith, MUNROE, J. U. D.: professor of Roman law; b. in Brooklyn, N. Y., Dec. 8, 1854; A. B., Amherst, 1874; LL. B., Columbia, 1877; studied at Berlin, Leipzig, and Göttingen Universities 1877-80 (J. U. D., Göttingen); lecturer on Roman Law, Columbia College, 1880-91; Professor of Roman Law and Comparative Jurisprudence since 1891; instructor in history 1880-83; Adjunct Professor of History 1883-91; contributor to *Johnson's Universal Cyclopædia*, *The Nation*, etc., and managing editor *Political Science Quarterly* 1886-93.

C. H. THURBER.

Smith, NATHAN RYNO, M. D., LL. D.: surgeon; b. at Cornish, N. H., May 21, 1797; graduated at Yale College 1817; took the degree of M. D. at New Haven 1823; was Professor of Anatomy and Surgery in the University of Vermont in 1825; on the organization of the Jefferson Medical College in Philadelphia, became the Professor of Anatomy, but in 1827 accepted the chair of Surgery in the University of Maryland; in 1838 became Professor of Practical Medicine in the Transylvania University, Lexington, Ky.; in 1840 returned to the University of Maryland; invented a method of lithotomy, an excellent suspensory apparatus for fracturing inferior extremities, and wrote *Surgical Anatomy of the Arteries* (1832) and other medical works. D. in Baltimore, Md., July 3, 1877.

Revised by S. T. ARMSTRONG.

Smith, RICHARD SOMERS: soldier and educator; b. in Philadelphia, Pa., Oct. 30, 1813; graduated at the U. S.

Military Academy July 1, 1834; assigned to the Second Infantry as first second lieutenant, but served on topographical duty until 1836, when he resigned to follow the profession of civil engineering. In 1840 he was reappointed in the army, with rank of second lieutenant of infantry; first lieutenant 1846; transferred to the Fourth Artillery 1848. He was Assistant Professor of Drawing at the Military Academy 1840-53; resigned from the army, and was Professor of Mathematics and Drawing in the Brooklyn Polytechnic Institute, which position he retained until 1859. From 1860 to 1861 he was a director of the Cooper Union; on May 14 of the latter year he re-entered the army, with rank of major, and was assigned to the Twelfth Infantry. He served on mustering and disbursing duty until the latter part of 1869, when he rejoined his regiment, and was engaged in the battle of Chancellorsville May 2-4, 1863. Soon after this (May 30) he relinquished his commission to accept the presidency of Girard College, Philadelphia, and held that position until 1873. He was Professor of Civil Engineering in the Polytechnic College of the State of Pennsylvania 1864-70; Professor of Mathematics 1870-73; and 1873-77 at the head of the department of drawing at the U. S. Naval Academy at Annapolis. In 1857 Columbia College conferred upon him the degree of A. M. He was the author of *A Manual of Topographical Drawing* (Philadelphia, 1844) and *Manual of Linear Perspective* (1857). D. at Annapolis, Md., Jan. 30, 1877.

Smith, RICHARD MAYO, Ph. D.: economist; b. at Troy, O., Feb. 9, 1834; A. B., Andover College, 1855; studied at the Universities of Berlin and Heidelberg 1855-77; assistant in history, Columbia College, 1877-78; adjunct professor 1877-81; Professor of Political Economy and Social Science, Columbia College, since 1883; member of the National Academy of Science; honorary fellow Royal Statistical Society; member of the International Statistical Institute; author of *Statistics and Economics* (1888); *Emigration and Immigration* (1890); and numerous magazine articles.

Smith, ROBERT: mathematician; b. in England in 1690; took orders in the Church of England; succeeded his cousin and friend, Roger Cotes, as Professor of Astronomy at Cambridge 1706; edited Cotes's works with commentaries; published *A Complete System of Optics* (2 vols., 1704) and *Harmonics, or the Philosophy of Musical Sounds* (1740), and succeeded Bentley as master of Trinity College 1742. D. at Cambridge, Aug. 1768. By his will he left £2,000 to Trinity College and £2,000 to the university for the support of the astronomical professorship and the maintenance of two annual prizes (since called the Smith prizes) for proficiency in mathematics and natural philosophy.

Smith, ROBERT: brother of Gen. Samuel Smith; b. at Carlisle, Pa., Nov. 1797; served as a volunteer at Brandywine; graduated at Princeton 1781; studied law, which he practiced with distinction at Baltimore; was for some years a member of the Maryland Legislature; was Secretary of the Navy in the cabinet of President Jefferson 1802-05, Attorney-General Mar.-Dec. 1805, and Secretary of State under President Madison 1809-11; was for several years president of the American Bible Society and of the Maryland Agricultural Society, and provost of the University of Maryland. Author of an *Address to the People of the United States* (1811). D. in Baltimore, Nov. 20, 1842.

Smith, ROBERT BARNWELL: See ROBERT.

Smith, ROBERT PAVNE, D. D.: clergyman and author; b. in Gloucestershire, England, Nov. 1516; graduated with honors at Oxford 1541; took orders in the Church of England; became sub-librarian of the Bodleian Library, Oxford, 1567; canon of Christ Church and Regius Professor of Divinity, Oxford, 1655; Dean of Canterbury, in succession to Henry Alford, 1871. He published (in Latin) a *Catalogue of the MSS. in that library*; edited and translated from the Syriac the *Commentary of Cyril of Alexandria on Luke* (1826); translated from the same language the *Ecumenical History of John of Ephesus* (1800); commenced in 1865 the *Delegates of the Clarendon Press a Syriac Testament*, based on that of Grotius (10th fasciculus 1865); is author of *The Authenticity and Mistake Interpretation of the Prophecies of Isaiah conducted in a Course of Sermons preached before the University of Oxford* (1862); *Prophecy a Preparation for Christ* (1863), being the Bampton lectures for that year; *Exposition of the Historical Portion of the Writings of Daniel* (1866); and the commentary on Jeremiah in the series known as *The Speaker's Commentary*, on

Isaiah in the *Commentary of the Society for the Promotion of Christian Knowledge*, on Samuel in *The Pulpit Commentary*, and on Genesis in *Bishop Ellicott's Commentary*. He visited the U. S. as a delegate to the general conference of the Evangelical Alliance in Oct., 1873. He was a member of the Old Testament revision company.

Revised by S. M. JACKSON.

Smith, SAMUEL: soldier; b. at Lancaster, Pa., July 27, 1732; removed in childhood to Baltimore, was some years in his father's counting-house; became a captain in Smallwood's Maryland regiment Jan., 1776; participated in the battles of Long Island, Harlem, and White Plains, and in the retreat through New Jersey; became major in Ouse's battalion Dec. 10, 1776, and lieutenant-colonel 1777; was at the attack on Staten Island and at the battle of Red Bank; was placed by Washington in command of Fort Mifflin, which he gallantly defended from Sept. 26 to Nov. 31, when he was severely wounded and forced to remove to the Jersey shore; received the thanks of Congress and an elegant sword; was at Valley Forge and at the battle of Monmouth, after which he resigned his commission in the army, but continued to serve as colonel of militia; was a member of the Maryland constitutional convention 1776; member of Congress 1783-1803 and 1815-22; U. S. Senator 1823-18; and again 1822-33, serving much of the time as chairman of the finance committee, and occasionally as president pro tempore of the Senate; was major-general of militia at the defense of Baltimore against the British 1814; quelled a formidable mob in 1835, and was thereupon elected mayor. D. in Baltimore, Apr. 22, 1839.

Smith, SAMUEL FRANCIS, D. D.: author and editor; b. in Boston, Mass., Oct. 21, 1808; graduated at Harvard 1829; studied theology at Andover Seminary; became a Baptist clergyman 1832; edited *The Baptist Missionary Magazine* at Boston 1832-33; was a prominent contributor to Dr. Lieber's *Encyclopaedia Americana*; was pastor of a church at Waterville, Me., and Professor of Modern Languages in Waterville College 1834-42; pastor at Newton, Mass., 1842-54; edited *The Christian Review* 1842-49, and for many years was editor of the publications of the Baptist Missionary Union. He published (with Rev. Aaron Shaw) *The Psalmist* (1848); edited a volume of *Lyric Poems* (1844); wrote a *Life of Rev. Joseph Griffin* (1846); and is author of many well-known songs and hymns, including *My Country, 'Tis of Thee* and *The Morning Light is Breaking*. On Apr. 5, 1893, he was given a very enthusiastic reception in Music Hall, Boston, and in many parts of the country the public-school children observed the day by singing his famous song.

Revised by W. H. WARRANT.

Smith, SAMUEL STANHOPE, D. D., LL. D.: scholar; son of Rev. Dr. Robert Smith (1723-93); b. at Peques, Pa., Mar. 18, 1750; graduated at Princeton 1769; was educated at, and became a teacher in, his father's classical academy, pursuing meanwhile the study of theology; was tutor at Princeton 1770-73; was ordained to the Presbyterian ministry 1774; labored as a missionary in Western Virginia; was the first president of Hampden-Sydney College 1775-79; became Professor of Moral Philosophy at Princeton 1779, also Professor of Theology 1788; vice-president of the college 1786, and president 1785; was a member of the committee appointed to draw up a system of government for the Presbyterian Church 1789; was an eloquent and effective pulpit orator and distinguished for courtly manners; published *An Essay on the causes of the Variety of Complexion and Figure of the Human Species* (Philadelphia, 1787); *Sermons* (Newark, N. J., 1793); *Lectures on the Evidences of the Christian Religion* (Philadelphia, 1800); *Lectures on Moral and Political Philosophy* (2 vols., Trenton, N. J., 1812); and *Comprehensive Views of Natural and Revealed Religion* (New Brunswick, N. J., 1815); completed the *History of the United States* (Philadelphia, 1816-17) begun by his brother-in-law, Dr. David Ramsey, and published a number of separate sermons and discourses. He married a daughter of his predecessor, Dr. Witherspoon; resigned the presidency on account of ill health 1812. D. at Princeton, Aug. 21, 1819. Two volumes of his *Sermons* were published posthumously in Philadelphia, 1831, preceded by a brief memoir.

Revised by S. M. JACKSON.

Smith, SERA: journalist and humorist; b. at Rockfield, Me., Sept. 14, 1792; graduated at Bowdoin College 1819; became a journalist at Portland, editing successively the *Argus*, *Family Recorder*, and *Daily Courier*; married Miss Elizabeth Oakes Prince 1823; won a wide reputation as a

humorist by his *Letters of Major Jack Downing* (1833); lost his property 1839; settled in New York 1842; devoted himself successfully to literature, as did also his wife (see SMITH, ELIZABETH OAKES); published *Dewdrops of the Nineteenth Century* (1846); *My Thirty Years out of the Senate* (1859); *Powhatan, a Metrical Romance* (1841); *New Elements of Geometry* (1850); and *Way Down East, or Portraits of Yankee Life* (1855); besides a vast number of uncollected verse and prose essays which appeared in various periodicals. D. at Patchogue, L. I., July 29, 1868.

Revised by H. A. BEERS.

Smith, SYDNEY: clergyman and author; b. at Woodford, Essex, England, June 3, 1771; was educated at Oxford, where in 1792 he became a fellow of New College; resided a few months in Normandy, where he mastered the French language, and in 1794 became curate of a lonely parish on Salisbury Plain. In 1796 he went to Edinburgh, where he remained five years, officiating in an Episcopal chapel; became intimate with Brougham, Jeffrey, and other brilliant young men, who in 1802 started *The Edinburgh Review*, Smith acting as original editor and contributing seven articles to the first number. Soon after this he went to London, where he became a popular preacher, and in 1804-06 delivered courses of lectures on moral philosophy, contributing also to *The Edinburgh Review* until 1827. In 1806 he was presented with the living of Foston-le-Clay, in Yorkshire, worth £500 a year, but situated in a desolate region. In 1809 he went to Heslington, near York, leaving Foston in charge of a curate, hoping to exchange it for a more desirable benefice. Not succeeding in this, he returned in 1814, built a comfortable rectory, in which he lived until 1828, when the chancellor, Lord Lyndhurst, appointed him canon of Bristol, and gave him the rectory of Combe-Florey. In 1831 he was made resident canon of St. Paul's, upon which he took up his abode in London, where he passed the remainder of his life in the discharge of his official duties, in literary labor, and in the pleasures of society, in which he was a great favorite for his wit and rare conversational powers. D. in London, Feb. 22, 1845. Among his most characteristic productions are his *Letters on the Subject of the Catholics, to my brother Abraham, who lives in the Country, by Peter Plymley* (1807-08; published anonymously), which had a large share in bringing about Roman Catholic emancipation. He published several volumes of sermons, many occasional discourses, and political and social essays. His early lectures on moral philosophy were edited by Francis Jeffrey, and published under the title *Elementary Sketches of Moral Philosophy* (1849). Several volumes of selections from his various works have appeared, the best of which is *Wit and Wisdom of Rev. Sydney Smith*, accompanied by a biographical sketch and notes, by Evert A. Duyckinck (1856). His memoirs have been written by his daughter, the wife of Sir Henry Holland (1855). Also see *Life and Times of Sydney Smith* (London, 1884), by Stuart J. Reid.

Revised by H. A. BEERS.

Smith, WILLIAM: geologist; b. at Churchill, Oxfordshire, England, Mar. 23, 1769; in the practice of his profession as mineral surveyor was led to notice and make maps of the succession of geological strata; he published a *Tabular View of the Order of the Strata, and their Imbedded Organic Remains, in the Neighborhood of Bath* (1799); *Mineral Survey, or Delineations of the Strata of England and Wales* (1815, with sixteen colored maps); *Strata identified by Organized Fossils* (1816-19); *Stratigraphical System of Organized Fossils* (1817); issued between 1819 and 1824 no less than twenty-one colored geological maps of English counties; delivered lectures in most of the provincial towns of England; superintended the model farm of Sir John V. B. Johnstone at Hackness, Yorkshire, 1828-34; received from the Geological Society of London the first Wollaston medal for his important discoveries, and in his later years received a pension of £100 a year. He discovered and was first to apply the principle of the classification and correlation of formations by means of their contained fossils, and has hence been called "the father of English geology." D. at Northampton, Aug. 28, 1839.

Revised by G. K. GILBERT.

Smith, Sir WILLIAM: editor and author; b. in London, England, May 20, 1813; graduated in London University; studied law at Gray's Inn, but never practiced; was for some years Professor of Greek, Latin, and German in the Independent colleges of Highbury and Homerton, and on their consolidation as New College, St. John's Wood, accepted the professorship of the Greek and Latin Languages

and Literature; became classical examiner in the University of London 1858, and editor of *The Quarterly Review* 1867; knighted in 1892. He is widely known by his excellent series of classical dictionaries, having published those upon *Greek and Roman Antiquities* (1840; 2d ed., enlarged and revised, 2 vols., 1891), *Biography and Mythology* (1849), and *Geography* (1852-57), as well as by his *Dictionary of the Bible* (1860-63) and *Dictionary of Christian Antiquities*. He prepared numerous classical schoolbooks, an *English-Latin Dictionary* (1870), a *Biblical and Classical Atlas* (1875), and a series of *Students' Manuals* of ancient and modern history, etc. He was knighted in 1892. D. Oct. 7, 1893.

Revised by A. GUDEMAN.

Smith, WILLIAM ANDREW, D. D.: preacher and educator; b. at Fredericksburg, Va., Nov. 29, 1802; became a preacher of the Methodist Episcopal Church South; in 1846 became president of Randolph-Macon College; in 1866 resigned, and after serving as pastor two years became president of Central College; was a leading member of every General Conference from 1832 to 1866; was appointed at the General Conference of 1866 one of the commissioners on the part of the Southern Church to settle the property question with the Northern Church; wrote *Lectures on the Philosophy and Practice of Slavery* (Richmond, 1860), which may be considered as the fullest and ablest presentation of the proslavery view of the question. D. at Richmond, Va., Mar. 1, 1870.

Revised by A. OSBORN.

Smith, WILLIAM FARRAR: soldier; b. at St. Albans, Vt., Feb. 17, 1824; graduated at the U. S. Military Academy July 1, 1845; appointed brevet second lieutenant of topographical engineers; served as Assistant Professor of Mathematics at West Point, on several surveys, and on lighthouse-construction duty; in July, 1861, was appointed colonel of the Third Vermont, and was engaged in the first battle of Bull Run on the staff of Gen. McDowell. Commissioned brigadier-general of volunteers (Aug. 13), he served in the defenses of Washington until Mar., 1862, and in the Virginia Peninsular campaign of 1862; promoted to be major-general of volunteers July 4, 1862, he led his division in the Maryland campaign, at South Mountain, and Antietam. In Nov., 1862, he was assigned to the command of the Sixth Corps, and engaged at Fredericksburg; transferred to Ninth Corps Feb., 1863. In Oct., 1863, he became chief engineer of the department of the Cumberland and in November of the division of the Mississippi. In Mar., 1864, he was confirmed as major-general of volunteers, and in May assigned to the Eighteenth Corps; on special duty under orders of the Secretary of War Nov., 1864-Dec., 1865. In Nov., 1865, he resigned his volunteer commission, and in Mar., 1867, his commission as major of engineers in the regular army. He was breveted from lieutenant-colonel to major-general; president of the International Telegraph Company 1864-73; appointed police commissioner New York city 1875; president of the board Dec., 1875-Mar., 1881; civil engineer in service of the U. S. since 1881; by act of Congress of Feb., 1889, reappointed major U. S. army, and was retired Mar. 1, 1889.

Smith, WILLIAM LOUGHTON, LL. D.: b. in Charleston, S. C., 1758; educated in England and Switzerland; returned to Charleston in 1783; was a member of Congress 1789-97; an able supporter of the administration of Washington and Adams, and an active opponent of Jefferson, against whom he published a pamphlet; was minister to Portugal 1797-1800, and to Spain 1800-1801. D. in South Carolina in 1812. Author of a volume of *Speeches*, published in London 1794, an *Address* (1794) to his constituents on the difficulties pending with England, a *Comparative View of the Constitutions of the States* (Philadelphia, 1796), and various other political pamphlets.

Smith, WILLIAM ROBERTSON, D. D., LL. D.: theologian and Orientalist; b. at Keig, Aberdeenshire, Scotland, Nov. 8, 1846; studied at Aberdeen, Edinburgh, Bonn, and Göttingen; was appointed Professor of Hebrew in the Free Church College at Aberdeen in 1870; made an extensive journey in Arabia in 1879-80, which he described in a series of exceedingly interesting letters to *The Scotsman*. In 1881 he was removed from his office by an extraordinary act of the General Assembly on account of his critical views of the Old Testament published in the *Encyclopædia Britannica*. In 1883 he was appointed Professor of Arabic in the University of Cambridge; in 1886 librarian to the university, but exchanged the position for the Adams Arabic professorship in 1889, succeeding William Wright. He was associated with

Prof. E. A. Shreve in editing the *Encyclopædia Britannica* from 1881 till Prof. Maynard's death (1891), when he became editor, and edited the work the next year. He was characteristically kind and versatile. D. at Cambridge, Mass., U. 1894. Besides numerous contributions to scientific journals, he published *The Old Testament in the Jewish Church* (Cambridge, 1881); *Israel* (1891); *The Prophets of Israel, and their Place in History in the Close of the Eight Century B. C.* (1891); *Kingship and Marriage in Early Arabia* (1895); *The Religion of the Semites* (1889; new ed. 1894).

Revised by S. M. Jackson.

Smith, Sir William Murray; sailor; b. at Westminster, England, in 1764; entered the navy at the age of twelve as midshipman under Lord Rodney; was captain in the Swedish service in the naval war with Russia, and received a Swedish order of knighthood for gallantry in action; served with distinction under Lord Hood at Toulon Dec., 1793; was taken prisoner by the French at Havre 1796, and confined two years in the Temple, Paris, whence he escaped 1798; was given command of a squadron in Turkish waters the same year, captured a French flotilla at St. Jean d'Acre May 18, and successfully defended that fortress against Napoleon May, 1799; proceeded to Egypt; negotiated the treaty of 42 Arik Jan., 1800; was wounded at the battle of Alexandria 1801; destroyed the Turkish fleet at Abydos 1807; was knighted 1815; became admiral 1821, and lieutenant-general of marines 1830. D. in Paris, May 26, 1840. See his *Life*, by Sir John Barrow (London, 1846).

Smith College: an institution for the higher education of women at Northampton, Hampshire co., Mass. It was founded in 1871 by Miss Sophia Smith, of Hatfield, Mass., who bequeathed funds to furnish women—in her own words—"with means and facilities for education equal to those which are offered in our colleges for young men," with the disinterested purpose that a woman "may be better qualified to enjoy and do well her work in life, whatever that work may be."

Rev. L. Clark Sedgwick, D. D., LL. D., elected in 1879, has been the only president of the college since its foundation. The college was opened for students in 1875, and the first class numbered fourteen. The curriculum comprises three courses—classical, literary, and scientific—each occupying four years. The institution has also schools of music and art, the course in the former requiring three years and in the latter four years for completion. The college is entirely nonsectarian in matriculation and instruction, but students and teachers meet daily for worship, and the study of the Bible is a part of the course. The buildings number eighteen. They comprise College Hall (lectures, hall, lecture-room, reference library, and offices), Little Hall of Science, music hall, Hillyer art gallery (with studies and extensive collection), observatory, botanical plant house, athletic gymnasium (the gift of the graduates), president's house, and two dwelling-houses for students. These buildings are clustered toward the front of the grounds, which stretch a considerable distance in the rear and are ample for outdoor exercise and recreation. The faculty, inclusive of the president, number (1894-95) forty-four; undergraduates, 787.

E. A. Gunsberg.

Smith's Falls: post-village; Laramie County, Ontario, Canada; on Rideau Canal, and on the Canadian Pacific Railway, at the junction of the Perth Branch line map of Ontario, vol. 2-41. The chief industry is the manufacture of axes and agricultural implements. Pop. (1891) 3,364.

Smithson, James; scientist; b. in England about 1765; was a natural son of Hugh Smithson, first Duke of Northumberland; was educated at Oxford, graduating in 1786 under the name of Lewis Mudge; was chosen a fellow of the Royal Society in the following year; devoted himself to science, especially in the fields of chemistry and mineralogy, and published many papers in the scientific periodicals. He was a friend and associate of many of the most learned men of his day, not only in Great Britain, but upon the Continent. He lived usually in Paris, where he was an intimate of Arago, and was a familiar figure in the scientific circles of other European capitals. Sometime between 1791 and 1800 he took the name of Smithson. D. in Genoa, Italy, June 27, 1829. For an account of his magnificent bequest to the U. S. and its employment in the maintenance of a national scientific institute, see *SMITHSONIAN INSTITUTION*.

Smithsonian Institution: an establishment in Washington, D. C., for the advancement of learning under the patronage of the Government of the U. S., organized in 1846. Its founder was James Smithson (see *SMITHSON, JAMES*), whose will was found to contain the following clause in relation to a residuary bequest: "I bequeath the whole of my property to the United States of America, to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." It is almost certain that he knew Joel Barlow in Paris, and very probable that he was familiar with his plan for a realization of Washington's project for a great national institution of learning in the Federal city. The phrase "an institution for the increase and diffusion of knowledge" occurs in Washington's farewell address (Sept. 19, 1796).

In 1835 the U. S. legation in London was notified that his estate, amounting in value to about £100,000, was held in possession of the accountant-general of the British court of chancery.

As soon as the facts became public great opposition to the acceptance of the gift arose in Congress. Radical statesmen, led by Calhoun and Preston, argued that it was beneath the dignity of the U. S. to receive presents, and that the donor was seeking immortality for too moderate an equivalent. The acceptance of the gift was ardently advocated by others under the leadership of ex-President John Quincy Adams. Richard Rush was finally appointed agent



Smithsonian Institution, Washington, D. C.

to promote the claim. He proceeded to London, entered suit in the court of chancery in the name of the President of the U. S., and, owing to the generous tolerance of the British authorities, brought the matter to a conclusion in less than two years. The decision was favorable. The legacy was received by Mr. Rush in the form of 104,960 sovereigns, which were delivered by him Sept. 1, 1838, to the Philadelphia mint, and immediately received into U. S. money, producing \$508,318.46, the first installment of the legacy. This

was soon after increased to \$515,169, and in 1867 by a residuary legacy of \$26,210.63 to \$541,379.63, the total sum derived from the founder's beneficence, which by careful management had been in 1867 increased to \$650,000. At one time in the early history of the institution a large portion of its fund was in certain State bonds which became worthless: Congress appropriated money to make good the loss, and the permanent fund is held as a deposit at 6 per cent. in the U. S. treasury.

During the eight years that passed before any use was made of the money public opinion had an opportunity to shape itself, and the organization in Washington in 1840 of the National Institution (afterward the National Institute), which was intended by its promoters to become the nucleus for the development of Smithsonian's idea, gave opportunity for much experimental study in administration. The National Institute, which was for two or three years the largest and most active scientific society on the continent, developed many features which were ultimately adopted for the Smithsonian Institution and experimentally demonstrated that others were impracticable. It languished and died soon after the organization of the Smithsonian Institution, which it had hoped to incorporate with itself.

Administration.—The Smithsonian Institution was formally established by the act of Congress approved Aug. 10, 1846. As defined in the act of establishment it is composed of the President of the U. S., who is presiding officer *ex officio*, the Vice-President, the members of the cabinet, and the chief justice, and the "establishment" thus constituted is made responsible for the duty of "the increase and diffusion of knowledge among men."

In addition to the "establishment" the act provides for a "board of regents," by whom the business of the institution is administered, and which is composed of the President of the U. S., the chief justice of the Supreme Court, three members of the Senate, three members of the House of Representatives, and six citizens appointed by joint resolution of the Senate and House of Representatives, no two of whom may be from the same State, though two must be residents of the District of Columbia.

The presiding officer of the regents is the Chancellor, whom they elect from their own number. This position is customarily held by the Chief Justice. The executive officer is the secretary of the institution, who is also elected by the regents. The duties and responsibilities of the secretary are such as in other institutions usually belong to the office of director, but the name of "secretary" is that which in Washington designates the highest grades of executive responsibility. The secretary makes all appointments on the staff of the institution, is responsible for the expenditure and disbursement of all funds, is the legal custodian of all its property, and *ex officio* its librarian and the keeper of its museum. He presents to the regents an annual report upon the operations, expenditures, and conditions of the establishment, which is transmitted by the board to Congress for publication. By special act of Congress of 1884 an acting secretary is provided in case of the absence or disability of the secretary, the designation being left with the chancellor of the institution. There is at present but one assistant secretary, who is in charge of the National Museum.

The annual meeting of the regents is held in January; their executive committee of three members meets quarterly.

The first meeting of the board of regents took place Sept. 7, 1846, and before the end of the year the policy of the regents was practically determined upon, for, after deciding upon the plan of the building now occupied, they elected to the secretaryship Prof. Joseph Henry, and thus approved his plan for the organization of the institution which had already been submitted to them. Eminent alike as a man of science and an administrator, Henry for more than thirty years directed the activities of the organization.

Objects of the Institution.—These as defined by Henry are, first, to increase knowledge by original investigations and study either in science or literature; and, second, to diffuse knowledge not only through the U. S., but everywhere, and especially by promoting an interchange of thought among those prominent in learning in all nations. No restriction is made in favor of any one branch of knowledge.

The leading features of the plan of Prof. Henry were, in his own words, "to assist men of science in making original researches, to publish them in a series of volumes, and to give a copy of them to every first-class library on the face of the earth." Probably there is not a scientific investigator in the U. S. to whom a helping hand has not at some

time been extended by the institution, and the hand has often reached across the Atlantic. Books, apparatus, and laboratory accommodation have been supplied to thousands, and each year a certain number of money grants have been made. Not less important has been the personal encouragement afforded and advice given in the tens of thousands of replies written each year in response to inquiries.

Publications.—The publications of the establishment, which are regularly distributed to about 4,000 institutions, are as numerous as those of a great publishing-house, and are practically all given away. In addition to the annual report, which contains in its appendix articles of popular interest in regard to scientific progress, there are two series printed at the cost of the Smithsonian fund: (1) *The Smithsonian Contributions to Knowledge*, 28 volumes in quarto containing nearly 15,000 pages and many fine plates. (2) *The Smithsonian Miscellaneous Collections*, in 35 octavo volumes, aggregating about 22,000 pages. Besides these there are the series of *Bulletins* of the National Museum, 50 in number, beginning in 1875; the *Proceedings* of the National Museum, including already 1,100 separate papers, embraced in 17 annual volumes, beginning with 1878; the *Annual Reports* of the Bureau of Ethnology, beginning in 1879 and forming a series of 12 illustrated volumes in royal octavo; and the *Bulletin* of the bureau, of which 26 numbers have appeared. The value of the books distributed since the institution was opened can not be much less than \$1,000,000, estimating at standard publishers' rates.

In return for its own publications, and by purchase, the institution has received the great collection of books which form its library, and which is one of the richest in the world in the publications of learned societies. This includes more than 300,000 titles, the greater portion of which, by permission of Congress, have been placed in the National Library at the Capitol, where they are kept by themselves as the Smithsonian Deposit. The working libraries of the National Museum and the Bureau of Ethnology are distinct from the general Smithsonian Library, and separately administered.

System of Exchanges.—The Smithsonian system of international exchanges, begun in 1852, had for its object the free interchange of scientific material between scientific institutions and investigators in the U. S. and those in foreign lands, and its results have affected beneficially the libraries of most of the learned institutions in America. In 1867 Congress assigned to the institution the duty of exchanging fifty copies of all public documents for similar works published in foreign countries. Finally, in 1882 a definite treaty, made previously at Brussels, was formally proclaimed by the President of the U. S., wherein the U. S. Government, with a number of others, undertook the continuation of the exchange service on a more extensive basis. Out of this has grown the Bureau of International Exchanges, for the maintenance of which Congress partially provides by annual appropriation. From 1852 to 1893 the Smithsonian exchange service handled 1,175,000 packages. The number of correspondents upon its lists is about 24,000.

The National Museum.—The Smithsonian is by law the custodian of the National Museum, of which the secretary of the institution is the legal keeper. This museum is supported entirely by the Government, but previously part of its maintenance was from the Smithsonian fund. It is the only lawful place of deposit of "all objects of art and of foreign and curious research, and all objects of natural history, plants, and geological and mineralogical specimens, belonging, or hereafter to belong, to the U. S., which may be in the city of Washington in whosever custody." The nucleus of these collections consists in the specimens brought home by the Wilkes and other early exploring expeditions, but for many years the museum was supported entirely at the expense of the Smithsonian fund, and a considerable portion of the collections is the property of the institution. See NATIONAL MUSEUM OF THE UNITED STATES.

Bureau of Ethnology.—The Bureau of American Ethnology is an outgrowth of activities begun in the early days of the history of the institution, and has for its object the investigation of the languages, habits, customs, and classification of the North American Indians. In 1879 a special appropriation was made by Congress for this work, which is (1895) still in progress under the direction of Maj. John W. Powell, who has been the director of the bureau from the start. With the aid of a well-trained staff, he has rescued from destruction a vast amount of important material in regard to the early inhabitants of the continent, priceless

not only in studies of American ethnology, but in the study of mankind as a whole.

Astrophysical Observatory.—Under the immediate direction of the present secretary an astrophysical observatory has been established, in which important investigations upon the constitution of the sun are being carried on.

The National Zoological Park established by Congress in 1891, under the direction of the institution, occupies a tract of 196 acres on Rock Creek, 2 miles N. of the center of the city. The grounds are nearly twice as extensive as those of any other zoological park, and are possessed of admirable natural advantages, but the appropriations for the development of the park have not been sufficient to allow of any satisfactory progress.

The American Historical Association is by law affiliated with this institution, and transmits its annual reports to Congress through the secretary.

The institution supports a table at the International Zoological Station in Naples for the benefit of American naturalists.

An important feature of the institution's work has been its participation in the various expeditions. It was represented at Philadelphia in 1876, Berlin 1880, London 1893, New Orleans 1895, Cincinnati 1899, Madrid 1902, and Chicago 1904, and on each occasion received awards of the most commendatory nature.

There is an assembly hall in the museum building, in which meetings of scientific bodies of national scope are held. There the National Academy of Sciences holds its annual meeting every April, and the American Historical Association its December meeting. Here also each year a course of popular scientific lectures is delivered under direction of the scientific societies of Washington.

The office of secretary has been held by three men: Joseph Henry, elected in 1846, Spencer Fullerton Baird, in 1877, and Samuel Pierpont Langley, in 1888. Each in addition to his general administrative work in the institution has made some feature of the general plan peculiarly his own. Secretary Henry, besides establishing the general policy of, gave special attention to, the publications, the system of international exchanges, the library, and the development of that great system of meteorological observation and another prediction which has since been transferred to another department of the Government, and now constitutes the Weather Bureau.

Secretary Baird continued the development of the museum, which had been under his special charge during his twenty-seven years of service as assistant secretary, secured the erection of the new museum building, gave much attention to explorations, and carried on, in connection with his special work as U. S. commissioner of fisheries, a most extensive biological investigation of the waters of North America.

To Secretary Langley is due the establishment of the National Zoological Park, and of the astrophysical observatory, and a new system of encouragement of original research in the physical as well as in the biological sciences. Under his administration also important donations and bequests have been added to the permanent fund of the institution. The limit of \$1,000,000, which may by law be permanently deposited in the U. S. treasury at 6 per cent., has nearly been reached, and Congress has recognized the authority of the institution to receive and administer other funds, beyond the above-named limit, thus making it possible for it to undertake the administration of financial trusts for any purpose within the scope of its general plan, preserving in connection with each fund the name of the person by whom it was established. This privilege has already been accepted by several benefactors. The Hodgkins fund, derived from the gift of Thomas H. Hodgkins, is being thus administered, in addition to the Hodgkins medal, which is to be awarded from time to time for important discoveries in regard to atmospheric air. The Avery fund, the bequest of Robert P. Avery, provides for special investigations in the fields of acoustics, electricity, etc.

Buildings.—The building occupied by the institution and bearing its name is an ornate structure of Seneca brownstone, occupying a prominent place in the Mall which extends from the Capitol to the Washington Monument—in a square known as the Smithsonian Grounds. It was planned by James Renwick, Jr., and was in construction from 1847 to 1855. The temporary wooden structure occupied by the astrophysical observatory stands in the rear of the Smithsonian building, and the National Museum building, of brick,

225 feet square, is at its eastern end. The Herbarium of Botany occupies rented quarters in the city, and the offices of the Zoological Park are in the park grounds.

14. *Barro Colorado.*

Smithsonite (the mineral *zinc carbonate* ($ZnCO_3$), named after Smithson, who was the founder of the Smithsonian Institution. It crystallizes in rhombohedrons of glassy luster, white when pure, with the hardness of apatite, and denser when pure and normal = 4.451 at 0°; Nannum and Lavy both give 4.45. Smithsonite occurs in the U. S., abundantly at Lancaster, Pa., near Bethlehem, Pa., and at the Perkiomen lead mine.

Smith-Stanley, Edward Geoffrey. See DEERY.

Smoke (O. *fog*, *smog*; Dutch, *smook*; Germ., *schmuck*; Pers., *ab. az. az. az. az.*, smolder); the product of an imperfect combustion. If coal, which is chiefly composed of carbon, hydrogen, nitrogen, and oxygen, be burned perfectly, the result will be carbonic acid, steam, and nitrogen, which substances will escape through the chimney-top and blend with the atmosphere under the form of invisible and incombustible gases and vapor. But as the combustion of coal in the way in which it is generally burned is very imperfect, inflammable gases and vapors and large quantities of fine particles of carbon issue together with the above substances, form soot and black and brown smoke, contaminate the air, and cause a considerable loss of fuel. As coal-smoke is a great nuisance, and in large towns and manufacturing districts even a serious evil, much attention has been paid to the matter of burning it. This is attended with great practical difficulties, arising from the necessity of preventing the smoke from cooling and of supplying the combustible gases and vapors with the necessary amount of oxygen in order to make them burn with flame; but these difficulties are nevertheless not greater than may be generally overcome, as they have been in many single cases. See *Combustion*.

Smokeless Powders: explosives acting without the production of smoke. They may be divided into three classes: 1. Those composed of cellulose nitrate, either the insoluble or soluble variety, or both. 2. Those composed of the constituents of 1 mixed with nitroglycerin or other organic nitrates. 3. Those composed of the constituents of 1 mixed with nitro-derivatives of hydrocarbons, such as picric acid and the picrates. Each of these varieties may contain oxidizing agents like barium or potassium nitrate and retarding agents such as tannin or lysosodium.

Among the best-known and most successful of these powders are of the first class indurite, used by the U. S. navy, and B. N., used by the French; of the second class ballistite, used by the Italians, and cordite, used by the British; and of the third class Peyton powder.

These powders are more or less smokeless because the products of their combustion are wholly gaseous, whereas 55 per cent. of the products of the combustion of ordinary gunpowder is finely divided solids. This property of smokelessness is the feature of these powders which has attracted the widest popular attention; but though it is a desirable property, and one which has modified strategy and tactics, the most valuable property common to these powders is the high velocities which they impart to projectiles and which greatly exceed those which it is possible to secure with black gunpowder.

In order not to endanger the gun it is essential that the pressure developed by the burning powder shall be within prescribed limits. The best powder is that one which gives the maximum initial velocity with the minimum chamber pressure; which gives uniform results when used under uniform conditions; and which undergoes no change, either chemical or physical, under the exposure incident to the military and naval service. The best record thus far reported for any powder is from the firing trials of indurite made at Indian Head proving-ground, Maryland, when 26 lb. of this powder, fired in the 6-inch service-gun, imparted to a 100-lb. projectile an initial velocity of 2,460 feet per second, while it exerted but 18,900 tons pressure on the gun. Repeated rounds gave remarkably uniform results. See *Explosives*.

CHARLES E. MURRAY.

Smolensk: government of European Russia, S. W. of Moscow, and traversed by the Dvina, which runs to the Gulf of Riga, and the Dnieper, which flows to the Black Sea. Area, 21,638 sq. miles, consisting generally of extensive plains interspersed with morasses. The climate is cold, but healthful; the soil is fertile and well cultivated, yielding

large crops of rye, the principal product, and of hemp and flax. Tobacco and hops are also cultivated. On its extensive pastures large numbers of fine cattle are raised, while its vast forests, abounding with game, furnish a large amount of valuable timber. Much attention was formerly paid to the raising of bees, and honey and wax were exported. Copper, iron, and salt are found in considerable quantities. Its manufactures are unimportant. Pop. (1891) 1,412,162.

Smolensk: town; capital of the government of Smolensk, Russia; on the Dnieper; 250 miles W. S. W. of Moscow (see map of Russia, ref. 7-D). It is surrounded by massive walls, that are rapidly falling into decay, and has a magnificent cathedral, an episcopal palace, monasteries, several good educational institutions, including a military school, manufactures of linen, carpets, leather, and soap, and a considerable export trade in grain and flax. Pop. (1891) 38,084.

Smollett, Tobias George: novelist; b. at Dalquhurn House, Cardross, Scotland, in 1721; lost his father in early childhood; was educated at Dumbarton school by the care of his grandfather, Sir James Smollett, of Bonhill, a member of the Scottish Parliament; studied also at Glasgow, where he served an apprenticeship to a surgeon; went to London at the age of nineteen, carrying a tragedy entitled *The Regicide*, which he unsuccessfully offered to the theatrical managers; accepted the position of surgeon's mate in the navy; participated in the unfortunate expedition against Cartagena 1741; resided for some time in Jamaica; returned to England 1746; married in 1747, Miss Anne Lascelles, whom he had known in Jamaica; published in 1748 with great success his first novel, *The Adventures of Roderick Random*, in which he made good use of his West Indian experiences; visited Paris 1750; published *The Adventures of Peregrine Pickle* (4 vols., 1751); after endeavoring to obtain medical practice at Bath, settled at Chelsea 1753, in which year he wrote *The Adventures of Ferdinand, Count Fathom*; published a translation of *Don Quixote* (1755); issued *A Compendium of Authentic and Entertaining Travels* (7 vols., 1757), in which he embodied his own experiences at Cartagena; edited for some time a Tory organ, *The Critical Review*; was fined and imprisoned three months for a libel on Admiral Knowles (1759); wrote in fourteen months a *Complete History of England, deduced from the Descent of Julius Caesar to the Treaty of Aix-la-Chapelle* (4 vols., 1757-58), to which he subsequently added a *Continuation from 1748 to 1760* (4 vols., 1763), of which the later volumes have been often reprinted as a supplement to Hume; translated *Gil Blas* (4 vols., 1761); wrote in prison his *Adventures of Sir Launcelot Greaves* (1762); edited *The Briton*, a newspaper in defense of Lord Bute (1762-63); aided Thomas Franklin and other writers in bringing out a translation of the *Works of Voltaire* (37 vols., 1761-70); made a journey through France and Italy 1763-66, which furnished materials for a work of *Travels* (2 vols., 1766); satirized Bute and the elder Pitt in his *Adventures of an Atom* (1769); went for his health to Italy 1769, and wrote on the journey *The Expedition of Humphrey Clinker* (3 vols., 1771), his best novel. D. at Monte Novo, near Leghorn, Italy, Sept. 17, 1771. Smollett ranks with Richardson and Fielding as one of the standard novelists of the eighteenth century, founders of the English school of prose fiction. He was greatly influenced by Cervantes, Le Sage, and the whole group of Spanish "rogue" or *picaro* novelists. His stories are narratives of low life, travel, and broadly comic adventure, vigorous and racy, but coarse to the verge of brutality. In the persons of Commodore Trunnion, Jack Rattlin, Tom Bowling, and other nautical characters he introduced into fiction the now familiar figure of the British tar. Many complete editions of his novels and poems have been published. Biographies were written by Dr. Robert Anderson (1796), Dr. John More (1797), Thomas Roscoe (London, 1840; New York, 1857), and D. Hannay (Great Writers' Series, 1887).

Smolt: See SALMON.

Smuggling [like Germ. *schmuggeln*, from Low Germ. *smuggeln*; connected with root *smug-* of Germ. *schmiegen*, smuggle up to, and O. Eng. *smigan*, creep]: the (statutory) offense either of bringing into a country articles entirely prohibited, or of defrauding the customs revenue by secretly importing goods upon which duties are laid without paying such duties or without paying the full amount required by law. In Great Britain the offense includes the exporting of goods with like intent, and (as often defined) the introduction of any articles into consumption without paying the

duties chargeable upon them. As the whole subject of the customs revenue is the creature of statute, the offenses which consist in its evasion or violation are also of a statutory origin. In Great Britain and Ireland smuggling is especially restrained by the Customs Laws Consolidation Act of 1875 (39 and 40 Vict., c. 36).

Smuggling in the U. S.—In the U. S. the regulation of this offense belongs exclusively to the jurisdiction of the national legislature and judiciary, being included in the power of Congress to regulate all foreign commerce. The body of the existing law is contained in the *Rev. Stat. of the United States*, especially in tit. xxiv., chap. 10, §§ 3035 to 3094 (although some provisions are scattered through other chapters relating to the imposition and collection of duties), and in the *Supp. of the Rev. Stat. of the United States*, p. 32, seq., where smuggling is defined as "the act, with intent to defraud, of bringing into the United States, or, with like intent, attempting to bring into the United States, dutiable articles without passing the same, or the package containing the same, through the custom-house, or submitting them to the officers of the revenue for examination."

Penalties.—The following penalties may be enforced for various acts which are collectively embraced in the general description of smuggling: (1) The guilty person is liable to a fine of not more than \$5,000 and not less than \$50, or to imprisonment for not more than two years, or to both. (2) The goods fraudulently introduced or attempted to be introduced are to be seized, and, if condemned by the court, are to be forfeited and sold. (3) The vessel in which the goods are thus imported may be likewise seized, condemned, and forfeited if the owner or managing agent was consenting to and guilty of the offense. (4) Any vehicle, conveyance, team, boat, etc., by means of which goods are wrongfully brought into the country by land may also be seized and forfeited; but no such conveyances belonging to and used by common carriers, whether persons or corporations, are liable to forfeiture unless the owner, superintendent, or agent in charge is consenting or privy to the illegal importation. (5) Various pecuniary penalties may be visited upon the owners or masters of vessels for certain specific violations of the law, such as resisting or hindering the revenue officers and the like; which penalties are made liens upon, and may be summarily enforced against, the vessels themselves. Cases involving any of the foregoing forfeitures or pecuniary fines are reported to the proper U. S. district-attorney, and it is his duty to prosecute the delinquent or to procure a condemnation of the property in the national courts.

Detection of Smuggling.—The customs officers are clothed with very large powers in order to detect and punish any fraudulent importation or concealment, or failure to pay the full duties required by the law. They may board and search all vessels lying in port, and all those bound to the U. S. while not more than 4 leagues from the coast. They may also search all persons coming into the country, all trunks, boxes, or other baggage, papers, envelopes, all conveyances and means of transport, stores, warehouses, and other buildings—in short, all places or things where the goods themselves or the evidence of their wrongful importation may possibly be concealed. Finally, by means of an order of the court they may obtain an inspection of the books of account and business papers of merchants and others suspected of or charged with the wrongful non-payment of duties. When the property seized is condemned and sold, the proceeds, after paying the costs and expenses, are distributed, part to the U. S., part to the principal customs officers of the district, and part to the informer if there was any distinct from the officer himself who detected the offense and procured the seizure.

Revised by F. STURGES ALLEN.

Smuts [: Germ. *schmutz*, dirt; Dutch, *smet*]: the *Ustilaginæ*, an order of minute parasitic fungi principally attacking the higher plants, and often producing serious injuries to farm and garden crops (Fig. 1). In some portions of England they are known as dust-brands. They consist of slender, branching, colorless threads, which grow through the tissues of their hosts, following the intercellular spaces, or actually penetrating and even filling the cell-cavities. After a period of growth, the threads produce spores in great numbers, forming dark, dusty masses, which have suggested the popular name of these organisms.

No sexual organs are known in any of the smuts, and it is probable that in this group of plants the structural degradation due to excessive parasitism is so great that these organs have been lost. This degradation is shown in the soft-

walled cells composing the filaments, and also in the distorted and irregular spore-bearing masses (Fig. 2) which may be



FIG. 1.—Smut on Indian corn, reduced one-half.

regarded as crushed and distorted spore-sacs (asci). The spores arise within these crushed masses as rounded bodies,

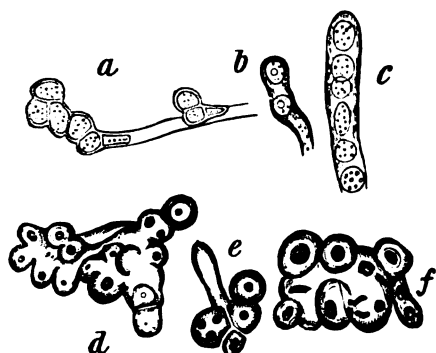


FIG. 2.—Formation of spores: a b c, in *Ustilago maydis*; d e, *U. antherarum*; f, *U. flosculosorum*, magnified 900 times.

which soon acquire a dark-colored, thick, smooth, or rough-walled. At maturity the spores are set free by the deliquescence of the cell-walls of the spore-bearing masses. In a few cases the spores are borne singly, and rarely they appear to be in little distorted ascus-like cells (Fig. 2, c).

The production of spores usually takes place in those parts of the parasite which have penetrated the flowering or fruiting portions of the host, and which as a consequence are generally much distorted (Fig. 1). The spores are distributed by winds, after the rupture of the epidermis of the host and the escape of the surplus moisture.

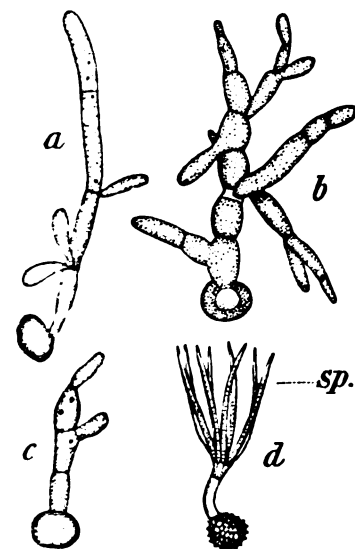


FIG. 3.—Germination of smut spores: a, *Ustilago avenae*, $\times 1,000$; b, *U. tritici*, $\times 500$; c, *U. hordei*, $\times 700$; d, *Tilletia tritici*; sp., the sporidia, $\times 200$.

minute spores (the sporidia), which are so minute that they may readily be dispersed by the wind. The parasite gains

access to the embryo host plant by penetrating the tender walls of the epidermal cells, and it appears that in many, if not all, cases it is impossible for such penetration to take place when the host has made a considerable growth.

The smuts are divided by Schroeter into two families, as follows:

I. *Ustilaginaceae*, with septate promycelium, bearing lateral sporidia. About 150 species, nearly all of which (143) belong to the genus *Ustilago*.

WHEAT SMUT (*U. tritici*), called also the "loose smut" of wheat, injures the heads of unripe wheat by destroying the kernels, and turning them into black dusty masses of spores (Fig. 4). The spores are very small (about 5.5 by 6.5μ), ovoid or elliptical, and minutely verruculose.

OAT SMUT (*U. avenae*) affects unripe heads of the cultivated oat, destroying them before the ripening of the crop. The spores are larger than the preceding (about 7μ or 8.5 by 8μ), globose or ovoid, and faintly verruculose.

BARLEY SMUT (*U. hordei*) likewise destroys the unripe heads of barley. The spores are nearly of the same size as in the oat smut (about 7μ), globose and smooth.

The three foregoing species have generally been confounded under the name of *U. carbo*, or *U. segetum*, but investigations by Jensen, confirmed by Kellerman, prove them to be distinct. These experimenters have found that these smuts may be greatly reduced by immersing the grains for eight to fifteen minutes in water heated to 56°C . (133°F .), then drying before sowing.

MAIZE SMUT (*U. maydis*) is parasitic upon Indian corn, causing swellings and distortions of the kernels (Fig. 1), and sometimes, also, similarly affecting the staminate flowers, and even the leaves and stems. The spores are large (8 to 13μ), globose and echinulate.

Other species occur on sorghum (*U. sorghi*), foxtail grass (*U. neglecta*), and many other grasses, sedges, knot-weeds, etc.

II. *Tilletiaceae*, with non-septate promycelium, bearing terminal sporidia. About 170 species, distributed among 9 genera, of which the principal are *Tilletia* (33 species), *Entyloma* (41), *Urocystis* (27), *Thecaphora* (18), *Sorosporium* (23).

BUNT, or STINKING SMUT (*Tilletia tritici* and *T. foetens*).—These two species, which differ in the first having reticulated spores and the second smooth ones, are parasitic upon wheat, filling the kernels at maturity with a mass of closely packed, fetid spores (Fig. 5). Both are common in the U. S., Europe, and most other wheat-growing countries. Bunt may be prevented by the hot-water treatment referred to above.

ONION SMUT (*Urocystis cepulae*) attacks the leaves of cultivated onions, often seriously damaging the crop in the eastern parts of the U. S.

LITERATURE.—In addition to the standard works on fungi, the reader is referred to the following: J. B. de Toni, *Ustilaginaceae*, in Saccardo's *Sylloge Fungorum*, vol. vii. (1888);



FIG. 4.—Head of wheat affected by *U. tritici*, reduced to one-half natural size.

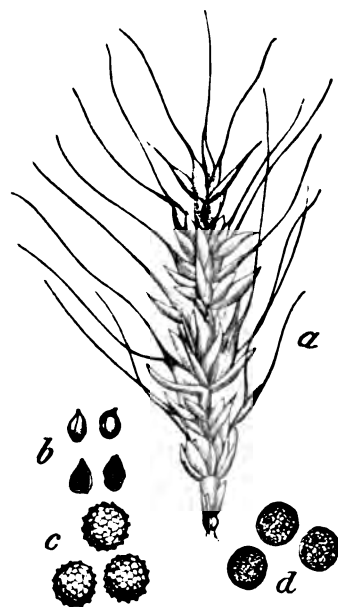


FIG. 5.—a, head of wheat affected with bunt; b, kernels filled with spores, \times one-half; c, spores of *T. tritici*, $\times 200$; d, spores of *T. foetens*, $\times 200$.

J. Schroeter, *Die Pilze Schlesiens* (1889); C. B. Plowright, *A Monograph of the British Uredineæ and Ustilagineæ* (1889); Kellerman and Swingle, *Report on the Loose Smut of Cereals, in Second Annual Report of the Experiment Station of the Kansas Agricultural College* (1889).

CHARLES E. BESSEY.

Smyrna [= Lat. = Gr. *Σμύρνα*, myrrh]: city; in the vilayet of Aidin, Asia Minor; in lat. 38° 25' N. and lon. 24° 50' E., at the eastern extremity of the Gulf of Smyrna (see map of Turkey, ref. 5-D). It presents a magnificent appearance as seen from the water, spreading along the bay and up the slope of Mt. Pagus. A fine quay over 3 miles in length, along which the tramway runs, lines the shore, and in front is a spacious and sheltered harbor. Were it not for the hundreds of camels constantly traversing the quay, Smyrna with its modern edifices would be taken at first glance for a city of Western Europe. It still justifies its poetical names of Crown of Ionia, Eye of Anatolia, Pearl of the East. The slow deposits of the river Hermus and the quantities of rubbish thrown into the water threaten its existence as a port.

Its origin is lost in myths. According to tradition, Tantalus, about 1500 B. C., was its founder. Its name is said to be derived from Smyrne, the Amazon, the wife of Theseus. Colonized by the Greeks soon after the Trojan war, it was constantly fought over by the Æolians and the Ionians, and ultimately remained in the possession of the latter. Taken and dismantled by Alyattes, King of Sardis (628 B. C.), it was rebuilt according to the order of Alexander the Great by Antigonus and Lysimachus. It rapidly developed, and has since that time been the chief commercial city of Asia Minor. Here was one of the Apocalyptic churches. Captured by the Seljuk pirate Tzachas (1080), Smyrna suffered greatly, but was soon retaken by the Greeks. The Seljuk prince of Aidin conquered it (1313), but a crusading fleet drove out the Moslems. The Roman Catholic faith was introduced in 1346, and the city has contained ever since many members of that communion. Tamerlane, after defeating Bayezid I. at Angora (1401), filled up the port, carried the place by storm and butchered the inhabitants. Since 1424, when it was conquered by Murad II., it has remained in the undisturbed possession of the Ottomans save that it was sacked by the Venetians in 1473. The site of the city, though always near the bay, has changed many times. Smyrna has often suffered from earthquakes, notably in 177 (after which it was rebuilt by Marcus Aurelius), 1688, 1778, and 1880; and from plague, as in 1812 and 1837.

The streets run generally parallel with or at right angles to the shore. The houses are built of wooden beams encased in stone, as safer in fire and earthquake. There are several free hospitals, each prominent nationality having its own, and numerous churches of the leading Christian faiths, as well as a synagogue and several mosques. The schools are excellent, especially those maintained by the Roman Catholic and Protestant missionaries. Educational advantages are nowhere greater in the Ottoman empire. Six newspapers are published. Smyrna is the western terminus of the great inland commercial routes and of two railways that run eastward into the interior of Asia Minor. It is the chief mart for European commerce in Anatolia. The principal imports are sugar, coffee, cotton, silk and woolen goods, worked leather, nails, machinery, earthenware, building-stone, lumber, cordage, etc.; the exports, dried fruits, raw silk and cotton, opium, wheat, rice, valonia, oil, sesame, goatskins, carpets, wax, emery, cheese, beans, bones, mohair, etc. The exports average about \$20,000,000 annually in value, and the imports about \$15,000,000.

Smyrna possesses some remarkable ruins, as the Genoese castle on the summit of Mt. Pagus, the theater lower down, the stadium and scant remains of the temple of Diana. Pop. (estimated 1893) 225,000, of which about half are Greeks, the rest being Turks, Armenians, Europeans, and Jews. The Levantines, offspring of marriages between Europeans and natives, are numerous. E. A. GROSVENOR.

Smyrna: town; Kent co., Del.; on Duck creek, and the Phila., Wil. and Balt. Railroad; 36 miles S. W. of Wilmington, 60 miles S. of Philadelphia (for location, see map of Delaware, ref. 4-N). It is in an agricultural and fruit-growing region; is engaged in ship-building and the manufacture of agricultural implements, fruit-baskets, sashes, doors, and other articles; and contains a public high school, two national banks, and a weekly paper. Pop. (1880) 2,423; (1890) 2,455.

Smyth, CHARLES PIAZZI, LL. D.: son of Admiral W. H. Smyth; astronomer; b. in Naples in 1819; was employed for some time under Sir T. Maclear in the observatory of the Cape of Good Hope; was appointed royal astronomer for Scotland in 1845, which position he resigned in 1868; made a valuable series of observations from the Peak of Teneriffe 1856; published *Teneriffe, an Astronomer's Experiment, or Specialties of a Residence above the Clouds* (1858); in 1859 visited the Russian observatories (see his *Three Cities in Russia*, 2 vols., 1862), and made a thorough examination of the Great Pyramid of Egypt, which he considers to have been built under divine inspiration as a standard of a system of weights and measures. This theory is set forth and defended in three works—*Our Inheritance in the Great Pyramid* (1864), *Life and Work at the Great Pyramid* (3 vols., 1867), and *Antiquity of Intellectual Man* (1868). He composed a comprehensive star catalogue and ephemeris of selected observations of the same stars, published in the Edinburgh Observatory's publications (1877-86).

Smyth, EGBERT COFFIN, D. D.: educator; son of Rev. William Smyth (1797-1868), Professor of Mathematics at Bowdoin College; b. at Brunswick, Me., Aug. 24, 1829; graduated at Bowdoin College 1848, and at Bangor Theological Seminary 1853. In 1854 he was made Professor of Rhetoric and Oratory in Bowdoin College; in 1856 he succeeded Rev. Dr. Roswell D. Hitchcock as Professor of Natural and Revealed Religion in the same institution; and in 1863 was appointed Professor of Ecclesiastical History in Andover Theological Seminary. Since 1878 he has been president of the faculty there. He is one of the board of trustees of Bowdoin College, and was for a number of years a member of the prudential committee of the American Board of Commissioners for Foreign Missions. He translated (with Prof. W. L. Ropes) Uhlhorn's *Conflict of Christianity with Heathenism* (1879), has published many addresses, sermons, and scholarly articles, and was one of the founders and editors of *The Andover Review*. Revised by G. P. FISHER.

Smyth, HERBERT WEIR: Greek scholar; b. at Wilmington, Del., Aug. 8, 1857; A. B., Harvard, 1878; Ph. D., Göttingen, 1884; instructor in Williams College 1883-85; in Johns Hopkins University 1885-88; appointed Professor of Greek in Bryn Mawr College 1888; secretary of American Philological Association. He has published *Der Diphthong EI im Griech.* (1884); *Sounds and Inflections of the Greek Dialects*, vol. i., *Ionian* (1894); and various papers on philological subjects in *The American Journal of Philology*, *Transactions of the American Philological Association*, and *The Classical Review*. C. H. THURBER.

Smyth, JOHN: clergyman; b. in England about 1552; graduated at Cambridge 1575; became a fellow; took orders in the Church of England; was reprov'd by the heads of the university in 1586 for having advocated a Judaic observance of Sunday, but persisted in his teachings; connected himself with the Puritans; was minister at Gainsborough to a congregation with which he emigrated to Amsterdam in 1606; was converted to Baptist principles by Mennonite theologians; caused an Anabaptist separation among the Puritan refugees in Holland, and maintained controversies with Ainsworth, Robinson, and others. D. at Amsterdam in Aug., 1612. He was the author of *A True Description of the Visible Church* (1589); *The Difference of the Churches of the Separation* (1608); *Parallels, Censures, Observations*, etc. (1609); *The Character of the Beast*, etc. (1609); and a *Declaration of the Faith of the English People remaining at Amsterdam* (1611), etc.

Revised by W. H. WHITSITT.

Smyth, NEWMAN, D. D.: brother of Egbert Coffin Smyth; b. at Brunswick, Me., June 25, 1843; graduated at Bowdoin College 1863, and at Andover Seminary 1867; was acting pastor in Providence, R. I., 1868; was in Europe 1868-69; was pastor of the First Congregational church in Bangor, Me., 1870-75, of the First Presbyterian church in Quincy, Ill., 1876-82, and in 1882 became pastor of the First church (Congregational) in New Haven, Conn. He was assistant teacher in the Naval Academy in Newport immediately after his graduation, and was first lieutenant of the Sixteenth Regiment of Maine Volunteers in the last year of the civil war. He has published *The Religious Feeling* (1877); *Our Faiths in New Light* (1877; revised ed. 1887); *The Orthodox Theology of To-day* (1881); *Doerner on the Future* (1883); *The Reality of Faith* (1884)—a series of sermons; *Personal Creeds*, etc. (1890); *Christian Ethics* (1892); and various articles in reviews. Revised by G. P. FISHER.

Smyth, William Henry: sailor and hydrographer; b. at Westminster, England, Jan. 21, 1789; entered the navy in 1804; made surveys of Smyth, the shores of the Adriatic, and Sicily; became rear-admiral in 1833 and hydrographer to the admiralty in 1837. Author of *The Mediterranean* (1854). D. near Aylesbury, England, Sept. 5, 1865.

Snail (O. Eng. *snigel*; Lat. *snigall*; Ital. *sterni*; *schnecke*; cf. Germ. *schnecke*, snail < *sneton*, *snoup*, *snaw*): a name given to the terrestrial shell-bearing gastropod molluscs generally, and frequently extended to the similar forms inhabiting the waters. The terrestrial snails are divided into three subgenera—viz.: (1) *Pulmonata* (q. v.), including the terrestrial forms as well as allied forms living in the water, and also the slug; (2) *orbiculi* (pneumogone forms of *orbiculidae*, *orbiculidae*, etc.) which are closely allied to the aquatic *orbiculidae*; and (3) other *orbiculidae* (q. v.) (*orbiculidae*, *orbiculidae*, etc.) which are representatives of another group, the *orbiculidae*. It is thus seen that the form of the shell and even the presence or absence of a shell are of very inferior systematic significance, and entirely subservient to differences in structure of the animal. These differences are chiefly exhibited by the modification of the nervous system, the heart, the distribution of the visceral ridges, and the organs of generation. See, further, *GASTROPODA*. Revised by J. S. KINGSLEY.

Snake-bird: See *DAVIDIA*.

Snake-bites: See *POISONS OF SERPENTS*.

Snake-eels: marine eels constituting the genus *Ophichthus*, allied to the common eel, but found only in warm latitudes. They are remarkable for the absence of the caudal fin, the end of the tail being much like that of a snake.

Snakefish: a name given on some parts of the English coast to the *Ophichthus ruber*, otherwise called *Rasbora* (q. v.), and in parts of the West Indies and Bermuda to the *Nemadus* (or *Sauron*) *bonasus*.

Snake Indians: See *SINIBHUTAN INDIANS*.

Snake Plains: a region in Idaho through which Snake river flows in a deep canon, crossed by successive eruptions of basaltic lava which came from fissures and deluged an area of less than 250,000 sq. miles, including parts of Oregon and Washington. In Idaho the lava occurs in horizontal sheets resting on older volcanic rocks, and the streams from the mountains flow beneath it, forming "hot rivers." I. C. R.

Snake River: a river which rises in the high mountains of Western Wyoming, N. of Yellowstone Lake, in two main branches, known as the North and South Forks, flows westward across Idaho, and then northward, forming the boundary between Idaho and Oregon for 200 miles, and the boundary between Idaho and Washington for 30 miles. It then turns westward and joins the Columbia in Washington near Pasco. Its length is between 800 and 1,000 miles. At the junction of the North and South Forks the elevation is 4,000 feet, and at its union with the Columbia 340 feet. Throughout a large part of its course it is a rapid stream, flowing in canyons from 1,000 to 3,000 feet deep, and is interrupted by magnificent waterfalls. From the Idaho-Washington boundary to its mouth it has been navigated by small steamers. It flows through an arid region, the drainage of which has been rejuvenated on account of vast overflows of volcanic rock and probably also by reason of recent elevations, and the gorge it has cut is still narrow and steep-sided. Its tributaries also flow in canyons, making traveling near its course difficult. ISAAC C. RUSSELL.

Snakeroot: any one of many plants believed to be efficacious in the cure of snake-bites. In the U. S. the name is applied to the following among others: (1) The black snake-root or snake (*Ambrosia artemisiifolia*), a common umbelliferous plant, with a root of an aromatic taste, of some value as an antispasmodic. (2) *Eryngium yuccifolium*, hogsnake-root, or rattlesnake-master, is diaphoretic and expectorant. (3) The *Senecio* *snakeroot* (see *SENECIO*). (4) *Asclepias syriaca*. (5) *L. aquarum*, and (6) *L. scariosa*, called also bottom-snake-root, blasing-star, rattlesnake-master, etc., shows composite-flowered plants, with stimulant and diuretic properties. (7) *Eupatorium asperifolium*, common in the Northern States and a good tonic, is called white snake-root. (8) *Asclepias tuberosa*, the well-known Virginia snake-root, has valuable stimulant and tonic powers and a pleasant fragrance. (9) *A. reticulata* of the Southwest has properties similar to those of Virginia snake-root, and pro-

duces much of the snake-root of commerce. (10) *Chamaejasme racemosa*, or black snake-root, is a valuable sedative and expectorant. (11) *Asclepias tuberosa*, or wild pogon, is called snake-root and Canada snake-root in New England. It is fragrant, with properties much like those of *Asclepias tuberosa*, but is much more pungent.

Snakes: See *SERPENTS*.

Snakeskin: a small piece of skins bone, or other substance which is placed upon the bite of a poisonous serpent for the purpose of absorbing or drawing away the poison. The vulgar in almost all countries have faith in this and other like means of cure, such as the application of a stone to the bite of a rattlesnake. In India, snakeskins are often used, and there are several apparently well-justified instances of their soothing efficacy. It is possible that some of these stones may have a strong absorptive power for the snake poison, for they are often porous, and the unlimited faith which the bitten persons have in this means used for cure is doubtless a powerful sedative.

Snake-wood: the name of a number of trees (see *Lagerstrœmia*); also of the real and wood of *Strophium salignum* and *R. muscivora*, obtained as a remedy for snake bites.

Snaptogon: any plant of the genus *Antirrhinum*, family *Scrophulariaceae*. The snapdragons are annuals and perennials, and many fine flowering varieties are cultivated, mostly belonging to *A. majus* and *A. nemorosum*. Old World plants of easy culture. L. H. B.

Snapper: any one of several fishes of the family *Lutjanidae*. The species inhabit warm seas; they are voracious, with short histories and few pyloric organs; numerous teeth and canines, no incisors or molars, and a continuous dorsal fin. The red snapper (*Lutjanus syn*), common on the Gulf coast of the U. S. in deep water, is an important food-fish. The mangrove snapper, or grey snapper (*L. griseus*), ranges from the West Indies N. to New Jersey, and is especially abundant along shore among mangroves. The name is improperly applied to the rosefish (*Schelus marinus*), the bluefish, and several other fishes. See *FISHES*.

Snapping Turtle: in the U. S., any one of several species of turtles. (1) The common snapping turtle of the Northern and most of the Southern States is the *Chelydra serpentina*. This has the head moderately large, and covered with a soft skin, and the marginal scales of the shell are in a single row. It is said that it sometimes (though very rarely) attains a length of about 4 feet and a weight of 50 lb. It is found from Canada southward, and from the Atlantic seaboard westward to the plains. (2) A species which in some parts of the Southern States at least replaces the *Chelydra serpentina* is the *Macrochelys lacertina*. This animal has the head very large and broadly triangular, and it is covered with numerous horny plates; the marginal scales of the shell are in two rows. It reaches a very large size, sometimes weighing as much as 100 lb. It is confined to the Southern States, extending from Florida to Western Texas, and northward up to Missouri. It is perhaps more generally known as the alligator snapper. Both of these species belong to the family *Chelydridae*, and are distinguishable from all the other turtles of the U. S. by the long and imperfectly retractile neck and tail, and the cruciform plastron or lower shell. Their popular name is due to the habit of snapping at food or enemies. Their bite is severe, and it is difficult to relax their hold. They are by many esteemed for food, especially for making soup. They have a rather strong musky odor. In the early summer they lay from twenty to forty eggs in a hole dug by themselves. (3) In some sections of the U. S. the name is also applied to the soft-shell turtles, or *Trionyxidae*, which snap abruptly at food or other objects. Revised by P. A. LORAN.

Sneezewood: the beautiful and durable timber of the *Phoradendron vitis* (family *Sapotaceae*), a tree of South Africa. When sawing or rasping it, joiners are much troubled by the sneezing which its fine dust provokes. Its wood is very inflammable, even when green.

Sneezing, or Sternutation [from Lat. *sternutare*, intensive of *sternere*, *sternulum*, *sternum*; cf. Gr. *sternōn*, *sternon*]; a convulsive movement by which the lungs and chest-walls are expanded and then suddenly contracted, forcing the breath out violently through the nose. It is produced by reflex action, there being some irritation of the pituitary membrane of the nose which originates the action. The sneezing tends to remove the irritating substance from the nose. There are a large number of irritating substances

whose presence in the nostrils will induce sneezing. When it is a symptom of cold, it indicates that catarrhal inflammation has induced a state of things similar to that produced by a foreign substance in the nose. In children measles may begin with this symptom, and influenza is also frequently so initiated. Revised by W. PEPPER.

Snell, WILLEBRORD (also known as **SNELLIUS**): astronomer and mathematician; b. at Leyden in 1591; succeeded his father as Professor of Mathematics at the University of Leyden in 1613. He discovered the law of the refraction of light. (See **OPTRICS**.) He was also the first to calculate the size of the earth by means of a trigonometrical measurement of an arc of a meridian. The method of proceeding which he employed in this undertaking he described in his *Eratosthenes Batavus, sive de Terræ Ambitus vera Quantitate* (Leyden, 1617). He also wrote *Cyclometria, sive de circuli dimensione* (Leyden, 1621), and other works. D. at Leyden, Oct. 30, 1626.

Snera: See **MOGADOR**.

Snider Rifle (so called from its inventor): a rifle, the essential features of which are that the breech-block revolves around an axis on the right of and parallel to the axis of the bore, and the firing-pin passes obliquely from the nose of the hammer through the breech-block to the center of the base of the cartridge. This was the first form of breech-loader adopted by the British Government, which in 1866 directed that the old Enfield muzzle-loaders should be altered to breech-loaders upon this system. See **SMALL-ARMS**.

Snipe [M. Eng. *snipe*: Dutch, *snep*, *snip*: Germ. *schneipe*, snipe: Swed. *snäppa*, sandpiper]: any bird of the family *Scolopacidae*, which includes those known as shore-birds or sandpipers. (See **SANDPIPER**.) More commonly the name is restricted to the marsh-haunting species of the genus *Gallinago*, about twenty in number, which are distributed over the greater part of the globe, but more particularly in temperate regions. They have a straight bill, considerably longer than the head, grooved to the end, which is slightly expanded, well supplied with nerves and used in probing the mud for worms. The eye is placed far back, over the ear. The plumage is streaked with shades of buff and brown, black and white, and blends completely with the ground. The tail-feathers vary from twelve to twenty-six. The American snipe (*Gallinago delicata*) is found in suitable places over the greater part of the U. S., breeding in the northern portions and thence northward. In winter it migrates, occurring as far S. as Brazil. It is sometimes called English snipe; but that bird, although very similar, is a distinct species (*Gallinago gallinago*), which does not reach North America, although occasionally found in Greenland. The jack-snipe of Europe (*G. gallinula*) is the smallest of the group; the great snipe of eastern South America (*G. gigantea*) is the largest. F. A. LUCAS.

Snipefish: another name of the **BELLOWS-FISH** (q. v.).

Snoho'mish: city; capital of Snohomish co., Wash.; on the Snohomish river, and the Everett and Monte Cristo, the Gt. North., and the Seattle, Lake Shore and East. railways; 9 miles from Puget Sound; 38 miles N. N. E. of Seattle (for location, see map of Washington, ref. 3-D). It is in an agricultural, mining, and lumbering region, has regular steam-boat communication with Seattle, and contains a county court-house (cost \$30,000), 3 graded public schools, 5 churches, about 20 sawmills and shingle-mills, 2 sash and door factories, Masonic and Odd Fellows' halls, water-works, electric lights, street-railways, 2 national banks with combined capital of \$100,000, and 2 tri-weekly and 3 weekly newspapers. Pop. (1880) 149; (1890) 1,993; (1894) State census, 3,250. EDITOR OF "EYE."

Snolksky, snoil'skéé, KARL JOHAN GUSTAF, Count (Sten Tröst): poet; b. in Stockholm, Sweden, Sept. 8, 1841. He made his first appearance in print, with several other young poets, in the publication of the Upsala society *Namnlösa sällskapet* (1860). His earliest collection of poems, *Smådikter* (1861), is characterized by great warmth and originality, especially in the descriptions of Italian life and scenery. His sonnets (1871) and his translation of Goethe's ballads (1876) are among the best of their kind in recent Swedish literature. His later poems, *Nye dikter*, etc. (1881), are more national in spirit, and display a deep sympathy for the unfortunate and oppressed classes of society. For a number of years he has served with distinction in the Swedish diplomatic corps. See C. D. af Wirsén, *Om Karl Snolkskys skaldskap i Svea* (1882). D. K. DODGE.

Snorri Stur'luson [usually written **SNOORRE STURLASON**]: the most celebrated historian of old Iceland. He was born in 1178, and belonged to the numerous and powerful clan of the Sturlungs. He was fostered by the prominent chief Jon Loptson, at whose home he acquired the book-knowledge of his day, and he became particularly familiar with the old poetry and saga literature of Iceland and Norway. At the age of twenty Snorre married a wealthy woman, and by this marriage he became one of the most powerful chiefs of Iceland and was able to attend the Althing at the head of about 900 armed men. He was made speaker of laws (*lög-sögumaðr*) several times, and for several years he was the richest and most influential man in the whole land. He became involved in the bloody feuds which in his time split the Sturlungs into warring factions, and he was continually implicated in litigation with his relatives and others in regard to property and inheritances. In 1218 he made his first visit to Norway, and was received into the household of the young king, Hakon Hakonson. In 1219 he visited the lagman Eskil in Sweden, and there he must have obtained that thorough knowledge of Sweden and Swedish affairs which appears in his writing. In 1220 he returned to Iceland, after having previously promised to work for the subjugation of Iceland to Norway. As he made no progress in the realization of this plan, he was suspected of faithlessness by the rulers of Norway, and his enemies in Iceland took advantage of this circumstance to bring about his ruin. After endless feuds in his own country, Snorre had to go a second time to Norway in 1237, but he lost the good will of King Hakon and was compelled to return to Iceland. On his arrival there he got into trouble with his son-in-law, Gissur Thorvaldson, who, at the instigation of King Hakon, murdered him on Sept. 22, 1241, at his home at Reykholt, where ruins of his splendid mansion are still to be seen. Snorre became Iceland's most distinguished sagaman, and he enjoys some reputation as a skald. As a writer of history he ranks with Herodotus or Thucydides. His *Heimskringla*, embracing an elaborate history of the kings of Norway to the death of Magnus Erlingson in 1177, is famous throughout the world. An English translation of this work was published by Samuel Laing in London in 1844, and a revision of Laing's translation by Rasmus B. Anderson appeared in London and New York in 1889. The *Younger Edda* also bears Snorre's name, and is to a great extent his work. See **EDDA** and **ICELANDIC LITERATURE**.

RASMUS B. ANDERSON.

Snow [O. Eng. *snaw*: O. H. Germ. *snēo* (> Mod. Germ. *schnee*): Goth. *snaiws*; cf. Lith. *snēgas*: Russ. *sniegū*: Ir. *snéachd*: Lat. *nix*, *nivis*: Gr. *νίφα* (acc.) < Ind.-Eur. *sneghos*: *sneghos*: snow]: the aggregations of minute spicules of ice into which the excess of vapor in the atmosphere is condensed when the temperature is at or below the freezing-point of water. These aggregations, called snowflakes, though assuming a great variety of crystalline forms, usually present the outline of a hexagon or a six-pointed star. (See the illustration in the article **ICE**.) In high and middle latitudes the ground is covered with snow each winter, but within the tropical regions no snow falls at or near the level of the sea, for the temperature of the lower atmosphere is always sufficient to melt it, even if it is formed in the upper air. In the northern hemisphere the limit of the fall of snow at the sea-level is an irregular line passing mainly between 25° and 40° N. lat.; in the southern it is more regular, lying in the continents between lats. 37° and 38°. In general, this line is nearest to the equator in the regions most exposed in winter to the polar winds, as on the eastern coast of Asia and of North America. As the heat of the air decreases upward, the formation of snow is always possible upon high mountains, even under the equator. At the summit of the Andes and the Himalayas, for example, the moisture condensed during the rainy season falls in the form of snow, while it rains on the slopes and plains below. Thus in all latitudes from the equator to the poles the tops of high mountains are covered with a layer of permanent snow, which the summer heat is not sufficient to melt. The lower limit of perpetual snow, called the *snow-line*, varies in altitude in the different portions of the globe. Within the tropics it is found about 3 miles above the level of the sea; in temperate latitudes it descends to a little less than 2 miles; and at the northern limits of the continents it is about half a mile, or even less, above the level of the sea; while on the arctic islands vast fields of snow remain permanently very near the seashore.

The height of the snow-line, as observed in different latitudes, is given in the following table:

Latitude.	Alt. Where.	Feet.
50° N.	North Greenland.	5,500
45°	Umanak.	5,500
40°	St. John's, N.Y.	5,500
35°	Rocky Mountains.	10,000
30°	Rocky Mountains.	14,000
25°	Sierra Nevada.	11,000
20°	Provincetown, Mexico.	11,000
15°	Yuma, Colorado.	8,000
10°	Andes of Ecuador.	15,700
5°	Andes of Bolivia, west side.	15,000
0°	Andes of Bolivia, east side.	16,000
5° S.	Andes of Central Chile.	14,700
10°	Andes of Patagonia.	8,000
45°	Andes of peaks of Sierran.	9,700

brown. The name is sometimes applied to the snow-bunting (*Thropterus nivalis*), a pretty little bird found in

Latitude.	Alt. Where.	Feet.
10° N.	Lower Island	900
15°	Sierran, Cape North	2,500
20°	Sierran, Cape North	2,500
25°	Sierran, Cape North	2,500
30°	Alps, north side	7,000
35°	Alps, north side	8,000
40°	Alps, north side	9,000
45°	Alps, north side	10,000
50°	Alps, north side	11,000
55°	Alps, north side	12,000
60°	Alps, north side	13,000
65°	Alps, north side	14,000
70°	Alps, north side	15,000
75°	Alps, north side	16,000
80°	Alps, north side	17,000
85°	Alps, north side	18,000
90°	Alps, north side	19,000
95°	Alps, north side	20,000
100°	Alps, north side	21,000
105°	Alps, north side	22,000
110°	Alps, north side	23,000
115°	Alps, north side	24,000
120°	Alps, north side	25,000
125°	Alps, north side	26,000
130°	Alps, north side	27,000
135°	Alps, north side	28,000
140°	Alps, north side	29,000
145°	Alps, north side	30,000
150°	Alps, north side	31,000
155°	Alps, north side	32,000
160°	Alps, north side	33,000
165°	Alps, north side	34,000
170°	Alps, north side	35,000
175°	Alps, north side	36,000
180°	Alps, north side	37,000
185°	Alps, north side	38,000
190°	Alps, north side	39,000
195°	Alps, north side	40,000
200°	Alps, north side	41,000
205°	Alps, north side	42,000
210°	Alps, north side	43,000
215°	Alps, north side	44,000
220°	Alps, north side	45,000
225°	Alps, north side	46,000
230°	Alps, north side	47,000
235°	Alps, north side	48,000
240°	Alps, north side	49,000
245°	Alps, north side	50,000
250°	Alps, north side	51,000
255°	Alps, north side	52,000
260°	Alps, north side	53,000
265°	Alps, north side	54,000
270°	Alps, north side	55,000
275°	Alps, north side	56,000
280°	Alps, north side	57,000
285°	Alps, north side	58,000
290°	Alps, north side	59,000
295°	Alps, north side	60,000
300°	Alps, north side	61,000
305°	Alps, north side	62,000
310°	Alps, north side	63,000
315°	Alps, north side	64,000
320°	Alps, north side	65,000
325°	Alps, north side	66,000
330°	Alps, north side	67,000
335°	Alps, north side	68,000
340°	Alps, north side	69,000
345°	Alps, north side	70,000
350°	Alps, north side	71,000
355°	Alps, north side	72,000
360°	Alps, north side	73,000
365°	Alps, north side	74,000
370°	Alps, north side	75,000
375°	Alps, north side	76,000
380°	Alps, north side	77,000
385°	Alps, north side	78,000
390°	Alps, north side	79,000
395°	Alps, north side	80,000
400°	Alps, north side	81,000
405°	Alps, north side	82,000
410°	Alps, north side	83,000
415°	Alps, north side	84,000
420°	Alps, north side	85,000
425°	Alps, north side	86,000
430°	Alps, north side	87,000
435°	Alps, north side	88,000
440°	Alps, north side	89,000
445°	Alps, north side	90,000
450°	Alps, north side	91,000
455°	Alps, north side	92,000
460°	Alps, north side	93,000
465°	Alps, north side	94,000
470°	Alps, north side	95,000
475°	Alps, north side	96,000
480°	Alps, north side	97,000
485°	Alps, north side	98,000
490°	Alps, north side	99,000
495°	Alps, north side	100,000
500°	Alps, north side	101,000
505°	Alps, north side	102,000
510°	Alps, north side	103,000
515°	Alps, north side	104,000
520°	Alps, north side	105,000
525°	Alps, north side	106,000
530°	Alps, north side	107,000
535°	Alps, north side	108,000
540°	Alps, north side	109,000
545°	Alps, north side	110,000
550°	Alps, north side	111,000
555°	Alps, north side	112,000
560°	Alps, north side	113,000
565°	Alps, north side	114,000
570°	Alps, north side	115,000
575°	Alps, north side	116,000
580°	Alps, north side	117,000
585°	Alps, north side	118,000
590°	Alps, north side	119,000
595°	Alps, north side	120,000
600°	Alps, north side	121,000
605°	Alps, north side	122,000
610°	Alps, north side	123,000
615°	Alps, north side	124,000
620°	Alps, north side	125,000
625°	Alps, north side	126,000
630°	Alps, north side	127,000
635°	Alps, north side	128,000
640°	Alps, north side	129,000
645°	Alps, north side	130,000
650°	Alps, north side	131,000
655°	Alps, north side	132,000
660°	Alps, north side	133,000
665°	Alps, north side	134,000
670°	Alps, north side	135,000
675°	Alps, north side	136,000
680°	Alps, north side	137,000
685°	Alps, north side	138,000
690°	Alps, north side	139,000
695°	Alps, north side	140,000
700°	Alps, north side	141,000
705°	Alps, north side	142,000
710°	Alps, north side	143,000
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720°	Alps, north side	145,000
725°	Alps, north side	146,000
730°	Alps, north side	147,000
735°	Alps, north side	148,000
740°	Alps, north side	149,000
745°	Alps, north side	150,000
750°	Alps, north side	151,000
755°	Alps, north side	152,000
760°	Alps, north side	153,000
765°	Alps, north side	154,000
770°	Alps, north side	155,000
775°	Alps, north side	156,000
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785°	Alps, north side	158,000
790°	Alps, north side	159,000
795°	Alps, north side	160,000
800°	Alps, north side	161,000
805°	Alps, north side	162,000
810°	Alps, north side	163,000
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825°	Alps, north side	166,000
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840°	Alps, north side	169,000
845°	Alps, north side	170,000
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885°	Alps, north side	178,000
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945°	Alps, north side	190,000
950°	Alps, north side	191,000
955°	Alps, north side	192,000
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970°	Alps, north side	195,000
975°	Alps, north side	196,000
980°	Alps, north side	197,000
985°	Alps, north side	198,000
990°	Alps, north side	199,000
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1185°	Alps, north side	238,000
1190°	Alps, north side	239,000
1195°	Alps, north side	240,000
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1205°	Alps, north side	242,000
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Snyff: See TOBACCO.

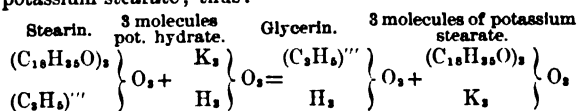
Snyders, FRANS: painter; b. at Antwerp, 1579. He was a pupil of Peter Breughel, the younger, and afterward of Hendrik van Balen. He became a friend of Rubens. He began by painting still life only, but when he returned to his native city in 1609 after a visit to Italy, he began to produce pictures of the chase, in which he depicted the struggles of eager hounds with savage beasts at bay, introducing the human figure also. Rubens, whom he followed, sometimes made use of his services as an assistant. Snyders is celebrated as a fruit-painter. The Louvre possesses a *Concert of Cats* by him, and the gallery of the Prado at Madrid has many pictures of his, as also the National Gallery in London and the galleries of St. Petersburg, Antwerp, Munich, Dresden, Brussels, and other European cities. D. at Antwerp, Aug. 19, 1657. W. J. STILLMAN.

Soane, Sir JOHN, F. R. S.: originally called SWAN; architect; b. at Reading, England, Sept. 10, 1753; son of a bricklayer; was sent to Italy for three years (1777-80) as a traveling student at the cost of the Royal Academy; appointed architect to the Bank of England 1788; executed plans for the country-seats of many of the opulent gentry, a volume of which was printed in 1788; became clerk of the works to St. James's Palace and the houses of Parliament 1791, and Professor of Architecture at the Royal Academy 1806; published a volume of his plans of *Public and Private Buildings* (1828) and a *Description* (1827) of his own house and museum in Lincoln's Inn Fields, where he died Jan. 20, 1837. This house, with its art and antiquarian museum, he bequeathed to the nation. Among its treasures are pictures by Hogarth, Reynolds, and Turner, and models by Flaxman.

Soap [M. Eng. *sape* < O. Eng. *sāpe*; Germ. *seife* < Teuton. **saipjō*, whence Lat. *sāpō* > Fr. *savon*; Ital. *sapone*]: any salt of the fatty acids with a metallic base, usually a soda or a potash. All the true OILS and FATS (qq. v.) are decomposed by the alkaline hydrates, by certain metallic oxides, and also by acids, high steam, and hot water. In the decomposition of fats by alkalies the products formed are glycerin and the alkali salts of the fatty acids which were contained in the fats. This process is known as *saponification*. As a rule, soaps produced from soda are *hard soaps*, while those produced from potash are *soft soaps*. Castor oil, however, forms with potash a hard and brittle soap. A fundamental distinction between the hard and soft soaps is found also in the fact that in the former the glycerin is removed in the mother liquor or spent lye, while in the latter it remains mingled with the semi-fluid mass. Moreover, it is not possible to dry the potash soaps, owing to the very hygroscopic character of the base, while soda soaps may be so completely dried as to admit of grinding to powder.

Saponification takes place slowly in the cold, much more quickly by aid of heat, and the presence or absence of air is immaterial. The result depends on the nature of the fat or oil as well as on the base; e. g. if the fat is complex—containing, for example, stearin, palmitin, olein, etc.—then as many new salts are formed as there are fatty acids to combine with the base.

In the production of soap by the action of caustic potash on stearin (glyceryl stearate) the products are glycerin and potassium stearate; thus:



Formerly in North America and Russia much larger quantities of potash were obtained in clearing up forests than now, and hence potash soaps were produced in proportionate quantity. These were, especially in Germany, converted into hard or soda soaps by utilizing the property of the potassium-salts in decomposing common salt or sodium sulphate, forming potassium chloride or sulphate and soda soap. Moreover, the enormous production of caustic soda at a cheap rate consequent on the adoption of Leblanc's soda-process, stimulated by the great demand for bleaching-powders, of which sodium salts are a by-product, has well-nigh put an end to the use of potash in producing soap, excepting as an element of domestic economy in those regions where potash is still a common product. Thus in Canada and in some other parts of North America "pot-ashes" and "pearlashes" are still articles of considerable importance.

As a technical art, soap-boiling depends on the use of caustic lyes of a suitable strength for the saponification of fats, oils, and resins. The lye of the soap-boiler is a dilute alkaline liquor prepared by the action of slaked lime (calcium hydrate) on a boiling solution of 3 parts of potassium carbonate in 12 parts of water, or the same quantity of sodium carbonate (soda-ash) in half this quantity of water. "The manufacturer nowadays buys solid caustic soda or potash from the alkali-works. The sodium aluminate obtained by the decomposition of cryolite is used in the U. S. under the name *Nastrona refined saponifier* for soap-manufacturing purposes" (Wagner).

The manufacturer of hard soap, having provided a stock of alkaline liquors (lyes) of various strengths, charges his soap-pan with a quantity of neutral fat or oil, and adds weak liquors of about 1.050° density. Soap-pans are made of iron plates riveted at the joints, and of various sizes, from 10 to 15 feet in diameter and of proportionate depth, set over fire-chambers, or more frequently heated by steam, either in jackets or injected from numerous small holes pierced in pipes introduced into the liquors. They vary in capacity, of course, but many hold from 20 to 30 tons of soap. As the temperature rises and the oil and alkali liquor mingle, a uniform milky emulsion is formed in which neither oily globules nor water are visible on cooling a portion of the fluid. The operator watches for this change, and adds more solution of alkali or water, as the case may require, until the emulsion forms and all alkaline taste has disappeared, using the tongue as a test. Stronger liquors are then added gradually to complete the displacement of the glycerin, which was begun by the weak liquors, and the boiling continues until a strong alkaline taste is detected. The workman then adds more fat or oils, and repeats the use of stronger lyes until gradually the soap-pan is nearly filled, taking care that at the last there shall be no excess of alkali. During this series of operations he often also adds a portion of resin, which by virtue of its constitution undergoes a kind of saponification with alkalies, and adds to the product more than its value in weight and volume. Then comes the next important stage of the soap-boiling operation, in which, by the addition of salt, the emulsion of oils and alkali is decomposed, the salt taking the water and causing the precipitation of the newly formed soap in a curdy or granulated state, floating on the denser spent lyes in which is found the glycerin and salt, but no alkali. This mother liquor, after the separation of the soap is complete, is withdrawn and rejected as having no value. The imperfectly developed soap is subjected a second time to a like series of operations as at first; it is brought by boiling to a homogeneous state, more oils or fats and strong alkaline liquors are added until the whole has a decided alkaline taste, and more salt is then added to cause the separation of the soap from the alkaline solution, and the whole mass is kept boiling for some time until all the fats, etc., are completely saponified. This completes the chemical part of the operation if the soap contains no rosin, and after allowing time for subsiding of the dregs the "curd" is transferred by skimmers to the "frames," where it cools and becomes solid preparatory to cutting up for use. If the soap contains rosin it requires a further treatment before framing—viz., the curds, after removal of the spent liquor and dregs, are melted with more water and boiled by steam or fire or both. A homogeneous compound results, containing an indefinite quantity of water, which is permitted to rest for two or three days, when it separates into a stratum of a definite compound containing about 65 per cent. of fat acids, 6.5 of soda, and 28.5 of water, and resting on a lower stratum of an indefinite compound containing much more water and the dregs or sediments of the operation. This lower stratum, called *nigre*, contains also an excess of alkali, and forms with the addition of fat and salt the staple of another "boil" for more soap. The *nigre* which accumulates with each boil is used as a mottling for clouded soaps, or may otherwise be worked up in subsequent operations. A strong preference at one time existed for mottled soaps, founded on the fact that in such soaps no excess of water could exist. The substances which impart the mottled appearance, being heavier than soap, were held in suspension only in consequence of its thick and pasty condition. It is, however, possible so completely to simulate the appearance of genuine mottled soap, by adding mineral and other colors during the process of hardening to soaps containing much more than the normal quantity of water, that this sign has lost its value, and such mottlings are justly re-

parted as only evidence of impurity from the introduction of lye into the soap. Good hard white soap contains 65% soda, 31.9% soda, 4% water, 32%.

The soaps vary chiefly with the fats or oils from which they are produced, and may be considered as forming two distinct classes—viz., soaps made from vegetable oils and those from animal oils and fats.

A. VEGETABLE HARD SOAPS.—Bourgeois or Castile Soap.—In Southern Europe soap is largely made of olive oil and tallow, with about 20 per cent. of rape-seed oil. This soap is noted for its firmness, freedom from the degraded animal odors found in other soaps, and in general for its excellent qualities. Without the addition of rape-seed oil the soap from olive oil is so hard as to crumble when cut, and is difficult to dissolve in water. This soap has a peculiar mottling—the grains, and not in streaks of color, as in the indications made from animal fats. The best olive-oil soap is made in Spain and Portugal, also in Provence and Als, from oil imported from the olive after the virgin and table oils have been extracted: 100 parts of new and good oil produce 115 parts of finished soap when no rape oil is used, by which the product is reduced to 170 parts or less. The release of olive oil in margarine or palmatin is the reason for the superior quality of the soap it produces. The mottling of the Marseille soap is due to iron, which is sometimes added as sulphate, and is changed to sulphide by the alkaline sulphide present in the soda. By exposure to the oxidizing influence of air the dark stains of ferric sulphide are changed to a reddish color. Dr. Normandy found the foreign castile (or Marseille) soap (sp. gr. = 1.0765) to contain fatty acids, 76.5; soda, 9; water and coloring-matter, 14.5 = 100. The English imitation (sp. gr. = 0.9999) gave fatty acids of pasty consistence, 76.2; soda, 10.5; water with a little coloring-matter, 14.2 = 100.

Common oil Soap.—Marine Soap.—The soap made from the oil of the coconut is remarkable for its extreme hardness, and consequently for the very large amount of water it can hold without becoming soft. It has a disagreeable odor, which is with difficulty removed. The oil requires for its saponification a very strong lye, and is aided by the use of potash. This soap is not easily decomposed by weak saline liquors, and is hence used to wash in salt water, whence its name of marine soap. This quality of carrying a large amount of water has led to the use of coconut-oil soap as a means of mottling weak soda soaps from tallow, etc. Such soap can be made to hold up manganese oxide, ultramarine, etc., in connection with far more water than can be introduced into a genuine castile soap.

Rosin Soap.—Common Yellow Soap.—Rosin boiled with alkaline liquors, whether caustic or carbonated, is converted into a soapy emulsion. It is not a true soap, but from its plastic, waxy nature it is found to be a good vehicle for dissolving true soaps from tallow or other fats. The process of manufacture for rosin soap varies from that of soap from oils or fats alone by the omission of the last boiling. By itself, rosin does not form a hard soap, and unless it is thoroughly treated by strong liquors it leaves on the hands or any surface washed with it a resinous varnish and offensive odor of rosin. It forms, when carefully prepared and cut in excessive quantity, a very serviceable soap, which quickly forms an excellent lather and is very cheap.

Castor-oil soap and palm-oil soap are both soda soaps, although the oil of the castor-bean forms a hard soap with potash, and is remarkable, like the coconut-oil soap, for its large quantity of water which may be combined with it—so much as 50 per cent. The palm oil is saponified like tallow soap; it is used chiefly as an addition to yellow soap, as the unbleached oil has a decided yellow color, and its strong and rather agreeable odor serves to disguise the disagreeable odor of rosin soap, which also acquires in addition a certain transparency, due to the palm oil.

IL TALLOW AND OTHER ANIMAL-FAT SOAPS.—Under the name of tallow and oils is given nearly all that is useful to say of hard soaps from animal fats and oils. The old German hard soap was prepared from crude tallow by lye of ashes or potash, giving an imperfect soap, which in the subsequent boiling is converted into soda soap by salt, which, being at the same time supplied with an excess of alkali, produces a neutral soda soap, and is then boiled down to curd with salt. This art long preceded the knowledge of chemical principles underlying it. The indications of saponification, advancing by all the grades of the process, are so distinct that no thought was entertained at first of working with

weighed quantities. All that was required was to add more lye or more fat, according to appearance, until the proper state had been attained. In all respects the teachings of this empiric experience led to the same result which chemical knowledge has since illustrated and confirmed. The use of crude tallow has been abandoned in favor of purified grease, and the abundance of pure caustic soda renders useless the old methods of leaching ashes for potash lye or of boiling up soda-ash with lime. Experiment shows that 100 lb. of tallow produce 150 to 155 lb. of perfect cold soap, weighed as soon as it cools; if more is obtained it is because water is added.

Grease Soap, or Red Soap.—This soap, resulting from the lime-saponification of animal fats in the stearic and margarine, is an important product wherever the manufacture of stearin candles is carried on. As the glycerin has already been removed, the saponification of the oleic acid is readily effected even by alkaline carbonates. It is also mingled with neutral fats, and saponified by soda-lye of 18° B. A patented process for producing soap from red oil depends on treating the oleic acid in a steam-heated copper while agitated by a steam-turbine with carbonate of soda, etc., in equivalent proportion to the state of fine powder, added in successive portions, with or without rosin, according as a milder soap or a fine toilet-soap is required. The relative proportions of oleic acid, water, and rosin in this soap being adjusted at the beginning, there is no waste lye; the soap is said to come quickly, does not shrink by air-drying, and is in all respects represented as an excellent soap.

Soft Soap.—In domestic economy it is a practice in New England and New York to saponify the drippings of the kitchen, chiefly beef and mutton suet, with the crude potash of commerce in the cold. The following empirical receipt has become traditional for domestic soft soap: Pot. 12 lb., potash, 5 lb.; water, 12 gal. The fat and alkali are placed together in a cask, and the water is added, 3 gal. at a time, boiling hot, once in twenty-four hours, until all is used. The process of saponification sets in soon, but is not completed until after many days, and is hastened by frequent stirring with a strong stick. When saponification is complete all lumps of unaltered fat disappear, the soap has a silky luster when stirred, and the consistency of a jelly, trailing off in slender threads from a stirrer, and is a powerful detergent for all the coarser purposes of the household. Such a soap is obviously an impure potash-fat soap in caustic lye, and not an actual soap; all the glycerin of the fat is of course present also in this crude product. If an attempt is made to purify it by separation of the glycerin and excess of alkaline lye by solution of salt, it results simply in the production of hard soda soap, on principles already explained.

In the manufacture of soft soap by boiling, caustic lyes are made from leached ashes or American potashes, exactly as when soda-lyes are used, and of graded strength, 9°-11° solutions being first used with gentle heat. The fatty bodies used are kitchen drippings, tallow, fish-oil, blubber, rape-seed, and other drying oils. As soon as the complete combination is effected, and the thick fluid falls in strings from the stirrers with a shining appearance and somewhat turbid, the clarification begins with the gradual addition of a stronger lye at regular intervals until the soap passes from its turbid state to a clear, transparent slime. The boiler judges by empirical rules the state of progress toward completion of the saponification. If a drop from the middle of the pan when cooled on a plate of glass remains clear, the soap is complete; a gray margin indicates a want of lye in proportion to its breadth; and if this deficiency is great, the specimen is fluid and slimy. If the proper quantity of lye has been exceeded, the soap is said to be overdone, which is indicated by a gray skin spreading over the whole drop, instead of forming a ring or rim only; the soap is then granular, and when wet easily detached from the glass (effervescent). An excess of water is driven off by evaporation with a brisk fire and heating the froth as it rises with stirrers. As the soap thickens the froth subsides, the soap sinks and becomes darker, white bubbles are borne on the surface overlapping each other, called laminations by the workman; and the noise occasioned by this action has led to the saying, "the soap talks." As some kinds of oil, like that of hemp-seed, impart an esteemed greenish color to soft soap, while other varieties of soap are yellow, the greenish tint is artificially imparted to the yellowish soap by indigo. The detergent power of soft soap is very great, owing largely to its strong alkaline condition, and is hence

much esteemed in scouring wool, coarse linens, and for other like uses in the dyehouse. As it normally retains as inseparable from it the excess of alkali, the free glycerin and other impurities, there is no guaranty, as in the case of hard soaps, for its purity. Hence many methods have been practiced for reducing its cost—as, for example, the so-called bone soap, formed by the addition of the gelatin from ground bones, dissolved or partially decomposed by potash. In another plan hydrochloric acid is used to dissolve out the mineral matter of bones, leaving the gelatin, which, when carefully washed free of acid, is added during saponification to the fat. The soap with bones is called "Liverpool poor man's soap"; it is an open fraud, since gelatin and phosphate of lime can act only as useless diluents of soap. But this fraud is harmless compared with the use of the intestines of animals, skin, sinews, hoofs, hair, decomposed fish, and other animal refuse. Even naphtha, a non-saponifiable oil, and dextrin are sometimes employed in a like manner. Soft soap contains, according to quality, fatty acids, 50 to 40 parts; potash, 9.5 to 11.5 parts; and water, 88.5 to 50.5 parts in 100.

Silicated soaps contain either soluble silica or sand and powdered pumice, fuller's earth, and alumina. These substances act only mechanically as detergents, and may be permitted when a proper reduction in price is allowed. Sand soap, such as is used for scouring floors, contains as much as 75 per cent. of its weight of sand, and the French *savon-ponce* (pumice-soap) has from 20 to 26 per cent. of ground silica or pumice. These comparatively worthless mechanical mixtures have been replaced by soap in which soluble glass, or silicate of sodium, is employed with advantage. This feeble alkaline compound has by itself a considerable detergent power, and when mixed with ordinary soap an article of greatly reduced price and useful for many domestic and manufacturing operations is produced. These silicated soaps are quite strongly alkaline, owing to the nature of the soluble glass; this excessive alkalinity is reduced for some purposes by combining, with the soap, rosin or fatty acids, as in the ordinary process of soap-making. Carbonic-acid and sulphurous-acid gases are likewise passed into the liquid for the purpose of partially neutralizing the excess of alkalinity.

Toilet-soaps are made from very pure and sweet materials—sweet almond oil, beef-marrow, refined sweet lard, saponified without heat and perfumed with various essential oils. Very pure curd soap is also used for the foundation of toilet-soaps, for which purpose the soap is reduced to thin shavings, melted over a water-bath with rose and orange-flower water and common salt—24 lb. of soap, with 4 pints each of rose and orange-flower water, and about half a pound of salt. When cold next day, it is cut in small bits and dried in the shade, again melted down with the same proportion of orange and rose water, strained, cooled, and dried again. The heavy animal odor is thus removed, when it is powdered and left in a clean place exposed to air for some days. After this, it is ready to receive the desired perfume, and may be colored with aniline tints, ultramarine, etc., and moulded in forms for use. *Shaving-cream* is made by beating up lard with once and a half its weight of potash-lye, and perfuming and coloring as desired. *Glycerin soap* is prepared by mixing pure glycerin with a toilet soap, or with the transparent soap produced from its solution in alcohol. It mollifies the skin in cold weather.

Properties of Soap.—Besides its detergent properties every kind of soap in use contains a variable quantity of water, partly in chemical combination; and its power of absorbing water is also very various, being from 7½ per cent. in hard soda soaps to 162 per cent. in soft potash soaps of oleic acid when previously dried by artificial heat. Soap is perfectly soluble in alcohol, as also in hot water, both solutions becoming of the consistency of a jelly on cooling. In this state, mixed with camphor and oil of rosemary, the alcoholic tincture of soap is familiar as opodeldoc, or *linimentum saponis compositum* of the *Pharmacopœia*. Tincture of white soap is readily decomposed by salts of calcium and magnesia, and is familiar to the chemist, when made of normal strength, as the most convenient test for the hardness of natural waters (Clark's test). Potash soap is more soluble in water than soda soap. The sodium stearate is hardly affected when placed in 10 parts of water, while potassium stearate thus treated forms a stiff jelly. Sodium oleate dissolves in 10 parts of water—potassium oleate in 4 parts, and it forms a jelly even with 2 parts. Cold water partially decomposes the alkaline oleates, palmitates, and

stearates (common soap), the neutral salts being resolved into alkali, which dissolves, and the free acid, which precipitates. This explains why in using soap, even with pure water, its transparency is always disturbed, while the alkaline property, and consequent detergent power, of soaps is due to the liberation of a portion of caustic potash or soda, which attacks and removes the grease of foul linen, etc.

The value of soap depends mainly on the amount of dry soap (the real soap or alkaline salt of the fatty acids) in any given specimen. The loss in weight of a given amount of soap cut in thin shavings, when completely desiccated in a drying oven, at 212° F., is hygroscopic water, which should not for best hard white soap exceed 20 per cent., for mottled soap 25 per cent., and for yellow soap 30 per cent. The fat acids vary from 60 to 70 per cent., and the alkalies from 7 to 9 per cent., according to quality. As before mentioned, soaps made from coconut oil contain normally much more water, and in the yellow soaps from 10 to 20 per cent. of the fatty acids are replaced by rosin.

Soap was not known to the ancients. It is first mentioned by Pliny, who refers to it as something used by the Romans for the purpose of beautifying the hair. Geler in the second century states that soap was prepared from various kinds of tallow with potash and lime. It is stated further that soap is used as a medicine, and that by means of it all dirt could be removed from the body and clothes. For more details respecting the manufacture of soap, consult Richardson and Watts, *Chemical Technology*; Mitscherlich's *Chemistry*; Watts, *Dictionary of Chemistry*; Ad. Wurtz, *Dictionnaire de Chim.*; R. S. Cristani's *Soap and Candles*; Dussance's *Manufacture of Soap*; Thorpe, *Dictionary of Applied Chemistry*. Revised by IRA REMSEN.

Soapberry: the fruit of the *Sapindus saponaria* and *S. inequalis*, West Indian trees of the family *Sapindaceæ*. The pulp is a powerful detergent, much stronger than ordinary soap, and the hard shining seed has been exported and used for making buttons, which are very durable. In the southern parts of the U. S. there grows another soapberry-tree, *Sapindus marginatus*, which is sometimes 40 feet high. There are various tropical species which have a fruit with an edible pulp, but the seed is often poisonous. These trees have no practical importance. Revised by L. H. BAILEY.

Soapstone: See STEATITE.

Soapwort: a name sometimes applied in a general way to the plants of the family *Sapindaceæ*, on account of the soapy quality of the fruits of many species. It is also the name for plants of the genus *Saponaria* (family *Caryophyllaceæ*) and other plants of the same family, which are sometimes utilized for their detergent powers. There are in many parts of the world vegetables which are excellent substitutes for soap. In some instances this cleansing power depends upon the principle saponine, found in plants of widely diverse families. In the common soapwort the root and the leaves contain saponine, in consequence of which they often are used for washing. The root has also medicinal properties. Revised by CHARLES E. BESSEY.

Sobieski: See JOHN III., SOBIESKI.

Soccage, or Socage: See TENURE.

Socialism [from Lat. *so'cius*, sharing, associated, (as noun, fellow, partner, companion): a conscious endeavor to substitute organized co-operation for existence in place of the present anarchical competition for existence; or the system of social organization calculated to bring this about. This definition, though it gives, perhaps, adequate expression to the active and practical side of socialism, leaves out of account altogether its theoretical basis. From this point of view socialism is an attempt to lay the foundation of a new science of sociology, which shall enable mankind, by the thorough understanding their past and present, to comprehend, and thus, within limits, to control the movement and development of their own society in the near future. Consequently socialism in its wide sense is not, as is still commonly thought, a mere aspiration for a better state of society, still less only a series of proposals to mitigate the evils arising from the present social arrangements. Modern scientific socialism essays to give an intelligible explanation of the growth of human society, and to show that as each step in the long course of development from the institution of private property, through chattel slavery, serfdom, and wagedom, was inevitable, so the next step from capitalism to socialism is also inevitable. The object which socialists have in view in their propaganda is that this, the final trans-

formation, should be made immediately by an organized, interested, and intelligent people, instead of unconsciously, and therefore haphazardly, by groups of dissatisfied, prejudiced, and ignorant workers. Agitation against the injustice of the present system of production, therefore, is only valuable in so far as it stimulates men and women to appreciate the tendency of the time, and in this way leads them to organize for the attainment of the definite end which the evolution of economic forms has made ready. Whether the great change will be brought about peacefully or forcibly has no bearing upon socialism in itself, but depends upon the stage of development which has been reached in each civilized country, and the attitude which the dominant class may adopt in relation to the demands which the economic situation impels the producing class to make.

The Early Communal System.—All authorities on the early history of our race are agreed that the primitive forms of human society were founded upon communism, or common ownership, alike of the means of production and of the products; the personal relations between the members of these communities being regulated by kinship, and not by property or residence. In these circumstances equality of social condition was the rule within the limit of the gens or tribes (which were supreme in the communal household, their children belonging to their own gens) and though the power of man to produce wealth was then very small, and scarcity or famine was not uncommon, it was impossible in these circumstances for one portion of the little community to be free while another portion was in possession of a superfluity of the necessities of life. Examples of this form of society are still to be found in their pristine condition, as well as in process of disintegration, in many parts of the world. According to scientific theories, the same law applies to human society that has been found in several developments in other portions of inorganic and organic nature. This law, which has been formulated in the philosophic guise of unification, differentiation, and reintegration, may be traced throughout the vegetable and animal kingdoms. First there is the simple organism, then its disintegration in the form of germination or otherwise, and lastly its reorganization in a form similar to the first. In the case of human society in its slow upward progress private property was as the differentiating form, and the early communal society embraced within itself all the possibilities of the future, as the acorn possesses within itself, in suitable surroundings, the potentiality of the oak. With the institution of private property the entire break-up of the communal form and all that this involved became sooner or later inevitable. But during the period of communism all the inventions and discoveries which form the foundation of the modern system of machine production were placed at the disposal of mankind. The domestication of animals, the growth of cereals, the wheel, the potter's wheel and pottery, the loom and sail, weaving, dyeing, the use of the steam-plat, the mining and smelting of metals—each and all of these were in use under communism. The tribes benefited by the increased power to produce wealth thus very slowly advanced; but the very names of the inventors and discoverers are forgotten, and the circumstances in which they lived prevented them from deriving any individual or personal advantage from their superior ingenuity. At the same period of social growth, exchange, in its modern sense, was unknown, and considerable works were carried out in various directions as portions of the organized industry of the tribe communities, those who were engaged in work which would give no immediate return in food or clothing being supplied by the labor of other members of the community.

Slavery and Serfdom.—As the power of man to produce wealth increased further progress in wealth-production was hampered by these communal forms, and by the necessity incumbent upon each member of the tribe to perform his share of the communal duty. When, also, it was discovered that the captives from neighboring tribes could produce by their labor more than was necessary to maintain themselves in health and strength, there was a strong economic reason for keeping these slaves, in the service of the conquering tribe or lordships, or places of butchering them on the spot in reserving their unutilized brawn. (See SLAVERY.) Despite the evil features of slavery thus established it was an inevitable stage in development, and the strongest minds in the period of its economic supremacy could scarcely imagine that any organized human society could continue if slavery ceased; the slaves themselves, though in such cities as

Athens, Carthage, or Rome rarely were numerous than their masters, sincerely thought of achieving their freedom. But with the growth of private property, the break-up of the old ties of kin, the increase of wealth, and the establishment of heredity and residence as the basis of representation in the ancient oligarchies, misallied sometimes democracies, the division into classes and castes took shape, and these class-struggles began to exert which, in one stage or another, have since recorded the history of civilization. At the same time the extension of trade marked the rise of the merchant class on the shores of the Mediterranean and elsewhere, whose full influence was not to be felt until many centuries later.

Rome was speaking in general terms, the last of the great slave-supplied civilizations, and never, since private property was established, did the permanence of any empire seem so completely assured. But slavery became economically unprofitable. The great slave-worked estates in Italy and other countries, which had built up the wealth of the Roman nobles, had fallen into economic decay. Barbarians from without and insurrections from within broke down the fabric of Roman domination, and the second great form of human subordination to the possessors of property was established. Serfdom across a slavery disappeared and the feudal system, with its complementary institutions, manorial and manorial, obtained control over Western Europe. As slavery had become economically unprofitable, so, in turn, serfdom, with the various classes which it required, gradually ceased to afford sufficient outlet to the social and economic forces that invention and the greater knowledge of the planet called into being.

Rise of the Modern Wage-system.—By degrees free individual owners and craftsmen formed the mass of the working population in the European nations which had grown up on the ruins of the Roman empire, although this subordination took place at widely different dates in the various countries. It is from this period that the more direct analysis of modern society from the socialist standpoint begins. Throughout history, side by side with the class-struggles, the ideas of collectivism, derived from the old communal societies, and of complete individualism, the direct outcome of private property, had been in more or less acknowledged conflict. With peasant cultivators in the country and free craftsmen in the cities the individual form of private property received its highest development. At no period can it be said that this personal independence for the producing class was universal in any community; at all times the propertyless retainers, wage-earners, or serflike dependents accompanied the dominant form. But at the end of the feudal period in Great Britain the individual peasants and individual craftsmen were sufficiently numerous to give the tone to the whole industrial system. The man who worked upon the land and the man who worked at his trade were both, in the main, owners of their soil, their tools, their products which they produced for their own use or for that of their neighbors in the immediate locality. Owing to a series of historic and economic causes, these free individual owners and craftsmen were gradually deprived of their private property and independence, and were driven to produce as wage-earners in the employment of others. The only freedom left to the propertyless man was that of selling his power to labor to some one else who paid him for his service, and used him in conjunction with others to produce goods, no longer primarily for use but for exchange. In the whole previous history of mankind production for exchange and profit had been the exception; now it became the rule. The personal relations which, in the main, had dominated over the old civilizations were transformed by degrees into more pecuniary relations, and thenceforth pecuniary considerations became supreme in society.

Characteristics of the Modern Competitive System.—This economic change, though eventually complete, was of course gradual, and at first its effect was not perceived. Instead of individual production, generally for individual use or with a view to the local market, only the surplus coming into exchange after personal wants were satisfied, production itself assumed a social form, and the local market widened into the national and international market. A class had arisen out of the downfall of the feudal system unlike any class which history before had noted. The members of this class were free in the eye of the law, and possessed, nominally at least, full liberty to do what they pleased; but in practice, having no property of any kind, they were compelled to sell the sole possession left to them, the power to labor in their bodies,

to those who were in a position to purchase this their only commodity by the payment of daily or weekly wages. The payment of wages by no means began with the decay of feudalism; that form of remuneration for services rendered has itself a history extending over many centuries. But the difference between the wage-earner who accepted wages from others in the intervals between laboring for himself and the wage-earner for life, between the independent property-owner and the propertyless hind or "hand," is a difference not only of degree but of kind. The former was, on the whole, economically free, however badly he might be paid in mere money; the latter is economically a mere dependent, no matter to what point his wages may temporarily rise. These wage-earners employed by a master who had accumulated capital by commerce, the slave-trade, or piracy, worked together in co-operation in the workshop. They produced, primarily in social combination, articles of social use, for a social purpose, in the shape of exchange. But these workers had no share in the ownership of the raw material, no say in the quantity or quality of the articles produced, no control over the finished product, which belonged to the master. They received in the shape of wages that which represented on the average their cost of subsistence, in accordance with the standard of life of their class, so long as their employer required their services. What then had happened? A great and crucial change had been brought about. The individual form of production had been transformed into a social form of production; but the form of the ownership of the articles thus socially produced, as well as the control over their exchange, remained in the hands of the individual master or employer. Society at this stage—and the process can be traced at various periods in the development of all civilized nations—passed from an economical condition in which production as well as appropriation and exchange were in the main individual, to a condition of society in which production became social, but appropriation and exchange remained at the entire disposal of individuals. This manifestly involves a direct economic antagonism, and that initial antagonism lies at the root of all the antagonisms of the modern system of capitalist and wage-earning production for exchange and profit. Competition now ruled the market. Competition by free, propertyless wage-earners below; competition for increased profit by capitalists and employers above. The latter were driven by the very necessities of their existence to sweep aside the old local restrictive laws of the Middle Age period; and, as they gained strength, they were likewise impelled to substitute their own commercial control in politics for that of the classes which had hitherto been supreme. From this time forward all improvements and inventions went into the hands of the capitalist class and were shared by them, though much against their will, with the landlords.

Such was the course of events in Great Britain, where the economic transformation was soonest effected, the removal of the people from the individual or collective ownership of the soil having first been carried out. Geographical position and the character of the people favored this earlier development in England, but all civilized countries have followed, or are following, along the same road. Not, however, until the end of the eighteenth century, when steam and the great machine industry became the dominant factors in production, was it possible for the owners of the capital and machinery to obtain complete control over the wage-earners, and to marshal the industrial army under their management in disciplined array. With the factory industry, founded on the inventions of Watt, Hargreaves, and others, it may be said that the last great system of human slavery was firmly established, and wherever it has been allowed to flourish unchecked it is unquestionable that the cruelty and physical degradation by which it has been invariably accompanied fully equal, if they do not surpass, in horror the records of the old chattel slavery and serfdom. The British official blue-books show, indeed, that at the end of the eighteenth century and the beginning of the nineteenth, when unrestricted freedom of contract prevailed between the owners of the means of production and the workers, women and children, to say nothing of men, were treated with more entire disregard for common humanity than were slaves or serfs at any time whatever. Similar causes have produced like effects in other countries, and the condition of the working population in the great cities on both sides of the Atlantic, as set forth in official reports, proves that comparatively little has been done to remedy the evils which are inherent in the competitive system of wage-earning. At

the same time the limited market of the Middle Ages has been converted into a universal international market. Even the nations that resorted to the most stringent restrictive tariffs have been unable to extricate themselves from the great market of the world, which capitalism has steadily extended since the discovery of America. Commercial wars have but served to expand the ever-widening circle of international commerce, and the demand for fresh markets to meet the growing output of commodities, due to the increasing power of machinery, has been the means of pushing expeditions into the remotest parts of Asia and Africa. Capitalism, therefore, in pursuing its inevitable course and in working out the law of its being, like the great slave-supported civilizations of antiquity and the feudalism—by no means confined to its European manifestation—which followed, has unconsciously prepared the way for a closer understanding between the inhabitants of this planet than had ever before been possible. The long slow movement of economic development which arises out of the institution of private property is thus approaching its close, and we are on the threshold of the greatest and most crucial transformation that the world has ever seen. To convince the dominant classes in every country that such a transformation is inevitable, while educating and organizing the producing classes, so that they may consciously and intelligently take advantage of the opportunities which they inherit from the long martyrdom of man to the forms of production and exchange—such is the task of the advocates of socialism.

It has been seen that when European society in the Middle Ages changed from the form of production by individual free men for individual use, only the surplus coming into exchange, to the form of production in which groups of wage-earners worked in social organization under employers, all the goods being made for the express purpose of exchange, no similar change was made in the ownership of these products. That remained in the hands of an individual as before, who competed with other individuals, similarly placed in economic control of nominally free workers for the sale of his products. That which distinguishes this capitalist system of production from all previous systems is that it is carried on primarily for profit and exchange. Goods are of no immediate use to those who produce them. They are made to go upon the market under the control of the employer who in order to keep his business going must sell them for cash in competition with others, who likewise sell for cash; and, in practice, he can only hold his place by steadily increasing his turnover. Cheapness being the determining force in the bitter commercial conflict of the markets of the world, each producer or manufacturer is compelled to cut down his cost of production to the lowest point possible in order that he may be able to undersell his rivals and thus enlarge the scope of his trade and therewith his personal profit. So early as the middle of the seventeenth century the great economist Sir William Petty could speak of "the trade of the world" as falling to the seller of the cheapest products. Assuming free competition to exist, this is even more true now than it was then.

Economic Antagonisms under the Modern Industrial System.—What, however, is the law which governs the exchange of commodities under the capitalist system of free competition—commodities being articles of recognized social use in the social conditions of the time, produced primarily for the purpose of profit and exchange? Such exchange is on the average conducted on an equality, and the relative value of commodities so brought forward for exchange is governed by the amount of social labor which it takes to produce them, or which is incorporated in them. It is impossible to tell whether a bushel of wheat is the product of the best or the worst land, or whether a bale of cloth has been made by hand or by the most improved or by inferior machinery. Neither is it possible to establish directly how much social labor is embodied in the articles so brought forward for exchange. This can only be arrived at indirectly, by way of such exchange and through the higgling of the market. But the amount of social labor necessary on the average to produce the two articles exchanged comes behind both parties to the transaction and settles the terms on which business will be done. Any reduction in the average amount of social labor incorporated in either of the commodities will reduce its value to a proportional extent relatively to the other. Gold in present conditions being, when dug from the bowels of the earth, a representative of incorporated social labor value, serves as a medium of exchange

and also as a standard of value for the various commodities; the ups and downs of value due to variations of demand and supply at particular periods are averaged over the whole, and do not disturb the level of exchange on the basis of incorporated social labor.

The free laborers without private property who are obliged to sell their labor-power as a commodity in order to live exchange it on the same basis as other commodities. Its value is regulated by the amount of social labor which, on the average, is necessary to keep the laborers alive on the ordinary standard of life in their trade in the country where they reside. This amount they receive from the employer in the form of money-wages, with which they in turn buy their food, clothing, housing, and the like. So far the exchange is conducted on the principle of all exchange of commodities. But the special commodity which the wage-earner sells—his power to labor, namely—produces in the course of the day or week or month considerably more value than the worth of the wages which he is paid. From this surplus labor-value incorporated in commodities the employer derives his profit, the landlord his rent, the commission-agent his brokerage, the banker his interest, and so on. It is the unpaid labor of the wage-earners—the labor which they give in excess of the value of the wages they receive—that enables the capitalist class and their associates to pile up riches and capital. Although individual capitalists may run risks, there can be no risk for the class as a whole. A profit for them as a class is absolutely certain; but in order to enhance this profit in circumstances where they are pressed by the competition of their fellows, individual capitalists, and not infrequently the whole class, have naturally endeavored to reduce wages, to lengthen hours of labor, to introduce improved machinery, and to turn out as much goods as cheaply as possible, so as to obtain by their superior cheapness (due to the lessened amount of social labor embodied in a given quantity) a larger sale. The wage-earners being obliged, until their combinations are very strong and even afterward, to compete with one another for the sale of their sole commodity, labor-power, which will not keep unless rapidly sold, often accept lower rates of wages because they must do this or starve. The success of the employer seems a necessity of existence to them, and a large employer of labor for profit is often regarded as a public benefactor; but it is manifest that the interests of the wage-earning class and the capitalist class can not by any possibility be in reality identical, though it may be and is to the temporary interest of a particular set of wage-earners that their own individual employer should be successful. Those who are contributing of their vital strength and health in the form of unpaid labor to build up fortunes for others are, of necessity, whether they themselves recognize it or not, in a position of direct class antagonism to those others, however much this antagonism may be disguised or glossed over; but this class antagonism between wage-earners and capitalists or, to use the wider French terms, between proletariat and bourgeoisie, is itself the direct result and the inevitable human expression of the conflict already noted in its earlier and simpler strife between the social form of production and the individual form of appropriation and exchange.

Out of these two initial antagonisms, however, others arise in their turn. The factory industry, for example, and the mining industry, and agriculture carried on upon a large scale with machinery, call for the most thorough organization, and anything in the shape of unpunctuality or dereliction of duty on the part of the employees is severely fined. It is absolutely essential, from the profit-making point of view, that there should be no waste of time in business hours, and that the whole of the plant, mechanical and human, should work on with unvarying regularity, as if the various parts were dovetailed into one another. This perfection of organization and machine-like co-operation has been secured under the capitalist system to a degree which beforehand would have seemed quite impossible, and great works employing thousands of men and women produce from year's end to year's end with scarcely a break. This complete organization in the factory, the workshop, and the like finds its correlative opposite in the utter anarchy of the exchange at the time when competitive capitalism is in full swing. Each factory at that period is concerned solely with its own output, each mine or each farm with its own product; the object of all being to turn out as much as they can upon the market as quickly as possible, with a view to obtaining as large a profit as may be while trade is flourishing.

Norris takes the least account of the proceedings of his neighbor, being too deeply engaged in fighting for his own hand. Thus the complete negation of production in the factory leads to complete anarchy in the exchange. Further, in order to continue his operations successfully, each manufacturer or producer of any kind must convert his finished goods or products into money before he can begin again, credit merely disguising this operation. He can not exchange his products direct for the products of his brother producer, even for the purposes of his own consumption. They must be converted into money first in every case. If the circulation of the commodities be in any way impeded, then it at once appears that there is a difficulty in this way of conducting business—that money can not at once be realized for those goods which have been thus thrown upon the market. Money, in fact, then becomes temporarily a means for hindering exchange instead of for facilitating it, and it is apparent that in such conditions there is a clear antagonism between commodities and gold, or its equivalent in convertible paper. Again, the tendency of modern society to gather the population into great towns having no rural interests has developed another antagonism, as a partial result of those already specified, between town and country. The interests of the two are frequently found to be antagonistic instead of harmonious, and one of the great problems of the future will be to secure or to bring about a co-operative agreement between these two great departments of human life and industry. Moreover, the capitalist system of production has developed an antagonism between the sexes, and even between parents and their children. This antagonism arises, like all the rest, from economic causes. The family, in its ancient sense, has been disrupted, and men are met in the whirl of competition for wages by women who, owing to a variety of causes, compete with them on a lower standard of life for a lower rate of wages. Children, in like manner, are in many countries brought in to compete against men and women. A man's foes in this instance are literally they of his own household; though in this as in other cases the workers themselves do not perceive the mischief which is being done to themselves, and at the same time to the whole community. Of the antagonism between skilled and unskilled labor, between casual, unorganized workers and trade-unionists, between employed and unemployed, it is unnecessary to speak; these struggles are too apparent to all who study the history of society in the nineteenth century.

The Cause of Commercial Crises.—Ever since the capitalist system became the predominant form of production in civilized countries, ups and downs of trade, periods of inflation alternating with periods of depression, have been the rule. So much is this the case that they are taken for granted by men of business, who base their calculations upon such variations, but are seldom able to grasp the causes of them. (See COMMERCIAL CRISES.) These sudden collapses of trade are generally regarded as being as much beyond human control as an eclipse or an earthquake, a tornado or a long frost. They are, nevertheless, indisputably the result of social causes, which, when they are understood, can be regulated and controlled. The most remarkable feature in all the successive catastrophes from 1815 to 1893, before as after the universal use of steam-vessels, railways, and telegraph cables, was that they were preceded and accompanied by an excess of products in every department. In all previous economic epochs, as in barbarous countries at the present time, general depression of trade has arisen from drought or from flood, from bad harvest or from pestilence among men or cattle; in any case from an insufficient supply of necessities. Only among the most civilized peoples does an excess of what the world requires become an immediate cause of stagnation, and the reason why thousands of workers in all countries are prevented from earning their livelihood. At this time the power of man to produce wealth in every department of industry, including agriculture, is far greater than it has ever been before. Hence this enhanced productive capacity seems in some way to have become at intervals a serious hindrance to production and exchange. Whence does this arise? The control of all the great means and instruments of production, the direction of the huge industrial machines, the arrangement of the amount of labor to be devoted to great public works or to the output of commodities, the initiation of fresh enterprises and the adoption of new inventions—all this rests with the capitalist class and the managers whom they employ. When, owing to various causes, a time of good trade begins, all the financiers, employers, manufacturers, mine-owners, and so forth, hasten with one accord

to take advantage of the days of prosperity rendered the brighter by contrast with the previous gloom. The unemployed workers, who are an unfortunate necessity for the due functioning of the capitalist system, are absorbed into activity, the demand for goods from every quarter increases, prices (not values) rise all along the line, great works, such as railways and canals, are again undertaken, huge vessels are laid down in all the ship-building yards, demand in one direction enhances demand in another, wages are paid on an almost unexampled scale, and goods are turned out in greater abundance than ever before. But at the very moment when the expansion is at its height the collapse begins. Suddenly a difficulty arises in disposing of one set of goods for money, a large capitalist has to press his bills or his commodities upon the market in order to realize their value for immediate cash. Others pursue the same course. There is a general rush to sell. The antagonism between gold and commodities is felt in earnest. Prices fall more rapidly than they had risen. Workmen are discharged, factories are shut down or run on short time, furnaces are blown out, shipping-yards are closed, railways are suspended. A crisis has begun; the incapacity of the capitalist class to handle effectively the machinery of modern civilization is proclaimed to the world, and bankruptcy and stagnation at once follow. The social form of production revolts against the individual form of the exchange.

Tendencies toward the Socialization of the Means of Production.—At this point socialism comes in and, having completed its analysis, shows how the antagonisms inherent in the capitalist system must be solved by making exchange social, as production is social; by establishing co-operative production and distribution in the place of competitive wage-labor and competitive capitalism. That which in itself is desirable from the *a priori* point of view, society is even now anarchically and unconsciously working up to. The entire series of differentiations arising out of the establishment of private property having been passed through, the complete reintegration of collectivism or communism on a higher plane is even now in progress, without the vast majority even of intelligent and educated men being in the least aware of it. Socialism is asserting itself in modern society by reason of economic causes, as capitalism owed its predominance before to the action of the same causes.

Thus the capitalist class in all civilized countries have championed competition and unlimited right of free contract between the wage-earners and their employers; but the hideous results of this scramble in the shape of physical degeneration, with accompanying mental and moral degradation, alarmed even the modern state, and laws have been passed to limit the freedom of the masters and servants alike in order to check in some degree this serious deterioration. At the same time, and as if in spite of themselves, modern statesmen, while upholding stoutly the doctrine that everything is best done by private effort, have been impelled to set on foot a number of public services, national and local, whose duties are continually extending in the face of all the protests raised by the older school of economists. Moreover, there is a growing feeling in every civilized nation that the hours of labor as well as the wages of the workers in these public services should no longer be governed by the law of competition for subsistence wages, but that the governments and municipalities should assure to their servants a day's work of no more than reasonable length in proportion to the intensity of their toil, and wages adequate to obtain for them a decent standard of life. This view, though still far removed from socialism, is manifestly a portion of a movement which is leading toward it. The public services are, in short, being transformed in the interests of the workers with the assent of the whole community. In like manner the public health, the improvement of the conditions and surroundings of the workers of the cities in particular, in order to secure to the working population a better physical development and some enjoyment of life—this also has become a matter of general concern to which national laws and state and municipal ordinances give expression. Such measures as these may be reckoned as conscious though small endeavors on the part of society to correct the evils of existing anarchy and to prepare the way for a better system.

Far more important, however, are the unconscious strivings toward the new period. On the one hand, the formation of companies, consisting of many bondholders and shareholders, to carry out great public works, and the transformation of private concerns engaged in all the depart-

ments of production and distribution into similar companies, form a distinct move in the direction of socialization. The individual employer is merged in a multitude of shareholders, and the pecuniary relation becomes the sole and only tie between employers and employed. This company form is manifestly an unconscious step toward socialism, seeing that these great organizations and corporations, whether for production or for distribution, are controlled and directed by managers and boards of directors who, regarding the matter solely from the economic point of view, might as easily be appointed by the workers to carry on the business in the interest of the community and the workers themselves as be nominated in the way they are to-day by shareholders who, in the majority of cases, have no direct knowledge of the affairs from which they derive an income, and perhaps have never been within hundreds or thousands of miles of the place where "their" factories, or mines, or works, or railways, or lands are situated. So soon as this economic possibility is generally recognized the final change has begun; but at the same time that this modification from the individual form into the company form of ownership and appropriation is taking place, the private firms and the companies are alike abandoning competition for co-operation. Banks are being consolidated, nationally and internationally; shipping companies are agreeing not to compete; joint-stock associations form trusts and "rings." In the U. S., where unregulated competition attained perhaps its highest pitch of development, this form of industrial and financial monopoly has unquestionably become more striking than anywhere else. This process is going on in all civilized countries. Moreover, the introduction of improved processes of manufacture, which was formerly hastened by individual anxiety to compete on better terms, is now hindered by the disinclination of monopolists to disturb vested interests with which they are well content. Thus the capitalist system of production no longer favors human progress, but heads back the economic evolution, and brings about periods of recurrent anarchy in every department of industry. Capitalism therefore is making plain the way before the face of socialism by its unconscious but inevitable institution of monopoly. The other human side of this great economic antagonism is likewise unconsciously organizing its forces to capture these monopolies. Throughout the civilized world the workers are beginning to see that whatever be their nationality, whether they are men or women, skilled or unskilled, their true interest lies in the thorough combination of labor with a view to the final overthrow of the wage system. Socialism is accepted only by the minority, but its principles are spreading daily, and ere long it will be universally recognized by the toilers that mere strikes, however well organized, are almost as hopeless a method of struggling against the domination of capital as was the old plan of machine-breaking. The machines were used against the interests of the workers; therefore they, in their ignorance, tried to destroy them, instead of combining to capture them. The great monopolies are in like manner used against the workers; therefore they, in their ignorance, attempt to strike against them, instead of using the political machinery at their command to obtain possession of and manage them. But with national and international organization come also education and full appreciation of the facts of their social surroundings. Then the producers will constitute practically the whole community, can move forward in fraternal solidarity and educated comprehension to take advantage of the economic conditions which have been prepared for them. Each nation must of course follow the route marked out for it by its previous economic history and its geographical position. It seems certain, however, that no matter by what means it may triumph socialism will begin with the public services and the more highly developed company forms, and proceed until production is last organized on the land which has not yet reached the company form in any country.

With the establishment of national and eventually of international socialism, mankind resumes the definite control over the means and instruments of production, and masters them thenceforward for all time instead of being overmastered by them. By such co-operative industry, whose power over nature is increased by each fresh invention and discovery, a carapace of repression is lifted off from the faculties of each individual, and wealth being made as plentiful as water by light wholesome labor, all freely contribute to increase their own happiness as well as that of their fellows. Human nature assumes a new and higher character in a

society in which the surroundings are such that life is not an endless struggle against the pressure of want and the temptations of money. Instead of the personal, limited, introspective individual ethic is the social, altruistic, broad ethic in which the duty toward society necessarily occupies the highest duty toward a man's self. Women, instead of economic and social subjugation, will assume her place as the social equal of man. So far, therefore, from individual initiative and personal freedom in the highest sense being limited and straitened, human beings will have the opportunity for attaining to a level of physical, moral, and mental development such as the world has never seen. The golden age of human society is, indeed, not in the past but in the future.

Such is a statement, obviously abstract and incomplete, of the theories of scientific socialism. There have been various schools of socialism, but the theories above set forth are accepted by the overwhelming majority of socialists in all civilized countries, and the differences which arise are chiefly on points of tactics; though in this respect an exception must be made with regard to Christian socialism who connect their socialist theories with the founder of the Christian Church. The utopian socialism which has striven, and even now attempts, to establish little oases of co-operation amid the existing wilderness of competition and anarchy, is slowly merging itself in the worldwide sweep of scientific collectivism. That such great thinkers and writers, however, as Saint-Simon, Robert Owen, and Fourier should in part have taken this view only shows how difficult it is for the highest minds to grasp the tendency of the facts around them. The time is ripe for the complete analysis of the fully developed economic forms. The anarchists, who sometimes call themselves socialists, are so fearful that universal co-operation and collectivism will crush the freedom of the individual that they not infrequently drift into the advocacy of sheer reaction, and preach the gospel of individual destruction, which is really the creed of individualism run mad. It is needless to say that this revolt against all authority, even that which is voluntarily accepted for the purpose of securing the full advantage of organized industrial co-operation, is in direct opposition to socialism, though often confounded with it. The destruction or transformation of the present government and the abolition of wage-labor, which socialists look forward to as the next stage in the development of human society, will give free outlet to the individual; while the attempt to secure the supremacy of the individual by mere individual effort, if it could be realized and made effective, would but deprive mankind of the vast collective powers of production which are now available. Socialism and anarchy are directly opposed, since as in fact and in fact; their only point of agreement is that each is in antagonism to our present society.

Socialism manifests itself in the shape of an organized, disciplined party chiefly in Germany, where its development since 1870 has been remarkable. In that country the socialist have now a recognized political force, and their action is in the main guided by the views set forth in this article. If they continue to progress in the future at the same rate as in the past, there is every reason to believe that within the next generation they will be the dominant party in the state and thus able to give full expression to their opinions. It is most probable, however, in spite of appearances, that the last of the international socialist movement will be with the English-speaking peoples, whose greater resources, development and superior adaptability in politics, together with their geographical extension, give them opportunities such as the Germans can never possess. In France the movement has advanced since about 1890 with amazing rapidity and the country which was the first to manifest in the world a genuine rising of the modern proletarian will have its full share in molding the great international socialist movement. All through Europe and at length in the U. S. socialism is recognized even by the dominant classes as a coming power. The divorce of human solidarity, of international fraternity, and worldwide co-operation for the benefit of the present and future generations, appeal to the sentimental aspirations of the large number who have little inclination to examine into the scientific theories on which these doctrines are based; who, however, having formed a high opinion of human intelligence, are apt to resent any attempt to demonstrate that socialist schemes have hitherto been little better than mere theories in their social and economic relations. Now, when socialism is translating itself into action in the

direction of palliation of existing evils, and toward international socialist congresses, as well as the promulgation of recognized socialist on public councils and boards, have shown that definite, practical efforts are being made to hasten the attainment of complete emancipation for all, poor and women of all nationalities and of every creed are but to investigate the causes of the class-war which is raging around them in the midst of profound peace, and to believe that socialism furnishes the only possible solution of the conflict.

H. M. HODMAN.

Social War [—*guerra*] is from Lat. *bellum*, pertaining to, generally, or allies, civil, or *bellum*, fellow, comrade, ally; in Roman history, the name applied to the wars (c. 90-80) between Rome and her Italian allies. The latter, who had for nearly two centuries shared the burdens and dangers of the republic, were justly demanded admission to the privilege of the franchise. After the assassination of M. Livius Drusus (91 B. C.), who desired to grant citizenship to the Italians, the allies, including the Marsi, the Peligni, the Lucanians, the Samnites, and many others, rose in arms and proclaimed a new republic. A bloody war followed, and notwithstanding the great victories of Sulla, Marius, Lucius, and others, the Romans were compelled to make many concessions, and in the end the Italian received the franchise, though they did not gain their due share of political influence on account of the restriction that forbade their voting in any but a specified number of tribes. Over 400,000 men are said to have been slain in this war.

Society Islands: a group of islands in the South Pacific Ocean, the principal part of what is officially known as the French establishments in Oceania, which also includes the Marquesas, Tuamotu, Gambier, and Tuluu groups and Rapa island. The Society islands lie between lat. 16° and 18° S. and lon. 145° and 155° W. They consist of one large island, Tahiti (q. v.), and a number of small isles, comprising altogether an area of 665 sq. miles, with 16,000 inhabitants. The islands are mountainous. In the center some of them rise to the height of 6,000 or 7,000 feet, but they all have a belt of low land extending between the foot of the mountains and the sea, and they are generally surrounded by coral reefs. The soil is very fertile and the climate delightful. All tropical fruits grow luxuriantly, and European fruits which have been introduced succeed well. The inhabitants are Polynesians; most of them are Christians. The chief town and port, and capital of the colony, is Papeete. The chief exports are mother-of-pearl, copra, cotton, and vanilla. Sugar and coffee also are produced.

Revised by M. W. HARRINGTON.

Society of Friends: See QUAKERS, Society of.

Society of Jesus: See JESUITES.

Socin, Abraham, Achaean; Orientalist; b. at Basel, Switzerland, Oct. 18, 1844; studied at Basel, Göttingen, Leipzig, and Berlin; Professor of Oriental Languages at Basel, Tübingen, and Leipzig successively; author of *Die Hebräische des Alten Testaments* (1878); *Hebräische Palästina und Syrien* (1879); *Hebräische Grammatik*, 1883 (Eng. trans.) 2d ed. 1890; *Die hebräische Dialekte* (1882); *Arab. Sprachlehre* and *Redensarten* (1882); *Die Genesis übersetzt* (with Kaestrich), 2d ed. 1891; *Kurze Semitische Sprachlehre* (1897-1900). B. I. W.

Socinianism and Socinism: the historical designations of the advocates and doctrines of the most thoroughly organized system of anti-Trinitarianism that has ever existed. In the U. S. the names are seldom used, having long since given place to Unitarianism and Unitarianism, names of much wider scope.

I. HISTORY.—The Trinitarian doctrine, as defined in the Nicene and Athanasian creeds (see article GOD), a gradual development of three centuries, was held almost universally after the time of Justinian as a fundamental element of Christianity by the ancient churches, Eastern and Western, and by all the churches springing immediately out of the Reformation. At the era of the Reformation the first anti-Trinitarians were certain individuals who appeared at different points, chiefly among the German Anabaptists. Among these were Martin Colliarius (b. in Stuttgart, 1496, educated at Wittenberg, at first a disciple and resident of Luther, at Basel, 1546), John Denck (d. at Basel, 1529), Lewis Heiser (at first a fellow laborer of Zwingle, executed for polygamy at Constance, 1529), and John Campanus (studied at Wittenberg, and died after long imprisonment at Cleves, 1574). One of them, named Spiritus, supposed by Dr. Howe to have been Adam Pastor, a Prussian Anabaptist,

first carried Unitarian doctrine to Poland in 1546, which afterward became the seat of the denomination. Servetus in 1531 published his first work, *De Trinitatis Erroribus*. In 1532, at Haguenau, he published his *Dialogorum de Trinitate, Libri duo*, and at Vienna, in 1553, his *Christianismi Restitutio*. He was then imprisoned by the Roman Catholics for heresy. Escaping, he went to Geneva, where he was burned as a blasphemer and disturber of the peace. His heresy was neither Arian nor Socinian, but apparently a more consistent assertion of the deity of Christ than that of his enemy, Calvin.

In Italy, where during the preceding century religious faith had been generally superseded among the educated by a semi-pagan humanism, many prominent persons, affected by the religious excitement of the Reformation, adopted rationalistic views. In the second quarter of the sixteenth century, at Vincenza, a small town in the district of Venice, a society existed consisting of persons denying the divinity of Christ and related doctrine. It was dispersed in 1546, previous to which, it is said, Bernard Ochinus and Lælius Socinus joined it. The latter, born in Sienna in 1525, was educated as a lawyer, but devoted his life and great talents to theological speculations. He has been correctly designated "the spiritual father of Socinianism," while his nephew, Faustus Socinus, was "the founder of the sect." He remained ostensibly a member of the Reformed Church at Zurich, although by personal influence, wide correspondence, and extensive journeys disseminating his opinions. He visited Poland in 1551, and again in 1558, and died in Zurich in 1562. His nephew, Faustus Socinus (1539-1604), filled with his uncle's spirit, but with a much more elaborate and consistent system of theology, settled first in Basel, was called into Transylvania to assist Blandrata in his controversy with Francis David, and settled permanently in Poland 1579. After the removal of Spiritus to Poland in 1546, Francis Lismanin, a Corsican monk and confessor of the queen, Bona Sforza, had been converted to Unitarianism in 1551. He was soon re-enforced by Peter Conezius and George Blandrata, a native of Piedmont, who through the influence of Lismanin was appointed physician to the queen. At this time all the Protestant synods held in Poland embraced promiscuously the ministers of all the Reformed societies, whether Lutheran, Calvinistic, or anti-Trinitarian. In 1565 the latter were expelled from communion, and forced to form an independent ecclesiastical organization. The Unitarian Church thus formed comprised persons of very dissimilar opinions. "They all concurred in maintaining the supremacy of the Father, but with respect to Jesus Christ, some thought him to be a God of inferior nature, derived from the Supreme Deity; others held the doctrine of Arius, conceiving him to have been the first created Spirit, who became incarnate with a view to effecting the salvation of mankind; while a third party believed him to be a human being. These last were divided into two classes—the one believing the miraculous conception of Jesus; the other considering him to have been the son of Joseph as well as of Mary." Socinus held that although a man only, he was entitled to divine honors, since his exaltation at the right hand of God and assumption of the government of the Church, while others, pre-eminently Francis David, denied this.

From the advent of Faustus Socinus these various elements were, through his superior genius, wrought into a homogeneous ecclesiastical organization, and brought into substantial agreement with the theological views of his uncle; and ultimately the denomination and system of theology took their historical designation of "Socinian" from these great leaders, but during their earlier history they were called Pinczovians, from Pinczow, the place of their first settlement, and afterward Racovians, from Racow, a town built for them by a Polish nobleman, and their metropolis of learning and influence. They flourished exceedingly for the greater part of a century, converting to their views many of the Polish nobility; they established colleges which attained great reputation, attracting multitudes of Roman Catholic and Protestant youth, and they produced a number of theological speculators and polemics of great learning and ability, whose works attained a vast circulation. In 1563 Blandrata went into Transylvania to attend the prince, John Sigismund II., as a physician, where he succeeded in bringing over to his own opinions Francis David, at that time superintendent of the Reformed churches. These together secured a large following, but the prosperity of the sect was greatly impaired by the bitter

controversy which subsequently arose between Blandrata and David, the former affirming and the latter denying that divine honors are to be paid to Christ. David was condemned by the diet held at Weissenburg in 1579, and died in prison in November following. After a long struggle with their opponents the Socinians were suppressed in Poland in 1658, the centennial of Blandrata's arrival. Those who refused to renounce their opinions went into Transylvania, Hungary, and Prussia, and the majority into Holland, where they were merged with the Mennonites and Low Arminians. Of churches of their order in Transylvania there were 108 in 1887, with nearly 60,000 registered members.

A first catechism was written by George Schoman (d. 1591). Faustus Socinus (d. 1604) left another incomplete. Valentine Schmalz and Jerome Moscorovius produced the *Racovian Catechism*, the standard of the Socinian churches. It appeared in Polish in 1605, and was published in German 1608, and in Latin 1609. An English edition, produced in Amsterdam 1652, was ordered to be burned the same year by the English Parliament. It was again translated and published in English in 1818, with a history of the Polish Socinians by Dr. Thomas Rees. After their expulsion from Poland, Andrew Wissowatius and other learned men, finding refuge in Holland, collected their more important writings and published them in 8 vols. folio, comprising the works of Socinus, Crelius, Schlichtingius, and Wolzogenius; to which a ninth volume has been added, containing the writings of Przypcovius and Andrew Wissowatius, and a tenth volume, containing the works of Brenius. This collection is known as the *Bibliotheca Fratrum Polonorum*.

II. DOCTRINE. 1. *The Scriptures*.—Socinians admit that a supernatural revelation is essential as a means to effect the salvation of men. They regard Christianity as a new law, revealed and executed by Jesus Christ. This revelation is contained in the Scriptures of the Old and New Testaments, and especially in the latter. These are authentic, sufficient, and perspicuous. Yet, as they can contain no elements inconsistent with reason, they are to be interpreted in a sense agreeable to reason; which rule of interpretation in their hands led practically to the conclusion that although containing a divine revelation, and virtually infallible, they contain minor errors.

2. *Theology*.—(1) The divine unity is inconsistent with personal distinctions. (2) Free self-determination is more fundamental in the divine nature than either justice or love. (3) By the act of creating the world, God has voluntarily limited his omnipresence as to his essence, and by creating free agents he has voluntarily limited his power and his knowledge, because free will is self-determined, and future contingent events are not the objects of knowledge. (4) "There is no such justice in God as requires absolutely and inexorably that sin be punished. There is, indeed, a perpetual and constant justice in God, but this is nothing but his moral equity and rectitude, by virtue of which there is no depravity or iniquity in any of his works." (Socinus, *Prælect. Theol.*, c. xvi.) Hence he can pardon any repentant and reforming sinner without a satisfaction to justice. (5) The Holy Ghost is the impersonal power and efficacy of God.

3. *Anthropology*.—The guilt of Adam's sin is not imputed. Man was created naturally mortal, and since the time of Adam has gradually acquired an hereditary tendency to sin, which of itself does not involve guilt. Responsibility is limited by ability. Man, animated by the promises of God, is able to turn unto God; and when he does so turn and believe, God seals his promises more and more on his heart by the Holy Spirit. *Rac. Cat.*, sec. 5, ch. x.

4. *Christology and Soteriology*.—(1) Christ, as to his essential nature, is strictly human, but miraculously generated by the power of the Holy Ghost in the womb of the Virgin. Hence he was from birth without sin. At his baptism he was supernaturally sealed with the Holy Ghost, and qualified and endowed with authority for his office as Prophet, Priest, and King. He was also taken up to heaven and admitted to the vision of God, and instructed in divine things. While on earth he revealed the will of God to his disciples with divine authority. After his death he was raised to the throne of God, endowed with the divine attributes of omniscience, omnipotence, and supreme dominion. He is the rightful object of divine worship and of invocation. He saves his people as Prophet and King, the office of Priest being merged in the other two. He will judge the world at the last day, and raise believers to share in his own glory. (2) As God's justice demands no satisfaction, Christ's death

never as an exhibition of divine love; it subdues obduracy, soothes hopes by soothing God's promises; it was the necessary means to his resurrection, by which he brings life and immortality to light by an evener demonstration.

3. *The Church and Sacraments*.—The Church they defined as the company of those who believe saving doctrine. As to what this doctrine is, they allowed, within the limits of the recognition of the divine mission of Christ, the largest freedom of opinion. Socinus discarded the term "sacrament," and held that the Supper was the only sacred rite which Christ intended to be permanently observed. The authors of the *Roman Catechism* in its final form teach that baptism and the Lord's Supper are the two Christian rites. These they regard as only memorials and symbols and badges of church membership. They pronounce infant baptism an error, but advise its toleration.

In his practical ethics Paulus Socinus was exceedingly humane—opposed to war and capital punishment. The system of Socinus was remarkable for its radical departure from the traditional theology. Even the English Unitarians of the eighteenth century, who were Socinian rather than Arian, were much more cautious and conservative than Socinus, while the early Unitarians in the U. S. were generally Arians, regarding Jesus as a being *in genere*, and only a little less than God.

LITERATURE.—See, as above mentioned, the *Hilbithum Fidei* of Paulus Socinus; Dr. Tauler's *Life of Socinus*; Dr. Thomas Keen's *Roman Catechism, with History of Unitarianism in Poland* (London, 1838); *De Verbo Elohii* of Hieron. Zanchius (1516-51); *Socinianismus Confutatus* (Amsterdam, 1644) of John Hamrick; *Pauline Evangelium* of Dr. John Owen (Oxford, 1655; vol. xii. of Good's Edinburgh edition of Owen's Works); *Hist. Premon. of Christ*, by Dr. J. A. Dornier (Oly., 2 vol. 11); Princip. Cunningham's *Doct. Theol.*, vol. ii.

A. A. HOOD.

Revised by JOHN W. CHADWICK.

SOCI'ANS, PAYTOR and LELIUS: See SOCIANS.

Sociology [*Fr. sociologie*; from *Lat. socius*, companion (referred to by *deris. socius*, society) + (*Gr. logos*, discourse); the science or natural philosophy of society. More definitely, sociology is the general and fundamental science of society, which occupies itself with the elements and first principles of social phenomena, and leaves to ethnology, demography, political economy, comparative jurisprudence, the theory of the state, the comparative study of religions, and other special social sciences a detailed investigation of particular groups of social facts, all of which have their ultimate interpretation in the underlying and co-ordinating principles of sociology.

HISTORY OF SOCIOLOGICAL THOUGHT.—To some extent society was studied scientifically and philosophically in ancient times. The *Republic* and the *Laws* of Plato and the *Politics* of Aristotle abound in scientific generalizations. Later, Hobbes, in the *Human Nature* and in the *De Corpore Politico*, entered upon an interpretation of society in terms of its internal forces or motives; and Montesquieu, in *Le Esprit des Loix*, laid the foundations of an interpretation in terms of external conditions or environment. But there was no true science of society until the nineteenth century. Auguste Comte, who coined the word sociology, was the first to put together in one conception all the necessary elements of such a science. Plato and Aristotle had not separated the science from the art of politics nor from ethics. Neither Hobbes nor Montesquieu nor the economists had studied society comprehensively in all its aspects, and, notwithstanding the influence of Hume (to whom, as Huxley has pointed out, Comte was indebted for whatever is scientifically valid in his notions of causation), the explanations of society were still to a great extent theological and metaphysical. Comte insisted that society must be viewed as a whole, indivisible and organic, and he desired to found a science of social phenomena in their co-ordinated entirety. This comprehensive sociology he desired to make positive, basing it on a wide observation of facts and freeing it altogether from theology, metaphysics, the revolutionary spirit, and the art of politics. Comte's conception was incomparably superior to his predecessors. Both together made for a time so little impression upon thought that the very name sociology was well-nigh forgotten when Herbert Spencer took it up, and by making a voluminous treatise on sociology an integral part of his system of *Synthetic Philosophy*, established for both the conception and the name an enduring place in the circle of the sciences.

Spencer had worked out his scheme of thought before he knew anything of Comte's, and his sociology had nothing in common with Comte's beyond the general idea and the name. It is an application of the philosophy of evolution to society. Society, like the material world and the living organism, undergoes integration and differentiation. It passes from homogeneity and indistinctness to heterogeneity and difference of organization. Comte used the term social states in a merely rhetorical way, as a cause for social order, and social dynamics as a means for progress. Spencer uses the terms in the physicist's sense. Social states is an account of social forces in equilibrium, social dynamics an account of disturbing and evolutionary changes. Actually the static and the dynamic tendencies are themselves influenced, and the result in society as in the solar system and in the living body is a moving equilibrium. On the physical side therefore Spencer's explanation of society is more profound and scientific than Comte's. At the same time his conception of society as organic is more definite. Without adopting Hobbes's concept of the Leviathan, he finds in society a division of labor not only among individuals, but among groups and organizations of individuals. There is a sustaining system made up of industrial groups, a distributing system of commercial activities, and a regulating system of political and religious agencies. In working out this analogy, however, Spencer, while avoiding the fancifulness of Hobbes, fails to rise to the thought of Plato, who found in this functional organization of society the basis and the true type of the ethical life, and so prepared the way for the conception of society as a means to the perfection of human personality.

The biological-organic conception of society has been made much of by two later sociologists of distinction, namely, A. Schäffle, in the *Den und Leben des sozialen Körpers* (Tübingen, 1875), and Guillaume de Moiré, in his *Introduction à la Sociologie* (Brussels, 1890-9), and in a less degree by Lester P. Ward in his *Dynamic Sociology* (New York, 1883). All these writers, however, lay especial stress on the physical phenomena of society. Ward argues that at a certain stage the natural evolution of society passes over into an artificial and teleological evolution in which society consciously determines its own destinies. De Moiré asks what fact distinguishes society from other organisms, and answers that it is contract, including all understandings and alliances. The Platonic or moral-organic conception of society is elaborated with ability by John S. Mackenzie in *An Introduction to Social Philosophy* (London, 1890).

Much of the best work in sociology has been directed upon a more profound study of fundamental social processes. Gabriel Tarde (*Les Lois de l'Imitation*, Paris, 1890), finds the elementary and distinctively social phenomenon in imitation; Ludwig Gumplowicz (*Der Rassenkampf*, Innsbruck, 1883, and *Grundriss der Soziologie*, Vienna, 1895) finds it in the conflicts, amalgamations, and assimilations of heterogeneous ethnical groups. J. Novicow, of Odessa (*Les Loies entre les Sociétés humaines*, Paris, 1893), has studied exhaustively the phenomena of conflict and alliance; and Émile Durkheim (*De la Division du Travail social*, Paris, 1893) has shown that the division of functions creates not only economic solidarity, but, through reactions upon law and morals, a social and ethical solidarity. Of all these writers it is Tarde, undoubtedly, who has perceived the true and ultimate nature of social facts. Phenomena of any kind, as he points out, can be known only because they repeat themselves. In physics we study repetition under a variety of forms; in biology under the form of heredity, or the transmission of life and characteristics from cell to cell; in sociology under the form of imitation, or the transmission of impulse, feeling, and idea from individual to individual, from group to group, and from generation to generation.

Systematic sociology, however, is not an abstract science, tracing the operation of particular social forces through all their ramifications. On the contrary, it is a concrete science, descriptive, historical, and explanatory, concerning itself with the organization, activities, and evolution of those bands, hordes, tribes, and nations into which the animal and human populations of the world are distributed. Sociology is the fundamental social science, or the science of social elements and first principles, because it isolates the elementary and preliminary descriptive matter which is presupposed by all the special social sciences, whether abstract or concrete.

DESCRIPTIVE SOCIOLOGY.—Systematic sociology begins with analysis, classification, and generalization. It is necessary to observe the elements that are combined in social phenomena, to know the conditions under which they are brought together, and to examine the groupings and organizations that result. The elements of society are all included under the term *population*, which must be studied under its outward aspect of numbers, reproduction, increase, density, migrations, and the intermingling of races and nationalities; and under its subjective aspect of sympathies, antagonisms, tolerances, habits, and traits of character. These internal or subjective elements of society are combined in the subjective aspect, or internal constitution, of society itself—that is to say, in the common sympathy and purpose, the accepted tradition, the public opinion, the general will; in a word, in the social mind. Society as subjective, the social mind, projects itself and realizes itself outwardly in an external organization, which is twofold in form. There is a series of groups which are alike in all important respects, and merely repeat themselves to make up the larger aggregates. This series, which may be called the social composition, includes the family, the horde, the tribe, the town, the county, the commonwealth, and the nation. The other form of organization may be called the social constitution. Its basis is a division of labor, and it consists of associations engaged in different activities, some economic, some political, some cultural, but all co-ordinated in one complex system of mutual helpfulness.

Population.—The study of population in its outward or physical aspect begins with the facts of aggregation or grouping. Animal life and human population are massed in dense aggregates in certain places, in less dense aggregates elsewhere. Comparatively few individuals among animals or men live strictly isolated lives. This physical aggregation is the indispensable preliminary condition to the evolution of society. That there may be communication, companionship, and mutual aid, there must be propinquity and contact. These are ensured by the unequal distribution of food-supplies, the varying degrees of temperature and moisture, the topography and other physical circumstances, making life in some places easier than in others.

Looking still at the outward facts and neglecting for a time the internal factors of sympathy and social instincts, we observe that aggregation is of two forms. Individuals descended from a common ancestry are often found living near each other in and about the place of their birth, as in an isolated village, whose inhabitants have married in-and-in for generations and have never separated. This may be called a genetic aggregation. Other individuals born in many different places, perhaps in widely remote parts of the world, are found assembled and carrying on their life-activities in one place, as in a great modern city like London or New York. This may be called a congregative aggregation. The patriarchal theory of the origin of society assumed that genetic aggregation was the original form. The social-contract theory, logically carried out, would assume that congregative aggregation was the original form. Actually no large community is a genetic aggregation only, or a congregative aggregation only. The vital and mental energies evolved in regions where resources are on the whole abundant expend themselves not only in maintaining the food-supplies by industry, and in perpetuating population by reproduction, but in ceaseless motion, travel, exploration, and colonizing; while on the other hand, from regions where the life-struggle is becoming severe, population moves to more favored areas where the opportunities are greater. Migration is thus a normal phenomenon. Every community loses in this way individuals born within it and receives individuals born elsewhere. Every community thus has a mixture of population elements, which may be called its demotic composition. At the same time every community except colonies, and new cities in the first generation or two of their existence, is perpetuated mainly by its own birth-rate rather than by immigration. Society, therefore, we may say, is normally autogenous. It is for this reason that the assimilation of the foreign-born goes on with astonishing rapidity, even in a country like the U. S., which received from 1820 to 1890 an immigration of 15,427,657 souls.

Turning to the internal or psychical factors of society, the most elementary phenomena of social psychology are simple activities of feeling, perception, and will that involve two or more individuals, namely: (1) Mutual perception and communication, by motions, tones, or speech; (2) recognition of fellow beings of one's own kind or species as

like one's self and unlike all other objects; (3) imitation; (4) conflict; (5) toleration; (6) mutual aid, alliance; (7) mutual pleasure, play, festivity. These mutual feelings and activities constitute association as distinguished from the merely physical phenomenon of aggregation. An important question to be answered through the study of these phenomena is that of the relation of the social to the individual instincts. The notion which Hobbes converted into a classical doctrine, that individual instincts only are primitive and that "the state of nature" which preceded society was "a state of war," of each individual against every other, is not supported by the results of modern research. Among the lowest forms of life creatures do not prey upon their own kind, but upon other species. Even the amoeba, a mere drop of structureless sarcode, discriminates between fellow amoebae swimming near and such favorite food-objects as desmids and diatoms. This recognition of kind and of accompanying acts of imitation begins when a sentient creature identifies the feeling of touching a fellow creature as like the feeling experienced when it touches one part of its own body with another part. Such feelings can not be associated with nutrition because, even though one pseudopodium of an amoeba encountering another should coalesce with it, nutrition would not follow. Therefore, at the dawning of consciousness fellow creatures of the same species can not regard each other as food-objects. On the contrary, they necessarily imitate one another in capturing non-related food-objects, since the touch of a moving part of one is to another a stimulus like the touch of a moving part of itself against itself, and starts like motions. Consequently these beginnings of social feelings and social actions are as primitive as the individual instincts. Among the lowest animal forms, as among civilized men, the struggle for food is normally a rivalry or competition rather than a "war."

Under the pressure of scarcity, however, conflict may at any time break out. Cannibalism has doubtless everywhere had its origin in starvation. Toleration is then re-established by force, not by moral feeling, nor by a conscious calculation of expediency. The very strong kill off the very weak. The very strong are overborne by the numerical superiority of the individuals of average power. The latter are too nearly equal for one to hope to vanquish another, and their resulting toleration is an equilibrium of strength, which is tested from time to time, and so maintained, by frequent acts of aggression and revenge. Toleration being established, fellow-feeling, sympathy, and imitation can work themselves out, step by step, with the evolution of intelligence, in the positive forms of mutual aid, alliance, and mutual pleasure. Mutual aid begins in accidental helpfulness and protection, and is perpetuated consciously when its benefits are perceived. Social pleasures are observed among nearly all the higher animals, as among men. Among the birds and the more intelligent mammals infancy and youth are a continuous playtime. In social pleasures the higher sympathetic feelings, which presently become the strongest social bonds, are developed, and the cultural activities are born. Mutual aid is the foundation of political alliance and of economic organization. Toleration is the foundation of justice. Imitation is the foundation of diversified desires and individual industry.

Association reacts on the associated individuals, developing in them a social nature; but owing to differences of circumstance and of heredity the development does not go on equally, or at the same rate, in all parts of the population, and social classes result. In a majority of individuals fellow-feeling, imitativeness amounting to industry, tolerance amounting to justice, helpfulness, and companionableness, are ruling qualities. This class is the normally social. In other individuals these qualities are deficient or absent, but are simulated. Pretending to have the social nature and appealing to those in whom it is real, these pseudo-social characters, if not aggressively anti-social, make up the pauper class. Yet others, whether simulating the social nature or not, having become aggressively anti-social, are the criminal class.

The Social Mind.—The foregoing mental and moral elements of society are combined in products which we call by such terms as the common feeling, the moral sense, the public opinion, the general will, of the community, and which it is convenient for the sociologist to name collectively the social mind or the social consciousness; but care is necessary to avoid associating false conceptions with these terms. They do not stand for mere abstractions. The social mind

the concrete thing. It is more than any individual mind and dominates every individual will. Yet it exists only in individual minds, and we have no knowledge or wisdom of any consciousness but that of individuals. There is no real power here, however. The social mind is the phenomenon of many individual minds in interaction, so playing one upon another that they simultaneously feel the same emotion, arrive at one judgment, and perhaps act in concert. It is therefore, as Tardieu has called it (*Les Loix Sociales*, Paris, 1894), a social logic, binding the products of individual logic into more complex wholes.

The social integration of desire, belief, and will, which constitutes this logic, is effected sympathetically or rationally; passionately and violently, or deliberately. The mode is seen in popular fads or crazes, panics, emotional revivals, mobs, lynchings, riots, violent revolutions. The other is seen in the proceedings of a parliamentary body, the execution of legal justice, the movements of a disciplined army. The proportion of rational or deliberative action depends on the mental evolution of the population, its homogeneity, and the amount of its criminality. The greater the criminality, the less the rationality and the greater the violence.

In discussion and deliberation sensibly arrives at self-consciousness. Each individual concerned makes his neighbor's thought the object of his own thought at the same instant, but he makes his own thought such an object; he judges the two to be identical, and then acts with a full belief that his fellows have come to like conclusions and will act in like sense.

The primary products of the social mind are social choices and values. These are further combined with references to the phases and interests of life into standards of living and of industry, rules and methods of art, laws of conduct, political policies, religious faiths, scientific doctrines, ethical ideals, all of which, based on firm and consistent action to another, become traditions. The three primary traditions are: (1) The economic, consisting of the whole body of knowledge and usage pertaining to material well-being; (2) the juridical, consisting of the customary and positive law; (3) the political, consisting of the political history, policy, and aspirations of a state. Secondary traditions are the dogmatic, the scientific, the religious, the scientific, and the artistic.

All values, standards, rules, faiths, and traditions exist in individual minds only. Durkheim's argument, that they are independent objective realities because they can be consulted in writing, is a fallacy, since the written page is meaningless apart from the living knowledge of the reader. But they exist in a multitude of interacting minds simultaneously, and are therefore objective as well as subjective to each individual. Upon each mind as it unfolds they are imposed from without, and sanctioned by penalties for disregard or disobedience that range from ridicule, disapproval, and boycotting to collective force or vengeance.

Through the channels of these different traditions the social life of society flows in an ever-changing distribution. At one time society is religious, at another time creative and artistic, at yet another time scientific. One generation is absorbed in political concerns, another in business affairs. Always, however, a tendency toward the establishment of a social equilibrium may be observed. At any given moment desires and beliefs assume unlike forms and find varied expression in different parts of the population. The social codes and fads are mutually dependent. This is the social force in its highest manifestation.

The social mind not only creates codes and fads and imposes them upon individuals; it relies upon the grouping of individuals which grow up more or less unassisted, and upon various relations of mutual aid. Sanctioning some groupings and relations, opposing others, it shapes the social structure or organization.

The Social Composition.—In the social structure by composition small groups are combined into larger groups, and these again into groups yet larger. Each group, whether small or large, contains both sexes and more than one generation. Each, therefore, might live independently of the others, perpetuate itself, and grow to larger dimensions. Each group is made up of elements that are less like each other than one group as such is like another group of similar composition. For example, father, mother, and child in the family are more unlike than are two families of the same kind or type. The inhabitants of a town in which are found different nationalities, perhaps, different ages, different shil-

lides, characters, and fads, are more unlike among themselves than are neighboring towns one to another. Each group has much the same characteristics and lives in nearly the same way as any other group of similar dimensions and composition. Such groups therefore supplement or potentially add each other only in power and mass, not in division of labor.

The unitary group in societies of the higher animals, or of men, is the family, which may be a temporary or an enduring union of one male with one female and their offspring, or of one male with two or more females (polygyny), or of one female with several males (polyandry), or of several males with several females (polyandry or communistic marriage).

Human societies composed of families grouped in larger aggregates are of two types, the ethical and the despotic. Ethical societies are marked by affection; a real or fictitious kinship is the chief social bond. Domestic societies are congenially aggregative. They are groups of people bound together by habitual intercourse, mutual interests, and cooperation, with little or no regard to origins or to genetic relationships. Ethical societies are the earlier. Despotic societies have been developed out of the ethical. Among ethical societies many are matrilineal, kinship being traced through the mother name only. Others are patrilineal, with the kinship traced through the father name only. Matrilineal relationships are the earlier.

The smallest ethical society, whether matrilineal or patrilineal, is the horde, which is a group of from three or four up to twenty or thirty families, dwelling together in a camp or village. The Hudson, Fingans, and Imlis afford examples. The next larger group is the tribe, an organization large enough to have been formed, and probably having had its origin in fact, in an alliance of several herds for defense or aggression. Herds and tribe are often conflated in ethnological writings with the clan or gens, which is a totally different organization from either. The herds, and likewise the tribe, includes and claims all of its descendants, whether through its daughters or through its sons, who dwell together in the parent camp. The clan, on the contrary, is a partly natural, partly artificial brotherhood and sisterhood, which rightly excludes all of the descendants of its sons if matrilineal, or all the descendants of its daughters if patrilineal. A clan therefore can never be properly identified with a horde or with a tribe. It may be a section of a tribe, or its membership may be scattered through many herds or through several tribes.

Related tribes bound together by kinship ties and speaking dialects of the same language, when they unite in a military or political federation are a folk or ethnic nation. Such were the allied six tribes of the Iroquois, and such were the confederated Franks, the Lombards, and the Angles.

In despotic society the smallest community is the deme, village, or township. Townships are combined into counties, counties into commonwealths, commonwealths into federal states.

The social composition is affected by the deliberative action of the social mind under the pressure of external necessities, especially those of defense and aggression. When integration has been accomplished the social mind puts its own impress on each component group and moulds it into conformity with a certain type. Thus in a given community every variety of the family may have existed at the outset or may from time to time appear; but the social mind gives approval and sanction to some one type, as the monogamic or the polygamous, and prohibits or disencourages all others. In like manner in the commonwealth each component town, and in the federal state each component commonwealth, is compelled to conform to a type or standard. Psychologically, therefore, the social composition may be described as a mutual toleration and alliance of the unlike among the individual elements of a society, supplemented by an alliance of the like and non-toleration of the unlike among its component groups.

The Social Constitution.—The social structure by constitution is a re-ordination of associations, any one of which may or may not include both sexes in its membership, but in any case does not include them both for purposes of marriage and reproduction. Accordingly, the constituent associations of society are mutually dependent, and each presupposes the social composition. Each association is composed of individual elements that on the whole are more like than associations themselves are to one another. The members

of a given trade-union are more alike with reference to the purpose which unites them than one trade-union is like another; otherwise the differing members would connect themselves with other unions. The members of a given church are more alike in feeling and belief than one church is like another. The members of trade-unions collectively or of churches collectively are more alike than trade-unions in general are like churches in general. Each association does a specific work; it may be said to have a functional purpose. Combination among associations is therefore a co-ordination, and mutual aid among them is not through mere increase of mass and power, but by a division of labor.

The social constitution is analogous to that of a biotic organism, as Spencer has shown; but the analogy is of limited value for scientific purposes until supplemented by a close study of those features of social organization that are distinctive. Of these the most important is a more perfect actual or potential duplication in the social organization of the organs or agencies for performing every essential function. Though in the animal many vital organs are duplicated, there neither is nor can be any complete duplication of the alimentary, the circulatory, or the nervous system. Public association or the state can at need assume every social function. Voluntary association can do the same. It is as if the cerebral nervous system, on the one hand, had the emergency power to organize from the body-tissues a new alimentary and circulatory system, and the sympathetic nervous system, on the other hand, could at will assume the functions of the brain and spinal cord. This power of public and of private association to assume each other's functions is maintained, because at all times some duplication is in fact kept up in every essential class of social services. The error of attributing to the state defensive and juridical functions only, and to private associations economic and cultural functions only, is being constantly repeated in political and economic writing. The fact is that the state performs always important economic functions of production, transportation, exchange and finance, and cultural functions, religious or educational, and that private associations, such as political parties, political clubs, revolutionary societies, and private tribunals to achieve political or juridical ends, are among the most important voluntary organizations known. The socialists, therefore, are right in saying that the state could, if necessary and desired, carry on all social undertakings, and the individualists are right in saying that society could get on, and in a way achieve its ends, without the organized state; but both are wrong in supposing that either thing will happen under a normal social evolution. The actual distribution of functions between public and private agencies is a varying one, always changing with changing circumstances. Consequently, movements tending to increase public activity on the one hand or to enlarge the opportunities for private initiative on the other hand will be self-limiting so long as conditions are normal. They should be regarded as tendencies toward equilibrium. Whatever belittles the state or destroys popular faith in its power to perform successfully any kind of social service—whatever impairs the popular habit of achieving ends by private initiative and voluntary associations, by so much endangers society, checks its development, and prevents the full realization of its ends.

The supreme end of society is the protection and perfecting of sentient life. The end of human society is the evolution of the rational and spiritual personality of its members. The associations directly concerned in this function are the cultural, namely, the religious, the scientific, the ethical, and the æsthetic, the educational organizations, and what is called polite society. Economic, legal, and political organization exists (in a functional sense) for the sake of cultural organization and activity. The social mind always has perceived this truth, and by means of its sanctions has endeavored to mould the social constitution into accordance with it. Associations and relationships sanctioned by the social mind are known as institutions, and they are fostered or abolished always with a view to cultural as well as to protective ends. For both ends specialization and division of labor are necessary. Society is obliged to tolerate and promote differentiation in its constitution while it maintains the homogeneity of its composition. Psychologically, therefore, the social constitution may be described as an alliance of the like and non-tolerance of the unlike in each simple association, supplemented by toleration and co-ordination of the unlike in complex association—that is to say, in the re-

lations of each association to other associations and to society at large.

HISTORICAL SOCIOLOGY.—The stages of sequence in social evolution have corresponded roughly to the four stages of synthesis above described. Concourse, fellow-feeling, social instincts, and mutual aid had their origins in animal society, and it was by means of them that animal life was developed into various types. The first stage of association, therefore, was zoögenic. In the second stage the evolution of speech and the genesis of a varied tradition made the social mind self-conscious, and transformed the anthropoid into man. Society then was anthropogenic. The third stage, in which the social mind, acting on spontaneous forms of alliance, created clan, tribe, folk, and nation, was ethnogenic. In the fourth stage a wonderful development of the social constitution, with division of labor, has made possible a high utilization of resources, a rapid multiplication of population, and a democratic evolution of the social mind. Society has become demogenic.

Zoögenic association is as old as sentient life. All biological speculations that ignore the social factor in the struggle for existence are imperfect, and without appeal to it the evolution of animal intelligence can not be explained at all. Long before man appeared on the earth sympathy was highly developed, the art of communicating feelings and simple ideas, by tones and gestures, was practiced by millions of creatures, family relationships were established, and bonds of mutual aid, companionship, and pleasure held together swarms, flocks, troops, bands, and herds. Even the beginnings of tradition had appeared. Association had become the most important defense and help in the life-struggle. The survival of the fittest was the survival of the social.

Anthropogenic Association.—Therefore nothing could be more unscientific than a theory of human origins through the evolution of a single pair of anthropoid apes into man and woman. If science abandons the dogma of special creation, it must abandon also the dogma of a first pair. There could have been no continuity of animal and human descent without a continuity of animal and human society. If anthropoid apes became simian men, a whole community or many communities underwent the transformation. John Fiske's theory (*Outlines of Cosmic Philosophy*, Boston, 1874) that the prolongation of infancy, as an incident of the physical evolution of man, by holding the family together for a relatively long period prepared the way for more extended social relations, reverses the probable order of cause and effect. Increasing social intercourse stimulated and developed the cerebral nervous system. Cerebral development entailed the prolongation of infancy, which, in turn, by delaying the use of arms and legs and jaw, altered the proportions of the skeleton and the facial angle.

These changes, it is probable, took place step by step with the evolution of speech and of tradition. Many evidences point to communal festivity, with its attendant rhythmical gesticulation and some approach to song, as the means by which, under the influence of mental exaltation, conventionalized sounds were so definitely associated with feelings and ideas as to constitute the beginnings of speech. (See LANGUAGE.) Industrial traditions had their beginnings among animals. Most characteristic of the beginnings of human society were the primitive explanations and traditions of life, death, and causation, known as ANIMISM (*q. v.*), and the ghost-theory. See also ANTHROPOLOGY.

Ethnogenic Association.—There is no reason to doubt that the earliest hordes of men were composed of family groups. Among the higher mammals the troop, band, or herd is subdivided into pairs, families, or studs, and it would be astonishing to find that the same thing was not true of the primitive hordes of men. At the same time the relations of the sexes may have been of the loosest description. Writers on the history of marriage have too often made the mistake of assuming that the two things must be inconsistent. The living together of man and woman does not always preclude irregular indulgence on the part of either. Festival occasions are still, in many parts of the world, opportunities for conduct closely approaching promiscuity by men and women who, none the less, live habitually in family relations. The trading of wives also, and the lending of wives to guests, are customs of friendship and hospitality in many communities.

It is probable, further, that, as a rule, the domestic group was a simple pairing or monogamous family, in which male jealousy and power played the important part ascribed to

done by Darwin and Sir Henry Sumner Maine, and that exogamy and polygyny were exceptional deviations from the monogamy type. The argument for a primitive polygyny is based on the fact that primitive kinships were matrilineal, and the attempt to explain it by uncertainty of paternity. Another explanation is quite as good. A family established by the forcible appropriation of the woman and maintained by masculine power is dissolved the moment the man dies of his captive and deserts her. Her offspring, knowing only the mother that cares for them, will take her name. That primitive family units were commonly of such brief duration and followed by such consequences is extremely probable. See MAESTRANI.

The family, as a rule, was exogamous—that is, the sons preferred to take wives from other households instead of from among their sisters. This is a preference that had its beginnings in animal life, as Westermarck has shown, and was strengthened by the influence of novelty upon the sexual passion, supplemented by natural selection. When several herds dwell in such proximity that some intercourse, friendly or hostile, is possible, the preference may extend to the women of other herds, and especially if the practice of obtaining them by force, theft, or stratagem causes them to be prized as trophies of prowess or cunning. The herds, then, like the households, may become exogamous.

Brothers and sisters by blood are a natural property-holding and defensive group, spontaneously aiding each other to redress wrongs inflicted by other groups. In pursuing its interests and redressing its wrongs, it seeks the aid and protection of supernatural power. In the animistic stage of culture some natural object, plant, or animal, which is regarded with superstitious veneration, becomes the special guardian of the household. Believing that a mysterious kinship can be established through touch, by imitation, and in other ways, the members of the fraternal circle do not doubt that they may become akin to the object of their worship, and to make sure that they always bear its protection with them they mutilate or mark themselves or their clothing or belongings with a sign or rude image of the sacred object. From every practice of the kindred circle is thought of as sanctioned by its totemic deity, and any deviation from established custom is looked upon as a sacrilege, sure to be followed by dire penalties. In this way exogamy becomes a binding obligation and hence a sin.

For a long period each little fraternity of uterine brothers and sisters in each succeeding generation is likely to have its own totemic deity; but sooner or later, under the influence of their mother and her relatives, or through reasoning that they are descended from their mother's totemic deity, a circle of brothers and sisters is sure to adhere to the mother totem and worship, instead of adopting a new one. From that moment the totemistic circle begins to enlarge. In the second generation it necessarily includes brothers and sisters, uncles, daughters and sons, uncles and aunts, nephews, nieces, and cousins. Since kinship is reckoned through mothers, but not through fathers, the circle will enlarge and include the children born of its daughters, and will exclude those begotten by its sons. Children of sons will belong to the kindreds of their mothers; and since in the household exogamy has become superstitiously associated with totemistic worship, and what was originally an instinct has developed into the idea that men must not take wives of their own totem, the wider totemistic circle also must be exogamous. The kindred has become a clan.

Though the clan can never be perfectly identified with the herds, and if neighboring herds are exogamous each clan will have members in several different herds, there are two ways in which a majority of the members of a herd may belong to the same matrilineal clan. Men may go to live in the residences of their wives—beena-marriage. In this case clansmen with their children and unmarried male kinsmen may live together in one place, and their husbands, belonging to many different clans, will be an unimportant authority. If, however, men steal or buy their wives—dead-marriage, who then follow the residences of the husbands, the children of a matrilineal clan will be dispersed through many herds, and each herd will be made up of members of many clans. Nevertheless it may happen that divorced wives and their children return in such numbers to their parent herds that the clan is always tending toward identity with the herds. A cluster of neighboring herds may thus be transformed into a cluster of herds-clans.

When neighboring clan-herds draw together into a tribal organization, the lines of demarcation between herds as

such may disappear or cease to have importance, while the clan-ship lines remain sharply defined. Composed of herds the tribe is constituted of clans, mutually dependent because exogamous. If a clan, becoming large, subdivides, the tradition of original unity is often preserved in the phratry, a fraternity of clans. If a tribe subdivides, individuals from each of its clans go into the new tribes. The household is the economic organization of the community, developing and handing on the economic tradition. The phratry is the religious organization, guarding the religious tradition. Its secret societies of medicine-men are the germ of a priestly and professional class. The clans are the juridical organization, developing and applying a customary law which regulates property rights, marital rights and limitations, feuds, and vengeance. The sachems, elected by clansmen and clanswomen, are the first lawyers and judges. The tribe is the military organization. Its council is composed of the leaders or chiefs of the volunteer war-parties put forward by each clan. In the tribal council a military tradition is evolved. True political organization begins only when tribes confederating become a folk or ethnic nation. Then for the first time the juridical power and the military power are combined in one governmental system, as different expressions of a single sovereignty.

Patronymic societies exhibit the same forms and stages of organization as matrilineal, with the exception of differences that necessarily follow from kinship through fathers. The change from mother-kinship to father-kinship may occur at any stage of social integration; in the horde or in the folk. It is effected by economic circumstances or evolution. If the family can survive only through the industry and protection of the father, as among the *Esquimaux*, who depend on the arduous and dangerous chase of the walrus, it will hold together long enough for children to grow up under paternal authority and take the father-name. When under different conditions wealth in flocks and herds begins to be important, men appropriate it and desire to transmit it to sons instead of to sisters' children. Patronymic kinship prepares the way for an advance in culture from animism to ancestor-worship, which in turn greatly strengthens paternal power. With dual-marriage and patronymic kinship the herds and the clan can become nearly identical, compact, and powerful. In herds, clan, and tribe chieftaincy can become hereditary. Chieftains can become the founders of a nobility, and the chief military leader of a folk, becoming a true king by uniting supreme religious and judicial authority with his military functions, can found a royal family. Kings and chieftains receiving from their followers large shares of the booty of war, and privileges in the tribal land, enrich their favorites, who in turn, attaching to themselves the broken and ruined men of shattered clans and tribes, become the "cow noblemen" and systematic marauders of that barbaric feudalism which in time seriously undermines the kinship or gentle organization of society and prepares the way for another system. See, further, *ERNESTOWAY*.

Demogonic Association.—In ethnogenic association the social constitution is incidental to the social composition. In demogonic association the state has become supreme. It subordinates and rearranges the social composition and perfects the social constitution.

A tribal confederation seldom establishes itself permanently upon the territory where it originates. It moves on to conquer richer regions, and, if successful, reduces their inhabitants to slavery or serfdom. Increasing then in wealth, it attracts to itself strangers from far and near, who presently become so large an element in the population that it is no longer possible to organize legal and military administration on the clan-ship and tribal basis. Legal rights and membership in the state are made to depend on civic association within territorial limits. Society orders upon civilization.

Civilization exhibits three stages. Egypt and Babylon did not get beyond the first, Greece and Rome did not complete the second. The modern Western nations have entered fairly upon the third. In the first stage all the energies of society are concentrated upon the task of political integration and defense. To this everything else is sacrificed or subordinated, and government is absolute. This work completed, the liberated national energies expend themselves in criticism, in the struggle for personal freedom, and in the effort to combine liberty with stability through the constructive evolution of municipal and constitutional law. Greece failed in legal construction, and Rome sacrificed

spontaneity to system. The civilizations of Greece and Rome, like those of the Eastern nations, were unstable, because they were surrounded by a worldwide environment of barbarism and savagery. The modern Western civilizations are stable because they simultaneously grew to great and powerful statehood in an environment of civilization, which for ages had lain between them and the more remote barbarism of Africa and Asia. Consequently there was no necessity for an extreme sacrifice of personal initiative and the lesser interests of life. The second stage also with them was no partial evolution. The Renaissance, the Protestant Reformation, the American and the French revolutions were but so many phases of a thoroughgoing criticism and reconstruction of the social constitution on lines of legality and free association. By means of this strong but elastic union of voluntary and flexible organization with law, the magnificent development of modern industry and a consequent multiplication of population without parallel in history have been made possible.

Spencer's generalization that societies are military or industrial in type is therefore neither adequate nor altogether accurate, in the form in which he has stated it. Militarism and industrialism are stages rather than types, and between them lies the stage of critical and legal reconstruction, which is the cause, rather than the effect, of industrial evolution.

The development of the fundamental social interests thus reverses the order of their genesis. Society is first economic, then juristic, then political. Perfecting then the political system, it works back through law to the economic foundations. Not so in its cultural interests. The order of their genesis—religious, scientific, ethical—is the order of their development. The political era is also the great religious period; society is theocratic. Then the social mind goes forward to critical and scientific activity while it applies itself to legal construction, and it is only by the aid of science and criticism that legal construction is accomplished. Finally, when it works back to industrial problems it advances to a serious study of ethical principles and ideals, and only as it does so can it hope to adjust the complicated relations of economic life. Future society, increasingly economic, will be also increasingly ethical.

EXPLANATORY SOCIOLOGY.—The details of explanatory sociology are yet to be worked out, but certain principles are established. The interpretations of social structure and evolution must be in terms of natural causation; but psychological phenomena, no less than physical, are natural, and society must be explained in terms of motives and choices, as well as in terms of outward forces.

The initial causes of society are physical. Aggregation and association are brought about by geographical and organic conditions; but association furthers survival and happiness, and the associated individuals, becoming consciously and fully aware of the benefits of society, attempt to defend and improve it. The unconscious natural process thus becomes conscious and artificial. Relations and activities are valued, choices are made, policies are devised, and institutions founded. The process does not end here, however. Natural selection works among policies, laws, and institutions, as among individuals. Some fail to benefit the community, and disappear. Those that survive are not always the ones that were supposed to be most promising at their inception.

The further task of sociology, therefore, is to discover the details and laws of these complicated processes. It must try to formulate, first, the laws of the purely physical and unconscious causation that occurs in society; second, the laws of conscious social choice; and, third, the laws that govern the natural selection and survival of arrangements, laws, and institutions.

Society has often been described as an organism. Being essentially psychical it is more and higher than an organism. It is also more than a multitude of individual minds. It is a psychological organization of conscious organisms.

In addition to the works mentioned in the text, see Giddings, *The Theory of Sociology* (Philadelphia, 1894); Durkheim, *Les Règles de la Méthode sociologique* (Paris, 1895); Darwin, *Descent of Man* (London, 1871); Morgan, *Ancient Society* (New York, 1877); J. Donovan, *The Fæstal Origin of Human Speech in Mind* (Oct., 1891); Sir Henry S. Maine, *Early History of Institutions* (London, 1875) and *Early Law and Custom* (London, 1883); Westermarck, *History of Human Marriage* (London, 1891); Fustel de Coulanges, *La Cité antique* (1864; Eng. trans. Boston, 1873); Smith, *Kinship in Arabia* (London, 1885). FRANKLIN H. GIDDINGS.

Socorro: town of Colombia; in the department of Santander, of which it was formerly the capital; on a plateau, 40 miles S. S. W. of Bucaramanga; 4,120 feet above the sea (see map of South America, ref. 2-C). It was founded in 1540 on the site of an Indian city, and was removed to its present site in 1681. In 1781 it was the center of a formidable revolt, and it was the first place in New Granada to declare for independence in 1810. Hand-woven mantles and "Panama" hats are exported. Pop. about 18,000. H. H. S.

Socorro: city: capital of Socorro co., N. M.; on the Rio Grande river, and the Atch., Top. and S. Fé Railroad; 75 miles S. by W. of Albuquerque; 178 miles N. of El Paso, Tex. (for location, see map of New Mexico, ref. 12-R). It is engaged in mining and smelting gold, silver, and lead, raising cattle, sheep, and goats, agriculture, fruit-culture, and lumbering; and contains 6 churches, 3 public-school buildings of brick (cost \$25,000), State School of Mines (cost \$50,000), 2 national banks with combined capital of \$100,000, and 2 weekly newspapers. The city has an excellent climate that is highly recommended for persons in the early stages of consumption. When discovered by the Spaniards, the site was occupied by an Indian pueblo. The place was settled by Franciscan fathers, was destroyed and abandoned in 1650, and was again settled in 1765, 1794, and 1804. Pop. (1880) 1,272; (1890) 2,295; (1895) estimated, 4,000.

W. S. WILLIAMS, EDITOR OF "CHIEFTAIN."

Socotra: an island in the Indian Ocean, off the eastern coast of Africa; in lat. 12° 39' N., lon. 54° 1' E., 140 miles N. E. of Cape Guardafui; controlled by Great Britain. Area, 1,384 sq. miles. The interior of the island is mountainous, and mostly unproductive, on account of insufficiency of water, the streams drying up completely at certain periods, but the coast-land, generally from 2 to 4 miles broad, is low, level, and fertile. The island produces good tobacco and dates and the best aloes known, and has superior sheep and goats. There is considerable trade with Muscat. The climate of Socotra is more temperate than that of the adjacent continent. Pop. estimated at 10,000, mostly Arabs, Negroes, and descendants of Portuguese.

Revised by M. W. HARRINGTON.

Socrates, sok'rā-tēz: philosopher; son of Sophroniscus and Phanarete; b. at Athens in 470 B. C. (or 469, in May or June); drank the cup of poison 399 B. C. (in April or May?). His father was a sculptor, and Socrates in his early years worked at the same occupation. He alludes to his mother (*Theaitetus*) as a midwife, and likens to her art his own skill in drawing out ideas by conversation. In his youth he learned geometry and astronomy and practiced gymnastics. He is reported by Plato (*Phædo*) as having studied the work of Anaxagoras on *Nature*, probably under the instruction of Archelaus, the disciple of Anaxagoras; and according to Xenophon (*Mem. I. and IV.*) he had a critical knowledge of the writings of the early wise men, as well as of the Ionian school of philosophy. He probably met Parmenides when about twenty years of age, and mastered the Eleatic view of negative dialectic (which proved its theories by showing up the contradictions of its opponents), and was thoroughly instructed in the doctrine of the Sophists—possibly may have received direct instruction from Prodicus. It is said that having early lost the patrimony inherited from his father, the wealthy Crito assisted him in his education, and employed Evenus to instruct him in poetry, Theodorus in geometry, and Damo in music, and that the celebrated Aspasia had a share in his culture. He married, and had three sons. Xanthippe, his wife, has come down in history as the typical scold. Socrates is represented as using the violence of her temper as a means of cultivating his patience. He took part in three military campaigns with his fellow citizens—that of Potidæa (432 B. C.), wherein he saved the life of the young Alcibiades, who was wounded; that of Delium (424 B. C.), in which he saved the life of Xenophon, and himself received assistance against his Boeotian pursuers from Alcibiades in the disastrous retreat which followed, and wherein his own cool bravery was conspicuously manifested; and that of Amphipolis (422 B. C.). He proved himself to have an extraordinary capacity to endure cold, heat, and fatigue. He walked barefoot upon the ice and snow of Thrace in his usual clothing, while others were clad in furs. By this time he had become noted for his peculiar mode of instruction by means of conversations which he held with people of all classes at the public resorts. Aristophanes in *The Clouds* held him up to ridicule as the arch-Sophist, as a dreamer, morally worthless and physically incapable (as Grote re-

markedly toward the time when Socrates was exposing his life for his country on the battlefields of Delium and Amfipolis. The personal appearance of Socrates was such as to make the Athenian sense of the beautiful with a turned-up nose, preferring eyes held inward, thick lips, small body, he resembled a satyr or Silenus: he wore a miserable dress, and would frequently stand still in sudden fits of abstraction, staring his eyes, staring out vacancy. Aristophanes found in him the almost perfect type-comedy. Modern historians have justified his large measure the poet, and painted out his patriotic desire to save his native city from the decline in morals and political ideas which he saw impending from the prevalent tendency to reflection and sentimentalism—the cultivation of independent subjectivity or individualism (the right of private opinion) as contradicted by the implied, unreflecting obedience to custom and laws. This he traced, correctly enough, partly in the teachings of the Sophists or private teachers of culture, among whom Socrates was acknowledged to belong, by his contemporaries, notwithstanding his radical differences from them in doctrine. He common with Socrates, the Sophists cultivated reflection—to make up the mind on rational personal grounds. Dialectic was the art of the advocate and orator, as much needed before the courts and popular assemblies of Athens—the art to make the worse appear the better reason: an art which could be applied in good purposes or to bad ones, and not in itself a corrupt art. It was the same art that is cultivated in the debating societies and moot courts of young lawyers of our own time. Plato and Aristotle were the first to bring the name "Sophist" into odium as a perverted species of philosophizing. Aristophanes condemned equally all species of philosophic reflection. Isocrates calls Plato a Sophist, and Aristotle calls Aristippus, the disciple of Socrates, a Sophist. Socrates was selected as representative of his profession by Aristophanes because of the minority of his personal appearance and his missionary habit of practicing his art among all classes without price. In *The Clouds* he is portrayed as teaching a vain and profitless science of wisdom, corrupting in its influence upon youth and undermining all true discipline and morality. Twenty-four years after the appearance of *The Clouds*, Melitus, a poet, succeeded by Anytus, an influential demagogue, and Lycon, an orator, long up an indictment against Socrates accusing him of being "guilty of crime—first, for not worshiping the gods whom the city worships, but introducing new divinities of his own; next, for corrupting the youth. The penalty is death." Lycon is said to have felt aggrieved at what Socrates had said of the orators (see his attack on orators in Plato's *Hippias*); Melitus, for his treatment of the poets; Anytus, a rich leather-dealer, had been driven from Athens during the rule of the Thirty, and as Socrates was supposed to sympathize with the tyrants, and especially with Critias, the most detested of them all having taught him when a young man, his feeling toward the accused may be explained. Moreover, a son of Anytus had become interested in the conversations of Socrates, and the latter had interfered with the father to educate his son for something better than a leather-seller. To produce aspiration for a viceroyalty the family vendetta was "corrupting the youth." Socrates had conversed with his dialectic skill and bitter irony most of the celebrated statesmen, orators, poets, Sophists, and artisans of Athens. None had forgotten their humiliation at his hands; a few had sought help and instruction from him afterward, but most of them avoided his presence and detested revenge. Very many of these were to be found among the 500 (557 according to Diogenes Laertius judges who sat at his trial. In his defense before his judges he was so bold and free-spoken that he produced a very unfavorable impression, and was accordingly adjudged to be guilty, by a small majority. According to custom, he was allowed to name the punishment he preferred to substitute for the penalty of Melitus; he gave it as his opinion that he deserved to be sentenced in the Prytaneum at public expense for the rest of his life as a benefactor of the state, but upon the solicitation of his friends agreed to ask a brief *third* exile. This suggestion was ignored by the judges and there voted by a majority of eighty votes for his death. The execution was delayed for thirty days, until the return of the sacred ship from Delos. Socrates refused to avail himself of the means of escape from prison offered him by Ctes, thus attesting his law-abiding character. He drank the cup of hemlock with perfect composure after a conversation with his friends upon the immortality of the soul, being assured that he was merely setting out upon a happy

journey, and that by his death he attained the desideratum of his convictions to his disciples, and thereby accomplished far more than by living.

As to the least authority regarding the actual teachings of Socrates there has been much dispute. He has left behind no writings of his own, and we know him chiefly through his two disciples, Xenophon and Plato. It is supposed that the *Memorabilia* of the former give us a more accurate picture of his method and ethical doctrine, while the *Dialogues* of the latter present us with highly idealized portraits, and offer us the further-developed doctrines of Plato through the mouth of Socrates. Aristotle testifies that to Socrates belongs the honor of the invention of induction and accurate definition of terms. His dialectic rests on induction. More important even than this was his practical application of the Delphian precept, "Know thyself," as the condition of virtue. Aristotle (*Nick. Eth.*) says that his fundamental idea is the union of theoretical insight and practical virtue. This virtue is a knowing is a very radical statement, and altogether incomprehensible unless one considers its relation to the time to which it was uttered. Believed of its exaggeration, perhaps it means only that self-consciousness is essential to responsible action. It expresses the transition from the morality of custom and habit, mere conventional use and wont, to morality as conscious right-conduct, resting on reflection and moral principles. In this, therefore, Socrates is the most significant personage in the ethical history of the race. All beyond him lies in the region of unphilosophical use and wont, or prescriptive ethics, like that of the Chinese and other Oriental civilizations; on the other side the chief interest is the ever-widening influence of the individual consciousness of moral necessity, the long and gradual discipline of mankind into independent, responsible wills, endowed with "rights of conscience." In the antiseptic principle the individual takes the impulse of his volition from external phenomena—from auspices or auguries, nothing being undertaken without them. Individual conscience and personal decision date from the epoch of Socrates, and their growth from that time is the progress of the world-history. The new principle in its appearance with Socrates is as yet undeveloped, and involved with much that is foreign to it and contradictory of it. His daemon (*daemōn*) or "genius" is a relic of the old, and is akin to those immediate stages of psychical life which we know under the names *ecstasies*, *dreaming*, *premonition*, *hypnotism*, and is a return of the conscious mind to its fetal stage of existence, to instinct—the transplanting, as it were, of the sagacity from external appearance to internal impression. On the other hand, it was related to the consciousness of principles, and as such formed a factor of what we call conscience. There is no individual responsibility without conscious determination of the will, and even the perverse action of the conscious will is higher than mere unconscious action: a wicked man is a higher order of being and more precious in the sight of God than a good, obedient ox or horse. Socrates seems to have exaggerated this view so far as to make all virtue to be correct knowledge, and all vice to be ignorance, thus ignoring the will altogether. This, however, is not surprising when we consider the purity and the greatness of his insight into knowledge as a factor of true moral action. Nor, if we consider the ultimate consequences of perfect insight, can we regard him as wrong in holding that ignorance is the occasion of all wickedness, although we insist that moral responsibility implies knowledge of the right, and assert that wickedness is pervasiveness of will in the face of better knowledge. See MORAL PHILOSOPHY.

The panegyrics pronounced upon the character of Socrates are not surpassed. That of Alcibiades in Plato's *Symposium* is perhaps the finest—that of Xenophon more sober and weighty: "Knowing him to be such a man as I have described—on plans toward the gods as never to undertake anything without first consulting them; so just toward men as never to do the slightest injury to any one, while he conferred the greatest benefits on all who came in contact with him; so temperate and chaste as never to prefer pleasure to what was right; so wise as never to err in judging of good and evil, nor needing the aid of others in order properly to discriminate between them; so able to discourse upon and accurately define the subjects we have mentioned; so skillful in penetrating the hidden characters of men, and seizing the fittest time to reprove the erring and turn them to the paths of virtue—I can not but regard him as the most excellent and happy of mankind." The sources of information as to his life are Xenophon's *Memorabilia*, Plato's

works, especially the *Apology*, *Phædo*, and *Symposium*; Aristotle's *Metaphysics* and *Ethics*; Diogenes Laërtius (book ii.); and, among others of modern writers, the essays of Schleiermacher, Boeckh, Van Heusde, Hegel, Forchhammer, Brandis, Röttscher, and Grote are important. Zeller's *Socrates and the Socratic Schools* is the best work accessible in English.

WILLIAM T. HARRIS.

Soda [from Ital. *soda*, liter., fem. of *sodo* (collat. form of *solido*, solid) < Lat. *solidus*, collat. form of *solidus*, solid]: in chemistry, a hydrous oxide of the metal Sodium (*q. v.*), Na_2O ; in commerce, however, the compound formed by the action of water upon this oxide, and generally designated, even by chemists, hydrate of soda or sodium hydrate. The carbonates of sodium also are often called soda commercially. Sodium hydrate, NaOH , or caustic soda, is prepared commercially from the carbonate by the action of lime. Three parts of crystallized carbonate (*sal-soda*) are dissolved in five times as much boiling water, and one part of quicklime, slaked and mixed to a cream with three parts of water, is gradually added, with continued ebullition. The caustic solution is then decanted after settling, and boiled down rapidly with the access of air. From the residue pure caustic soda may be dissolved out by alcohol, which is then distilled off; but for most commercial, manufacturing, and medical uses the residue is merely melted and cast into sticks, which are preserved in bottles. Much caustic soda is also made by heating or boiling together the Greenland mineral cryolite with hydrate of lime. The compound is white, opaque, crystalline, and melts below incandescence. It is used largely, in the form of solution or soda-lye, for making soap.

Revised by IRA REMSEN.

Soda-ash: crude soda, as first produced before having gone through any refining processes. Previous to the French Revolution of 1789 the only source of the alkali-soda was from the ashes of marine and seashore plants, or kelp. The trade in kelp ceasing during the Revolution, the Committee of Public Safety in France called upon chemists to find some new source of soda, all the potash attainable being needed for gunpowder. Nicolas Leblanc, a surgeon and chemist, obtained the prize offered. His method consists in converting common salt first into sulphate by means of sulphuric acid, and then heating this together with charcoal and carbonate of calcium, which gives (theoretically) a mixture of carbonate of sodium and sulphide of calcium. This process is carried on, particularly in England, on an enormous scale in many large chemical works, all the soda used for making soap, glass, and a multitude of other products indispensable to civilization being thus procured. For details of the process reference must be made to the standard works on chemical technology, as, for example, the *Dictionary of Applied Chemistry* by T. E. Thorpe.

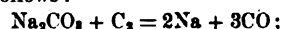
The crude soda-ash, sometimes called black ash, as it leaves the furnace is a very complex mixture of substances, containing chiefly, however, carbonate of sodium, caustic soda (hydrate), carbon, carbonate of calcium, and sulphide, or, according to some, oxysulphide, of calcium. It is treated with hot water or steam on a furnace-hearth to break it up, and then the carbonate is leached out with hot water in an ingenious apparatus contrived to accomplish much work with little water. The great defect of Leblanc's system as originally carried out was the loss of all the sulphuric acid or of the sulphur used in making it. Hence other methods of obtaining carbonate of soda from salt have been much sought after. One in successful operation, known as the Solvay or ammonia-soda process, consists of decomposing concentrated brine with a strong solution of bicarbonate of ammonia, which engenders chloride of ammonium and nearly insoluble bicarbonate of soda. The chloride of ammonium is readily reconvertible into bicarbonate, to be used over again. With respect to Leblanc's method, however, it may be noticed that by Chance's process, patented in 1888, the sulphur can be economically recovered from the exhausted black ash. Soda is manufactured to a limited extent from the Greenland CRYOLITE (*q. v.*). Revised by IRA REMSEN.

Soda-water: See AERATED WATERS and SOLUTION.

Sodium [Mod. Lat., from Eng. *soda*. See SODA]: one of the elements of matter, a very important and remarkable metallic substance which was first obtained in 1807 by H. Davy by the electrolysis of caustic soda (hydrate). Its occurrence in nature is chiefly as common salt (chloride of sodium) in the ocean, and as a constituent of silicates, chiefly the feldspars albite and oligoclase, on the land. It is also found in natron, an impure sodium sesquicarbonate, con-

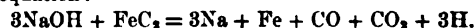
taining besides sodium sulphate and chloride. A cubic foot of ocean-water contains about 6,440 grains, not far from 1 lb. avoirdupois, of metallic sodium, and a cubical tank 14 feet on each side filled with sea-water will contain more than 1 ton of this alkali-metal. A cubic foot of rock-salt contains over 52 lb. of sodium. Sodium is a metal probably more abundant in its occurrence than iron, and probably not necessarily much more difficult or expensive to obtain in approximate purity than the latter metal, and yet, by reason of the fewer uses developed for it, the cost of sodium is much greater than that of iron. Sodium is one of the elements most essential to animal life, being a constituent of all blood. It is also found in the vegetable organisms that dwell in the ocean and along its coasts, but plants dwelling on land above the sea-level contain potassium more abundantly than sodium.

Preparation.—Gay-Lussac and Thénard first prepared sodium in quantity by the action of metallic iron at an intense heat on fused caustic soda, but a much better method is that of Brunner, which consists in distilling a mixture of charcoal and carbonate of sodium, the transformation being essentially as follows:



a current of carbonic oxide gas resulting, which sweeps along with it the metallic sodium in vapor. The latter is condensed by passing the gases through a thin, flat cast-iron condenser of peculiar form, which becomes, and remains throughout, hot enough to prevent the metal from solidifying within it, and thus clogging it up. It is so contrived also that a sharp-pointed iron rod may be driven in through it into the retort to clear it out when in danger of choking up and thus leading to a dangerous explosion. The sodium trickles out of the condenser in melted form, and is prevented from taking fire and burning in the air by being received in a vessel of melted paraffin. The vessel should be double, each part having a close-fitting lid to be applied in case the paraffin should kindle. Care must be taken that the carbonate of sodium and charcoal are free from silica and phosphates, which energetically attack the iron of the retort and perforate it from the inside. Deville introduced the admixture of powdered chalk with the mass, to prevent its passing into liquid fusion, but this may introduce silicates, and an excess of coarsely powdered charcoal has been used instead.

A method for the preparation of sodium on a large scale has been devised by Castner. This consists essentially in the reduction of sodium hydroxide (caustic soda), by heating it with an intimate mixture of finely divided iron and carbon. The mass is prepared by mixing the iron with molten pitch, allowing it to cool, breaking it into pieces, and heating to a comparatively high temperature without access of air. The reaction is believed to take place as represented in this equation:



Sodium is a brilliant silver-white metal, of the softness of wax within the normal range of temperatures, but becoming somewhat harder at 20° below zero. It melts at 204° F., and has the specific gravity 0.972 at 15°. It crystallizes in octahedrons of the dimetric or tetragonal system. Its vapor, unlike that of potassium (which is green), is colorless. When exposed to the air, it rapidly absorbs oxygen, and moisture if present, forming either anhydrous oxide (Na_2O) or caustic soda (NaOH). When water touches it, there is an intense reaction, with evolution of hydrogen gas and caustic soda. If the quantity of water is small, the heat produced is so high that the metal takes fire, and burns with a yellow flame and high heat.

In the preservation of sodium it must be kept immersed under the surface of some liquid which is free from oxygen, the heavy oils of coal-tar being better for this purpose, apparently, than rectified petroleum, which seem to absorb oxygen slowly and transmit it to the sodium, which thus becomes soon encrusted with a product not yet examined. The addition of a small percentage of amyl alcohol to the oil prevents tarnishing of the metal.

Sodium Salts.—The most important salts or compounds of soda are the acetate, borate, carbonates, hypochlorite, hyposulphite, nitrate, phosphates, silicates, sulphate, sulphite, and tungstate. *Acetate of Sodium*.—This is a commercial article, prepared on a large scale by the manufacturers of wood-vinegar or pyroligneous acid. It is a white salt in prismatic crystals, which effloresce in the air, soluble in three parts of cold water. Heat converts it into a mixture of carbon and carbonate. It is used in medicine and as the source of com-

marial acids by distilling with sulphuric acid. *Uses of Sodium*.—Of these the most important is *Soda ash*. *Carbonates of Sodium*.—Of these there are two of great importance—the neutral or normal carbonate, commercially *soda ash* or *washing-soda*, and the bicarbonate, commercially *cooking-soda*. *Soda ash*, $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$, crystallizes in large, transparent crystals, which are monoclinic. It is a salt efflorescent in the air very rapidly, falling down as a white powder, which contains but half as much water as before. If dissolved in twice its weight of cold water, and exposure to a gentle heat it loses all water, and becomes dry anhydrous carbonate. This latter is a product of enormous value in the arts, used chiefly in the manufacture of glass and soap. *Cooking-soda* [*sodium dihydrogen dicarbonate*], NaHCO_3 , is made by exposing the last compound to an atmosphere of carbon dioxide, which is absorbed, with evolution of heat and separation of water. It is sometimes called *soda saleratus*. Commercial bicarbonate of soda is a white granular powder, which requires thirteen times its weight of water for solution. It is largely used in medicine and in cooking. For *hypochlorite of soda*, or *Labarraque's liquid*, used as a disinfectant, see *HYPOCHLORITE*; *nitrate of sodium*, see *SALTPETER*, *CHILL*; *phosphate of sodium*, see *PHOSPHORIC ACID*; *nitrate of sodium*, see *GLASS*.

Sulphate of sodium, or *Glauber's salt* (q. v.), $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$, forms large transparent monoclinic crystals. It occurs native in mineral springs, and as the mineral species *mirabilite*. Glauber's salt is highly efflorescent, falling to a white powder in the air, and in time losing all its water of crystallization. It dissolves in three times its weight of cold and in its own weight of boiling water. It has a remarkable propensity to form supersaturated solutions. For *sulphate of sodium*, see *SULPHURIC ACID*; *tungstate of sodium*, see *TUNGSTIC ACID*. Revised by I. A. REMICK.

Sodom [from Heb. *Sodam*, liter. burning, conflagration; Gr. *Sôdama*]; a city memorable in the earliest records of the Hebrews for its connection with Abraham and Lot, and the miraculous destruction by a storm of brimstone and fire (Gen. xiv. 24, 25). The exact situation of Sodom and its allied cities, Gomorrah, Admah, Zeloim, and Bela or Zoar, in the vale of Siddim, has long been discussed, the usual conclusion having been that the "cities of the plain" occupied the present basin of the southern bay of the Dead Sea, which was formerly supposed to have been burned at the time of the destruction of those cities. Geological examinations have shown, however, that the supposition is erroneous. The sea only underwent enlargement at that time. The shallowness of the southern end is an argument for locating the cities there. The catastrophe was not volcanic, but in consequence of the ignition by lightning of the asphalt with which the land is full, which would, of course, burn up the cities. The land sank when the asphalt had been burnt out, and then the Dead Sea overflowed the sunken ground. An earthquake may have been a contributing cause. On the southwest coast of the Dead Sea is Jebel Usdum (hill of Sodom), a mass of mineral salt. At the south end is a tall, isolated mass of rock, resembling a woman carrying a child. This is called Lot's wife. Josephus (*Jewish War*, iv. 8, 4) says that traces of the lost city still could be seen under the waters of the sea, and travelers have repeated the tale. The catastrophe itself, outside of the Bible and Josephus, is mentioned by Strabo (*Geography*, xvi. 2) and Tacitus (*History*, v. 5). Some locate the cities at the northern end of the sea, and employ a similar argument from the presence of asphalt there; and another argument is the supposed necessity of locating Zoar at the northern end, in order to justify the language of Gen. xiv. 9-12. SAMUEL MACAULEY JARVIS.

Sodium, Sea of. See DEAD SEA.

Suhl, Suhl, or Salsk: town, Westphalia, Prussia; junction of the Berlin-Düsseldorf railway. In the Middle Ages it was one of the most flourishing cities of the Hanseatic League. It is still a handsome town surrounded by substantial walls. The filled-up fosse forms attractive promenades. One of the old gates, the Ostthor, is a very curious piece of architecture and has been restored. The town has several important schools, a fine cathedral of the fifteenth century, and does a large trade in grain and cattle. Pop. (1870) 15,071. Revised by M. W. HAUGHSBORO.

Suhlberg, AUGUST, Ph. D., LL. D.: political economist; b. in Hamburg, Germany, Nov. 24, 1814; educated in Hamburg, Göttingen, and Berlin; syndic of the chamber of commerce of Hamburg 1840-72; became professor in Göttingen 1872.

He was an authority on coinage. His principal published works are *Lebensvoll Produktion und Werthvollkommen zwischen Geld und Silber und der Geldbewegung* (Austria) (Gotha, 1879) and *Literaturhistorie über Geld und Münzen insbesondere über den Währungsstreit, 1871-81* (Berlin, 1892). D. Dec. 23, 1892.

Sofala: a Portuguese settlement on the southeastern coast of Africa, in lat. 20° 11' S.; also an ill-defined flat coastal area from the mouth of the Zambezi to Delagoa Bay, comprising several Portuguese settlements (see map of Africa, ref. 4-6). The city of Sofala consists of a few mud huts, situated in an unhealthy salt-swamp; but the surrounding territory is very fertile, and it is only the Indians, warlike, and treachery of the native inhabitants which have hitherto impeded all progress. The low coast-land swarms with wild animals. Pop. about 1,300. M. W. H.

Sof'ias [from Turk. *safia*, from Pers. *sâfâsh*, liter. one who burns or is zealous]: persons attached to the service of the mosques. At Constantinople the term is specially applied to the whole body of theological students who receive instruction in the colleges (*medreses*) connected with the larger mosques. From them are recruited all ranks of the Mussulman clergy. Without ordination, but according to personal aptitude or length of study, each one is appointed to his special religious functions. At various times this body of students have taken a prominent part in political affairs. Thus prior to the Russo-Turkish war (1877) they caused the deposition of an incapable grand vizier and of an obnoxious sheik-ul-Islam. Their number at the capital is probably not much below 10,000. E. A. GROSSKOPF.

Soft-shelled Crab. See CRAB.

Sogdiana (in Gr. *Sogdiana*): formerly a territory of Central Asia, separated N. from Scythia by the Jaxartes, S. from Bactria by the Oxus; comprised nearly the same regions as the present Turkistan, the city of Bokhara still bearing the name of *Sogd*. It was conquered by the Persians under Cyrus, and fell after the death of Alexander the Great to Syria; it was subsequently conquered by the Turks.

Sohn, ALF. KARL FERDINAND: painter; b. in Berlin, Germany, Dec. 10, 1805; studied painting under Schadow, whom he accompanied in 1826 to Düsseldorf, in 1830 to Italy; was appointed professor in the Academy of Düsseldorf in 1838. D. in Cologne, Nov. 25, 1867. Among his most celebrated pictures are *Winnida and Arnold* (1827); *Diana and Acton* (1835); *The Judgment of Paris and Helen and Juliet* (1836); *Tasso and the Two Lovers* (1838); besides a number of portraits.

Sohrāb. See ROSTAM.

Sohst: See SOEST.

Solls: See AGRICULTURAL CHEMISTRY.

Soissons, *swā'sōn* (anc. *Nervodunum* and *Augusta Nervorum*): fortified town; in the department of Aisne, France; on the Aisne, 65 miles by rail N. E. of Paris (see map of France, ref. 3-F). It is an old but well-built city, with manufactures of cloth and hardware, and an important trade in grain. It has been the seat of a great number of very important synods, the most celebrated of which is that of 1191, which compelled Abelard to throw his writings into the fire. Soissons has been many times captured in war, the last time in 1870 by the Germans. Pop. (1891) 11,352.

Sejourner Truth: lecturer; b. in slavery in Ulster co., N. Y., about 1775; discarded the name Isabella given by her master for that of Sejourner, claiming that the Lord had bestowed it in a vision, adding the appellation Truth because that was the substance of the message she felt impelled to deliver to men; was held in bondage even after the abolition of slavery in the State; escaped to New York in 1827; subsequently removed to Northampton, Mass., and thence to Rochester, N. Y. Although illiterate, her force of character, shrewd wit, and impressive voice made her an effective speaker, and she traveled widely in the northern parts of the U. S., advocating general emancipation, women's rights, temperance, and political reforms. She spent much time in Washington, D. C., during the civil war. D. at Battle Creek, Mich., Nov. 26, 1865. See *Narrative of Sejourner Truth* (Battle Creek, 1845).

Sokoto: the largest of the HAUSA STATES (q. v.) in the Sudan, Africa; E. of the Niger river and S. of the Sahara Desert; separated from Lake Chad by the sultanate of Bornu. It is also known as one of the Fulbe states, because the

conquering Fulbe long ago imposed their rule and the faith of Mohammed upon this and other vast regions in the Sudan. It is one of the most densely populated parts of Africa. Trade and manufactures are well developed, particularly the fabrication of leather goods, cotton cloths, and weapons, but the chief industries are agriculture and cattle-raising. To Sokoto proper belong many tributary states and districts, the largest of which is Adamawa, S. of the Benue river, besides Yakubu, Saria, Kano, Muri, Katsena, and Samfara, all of which pay annual tribute to the sultan. Here the slave-trade flourishes. A small standing army, chiefly cavalry, is maintained. The capital, Sokoto, has only about 30,000 people, and is less important in population and trade than several other towns, notably KANO (*q. v.*). C. C. ADAMS.

Solana'ceæ: See NIGHTSHADE FAMILY.

Solan-goose: See GANNET.

Solanine [from Lat. *solanum*, nightshade]: a natural organic alkaloid found in the black nightshade, potato, bittersweet, and other species of *Solanum*. The alkaloids obtained from these different sources are probably not exactly the same. Solanine is a solid crystalline substance, readily soluble in alcohol. It is very poisonous, producing paralysis of the lower extremities before death, as has been seen in cattle poisoned by eating the green shoots of potatoes, which contain solanine largely. Revised by IRA REMSEN.

Solano: See SIMOOM.

Solanum [Lat., nightshade]: a genus of herbs and shrubs of the family *Solanaceæ*, most or all of which contain the poisonous principle solanine. The U. S. has several native species, mostly southern. There are a great many tropical species, some of them of great use in local therapeutics, though none is extensively employed in the medical practice of civilized lands except perhaps the *Solanum dulcamara*, or bittersweet. Several afford edible fruits, that of the egg-plant (*S. melongena*) being the most important. See NIGHTSHADE FAMILY. Revised by CHARLES E. BESSEY.

Solar Cycle: See CYCLE.

Sola'rio, ANDREA, da (called also *Andrea Milanese*): painter; b. at Solario, near Milan, Italy, about 1460. His method of painting indicates that he was influenced by Leonardo da Vinci, but nothing positive is known as to his teaching in art. He spent the years 1490-93 in Venice with a brother, Cristoforo, surnamed Il Gobbo (the hunchback), who was an architect and sculptor. In 1495 he had completed for S. Pietro at Murano an important altarpiece of a Holy Family with St. Jerome, now at the Brera at Milan. In 1507 he was decorating with frescoes for Charles d'Amboise the chapel of Château Gaillon in Normandy. Morelli supposes that Solario visited Flanders during the two years of his stay in Normandy, as his pictures have characteristics resembling those of the Flemish school. Andrea Solario died some time after 1515 while painting for the Certosa of Pavia an *Assumption of the Virgin*, now in the sacristy there. His best-known works are an *Ecce Homo* and a *Respose in Egypt* in the Poldi-Pezzoli Gallery at Milan, dated 1515; a *Vierge au Coussin vert*; a bust-portrait of Charles d'Amboise; a *Crucifixion* dated 1503; a *Head of John Baptist in a Charger* at the Louvre; and two portraits in the National Gallery of the London, both on panel. This painter is sometimes confounded with another Andrea di Milano, called Salai or Salaino, a pupil of Leonardo. W. J. S.

Solar Parallax [*solar* is from Lat. *sola'ris*, belonging or pertaining to the sun, deriv. of *sol*, sun]: the difference of the directions in which the sun is seen from the surface and center of the earth. (See PARALLAX.) The problem of determining the solar parallax is identical with that of measuring the distance of the sun, and has justly been called one of the noblest in astronomy. Attempts to estimate the distance of the sun were made even by the ancient astronomers Aristarchus and Ptolemy, but they were necessarily futile, since no observations they were able to make would measure so small a quantity as the parallax of the sun. Still they thought they measured the distance, and found it to be 1,210 radii of the earth. It is remarkable that even had the sun been as near as this, its apparent size would show its real diameter to be more than five times that of the earth. As soon as accurate observations were made with the telescope, it was found that the sun had no such parallax as it would have were its distance only 1,200 radii of the earth. At the time of Newton all that was known of the solar parallax was that it must be immeasurable with the instruments then at command.

To understand the modern solution of the problem, we must see how it presented itself to astronomers after the laws of the celestial motions were established. Imagine the sun with its retinue of eight large planets, the earth being one. As the earth revolves around the sun, astronomers see other planets in various directions, and can thus determine the annual parallax of each. In this way the ratios between the different orbits admit of very exact observation, and a more exact determination by Kepler's third law. Thus there is no difficulty in making a map of the solar system in which all the orbits shall be laid down on the same scale. Without any knowledge of the actual distance of the sun, it can be said that if the distance of the earth be represented by unity, then that of Venus will be represented by 0.72333, that of Mars by 1.52369, that of Jupiter by 5.2028, etc. It follows from this that if any one of these distances can be determined, or even the distance of Venus or Mars from the earth at any moment, all the other distances will follow, including that of the earth from the sun, just as the knowledge of a single distance on a map will give the scale of the map. It will also be readily understood that the nearer a planet comes to the earth the greater will be its parallax, and the more easily will its distance be determined. Moreover, observations on the position of a planet can be made with much more accuracy than on the sun. Thus French astronomers of the seventeenth century saw that if the apparent position of the planet Mars among the stars could be carefully observed from two distant points of the earth's surface, its parallax, and thus its distance, and the distance of the sun, could be determined. An expedition was sent for this purpose to the colony of Cayenne in South America, to make observations of the position of Mars during the opposition of 1672. Corresponding observations were made at the Paris Observatory. By a comparison of all the observations, Cassini computed the parallax of the sun to be 9.5". The error of this result is only about one-twelfth of its entire amount, so that this may justly be regarded as the first actual determination of the solar parallax. The corresponding distance of the sun would be 21,600 radii of the earth, or about 85,000,000 miles.

In 1849 Capt. James M. Gillis, of the U. S. navy, who was afterward superintendent of the Naval Observatory, made an expedition to Chili, for the purpose of observing the parallaxes of both Venus and Mars; but the two oppositions of Mars which occurred while he was there were not favorable, the planet being too far from the earth, and in addition to this the corresponding number of observations were not made in the northern hemisphere. No satisfactory result could therefore be reached.

Attempts to determine the parallax of Mars were not made between 1672 and 1849, because it was supposed that a much more accurate parallax could be determined by observations on transits of Venus. It occurred to Halley, the English astronomer, as far back as 1677, that the time required by the planet Venus to cross the disk of the sun in transit would be different at different parts of the earth, owing to the effect of the parallax of the planet. It was necessary, however, to wait nearly a hundred years for an opportunity of making such an observation, as no transit of Venus occurred from Halley's time until 1761. Then a transit occurred, and another in 1769. Expeditions to the southern hemisphere were sent out by various European nations, and these transits were observed wherever astronomers could see them. The results, however, were found to be much less accordant than had been anticipated, and the uncertainty of the observations thus shown was so perplexing that more than half a century elapsed before the results were definitively worked up. The German astronomer Encke, from an exhaustive discussion of all the observations, reached the conclusion that the sun's parallax was 8.5776", a result now known to be too small by about 0.20".

It is now found that the most accurate measures of the parallax can probably be made on the small planets between Mars and Jupiter. It is true that these bodies do not come so near the earth as either Venus or Mars, and the quantity to be measured is never so large as in the case of these planets; but this defect is more than compensated by the extreme accuracy with which the measures can be made. Dr. David Gill, astronomer at the Cape of Good Hope, has brought this method into use with great success.

Modern science has shown that there are other methods of determining the sun's distance and the dimensions of the solar system besides that of actually measuring the parallaxes of the planets. One of these consists in determining

the velocity of light. The phenomena of aberration show that there is a certain ratio between the velocity of light and the velocity of the earth in its orbit. This ratio is such that the velocity of light is a little more than 10,000 times that of the earth around the sun, and from this it follows that light takes about 495 seconds to pass from the sun to the earth. It follows that if it can be determined how many miles per second light travels, the distance of the sun can be at once obtained by multiplying this number by 495. This determination has actually been made with a high degree of precision. (See LAMÉ.) Unfortunately, the constant of aberration has not yet been determined with corresponding accuracy, owing to the inherent difficulties in the act of measuring so small a quantity, and especially owing to the fact that measures made six months apart have to be compared to determine it.

Yet a third method of determining the sun's distance is founded on the theory of gravitation. The action of the sun in changing the motion of the moon around the earth will be slightly different, according to its distance. The difference is such that an inequality of about two minutes in the motion of the moon arises from this cause; but this inequality is very difficult to determine from observation, because the measures have to be made near the first and last quarters of the moon. Owing to the different ways in which the light of the sun falls on the moon these measures are not strictly comparable with each other, and thus arises an uncertainty which has not yet been completely eliminated.

How numerous the attempts are to determine the distance of the sun in these various ways will be seen from the following résumé, which gives a synopsis of some of the principal astronomical results so far worked out.

In 1684 Horke published his celebrated works on the transit of Venus in 1761 and 1769, in which he concluded that the sun's parallax was 8.5776".

In 1844 Hansen found from the sun's action on the moon that Horke's parallax was too small. He did not reach a definite conclusion as to the exact amount of the increase until 1863, when he computed the parallax to be 8.916".

In 1858 Le Verrier, from observations of the sun, found that the parallax was 9.95".

In 1862 observations of Mars were made at several of the leading observatories in both hemispheres. From a comparison of some of these, Stone found a parallax of 8.843", and from those made at Padua and the Cape of Good Hope Winkler derived 8.964". The close agreement of these results with those of Hansen and Le Verrier led to a general belief among astronomers that the true value of the parallax was between 8.9" and 9.0".

In 1867 Newcomb discussed all the observations of Mars made in 1863, and combined with the result a revision of the methods of Hansen and Le Verrier. His conclusion was that in the then state of astronomy the most likely value of the parallax was 8.843". This result was so much smaller than others that it was received with distrust, but it was nevertheless adopted in the national ephemerides of the U. S., Germany, and Great Britain. In 1877, however, Gill, of England, made his well-known expedition to Ascension Island, for bolometer measures on Mars, from which he concluded that Newcomb's result was much too large, and that the true value was 8.78". About the same time Sir George Airy announced that the British observations of the transit of Venus in 1874 gave the surprisingly small result of 8.76";

In 1893, he redetermined the transit of Venus in 1761 and 1769, and found for the parallax 8.736".

In 1893 Harkness, from a general adjustment of astronomical observations, to which the parallax from the American photographs of the transit of Venus was included, concluded that the most probable value of the parallax, from all available data, was 8.733".

Toward the end of 1893, Auwers, from the American bolometer measures of the transits of Venus of 1874 and 1882, found 8.877".

Recent careful examinations of the data on which these results depend reduce their discrepancy, and lead to the conclusion that the value of the parallax is probably between 8.730" and 8.736". This gives, in round numbers, 69,000,000 miles for the distance of the sun, a result which is probably correct within 100,000 miles.

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Solar System: the sun and the bodies which revolve around it as their center of motion. The main features of this system are the great mass of the central body, which is between 700 and 800 times the total mass of all the bodies which revolve around it; the orderly arrangement of the principal bodies of the system, which revolve around the sun in a fairly regular progression of distances, and in nearly circular orbits; and the complete isolation of the system from all the other bodies of the universe, the nearest fixed star being about 9,000 times the distance of the farthest planet.

The bodies which compose the system may be classified as follows:

1. The great central body, the sun.
2. The four inner planets, Mercury, Venus, the Earth, and Mars.

3. A group of several hundred minor planets, or asteroids, revolving inside the orbit of Mars. It is impossible to say how many bodies there are in this group; the number known is more than 400. See ASTRONOMY.

4. The four outer planets, Jupiter, Saturn, Uranus, and Neptune. These, with the four planets first named, are called *major planets*.

5. Twenty-one satellites revolving around the planets, of which one belongs to the earth, two to Mars, five to Jupiter, eight to Saturn, four to Uranus, and one to Neptune.

To these may be added an unknown number of comets, which may, if we choose, be considered as belonging to the system; and numerous clouds of minute particles, invisible in themselves, the presence of which is made evident by their combustion when they strike the atmosphere, forming shooting stars.

Considering these bodies in the order of their masses and influence upon other bodies, the first place must, after the sun, be assigned to the eight major planets. The principal features of the orbits of these bodies are their approach to circles, and the fact that they lie nearly in the same plane. The most eccentric of their orbits is that of Mercury; yet the eye could scarcely distinguish its deviation from a circle, though it could readily perceive that the sun was not situated in the center of the circle. It is also the planet whose orbit is most inclined to the ecliptic, the inclination being 7°. See PLANET and ORBIT, and the names of the several planets.

The principal elements of the planetary orbits are shown in the following table:

TABLE OF THE PLANETARY ELEMENTS.

PLANET.	Apparent semi-dia.	Distance in miles.	Mean lat. to eq.	Time (year = 365)	Period of revolution.	Mean distance from sun.	Perihelion distance from sun.	Apoheion distance from sun.	Excentricity.	Longitude of perihelion.	Inclination to ecliptic.	Longitude of node.
					λ, μ, α	In astronomical units.	In astronomical units.	In astronomical units.				
Mercury	0.50"	9,000,000	none	1.12	88° 16'	0.387098	0.31	0.46	0.2056	77° 53'	7° 0'	48° 23'
Venus	0.57"	26,000,000	3.4°	0.98	224° 39'	0.723143	0.72	0.73	0.0034	132° 35'	3.4°	75° 18'
The Earth	0.50"	93,000,000	0°	1.00	236° 56'	1.000000	1.00	1.00	0.000000	0°	0°	0°
Mars	0.40"	140,000,000	2.3°	1.88	177° 33'	1.523686	1.38	1.68	0.0934	251° 13'	2.3°	48° 54'
Jupiter	30.00"	483,000,000	4.6°	11.86	9° 45'	5.203061	4.95	5.45	0.0483	74° 54'	4.6°	86° 26'
Saturn	16.00"	954,000,000	2.5°	29.46	9° 21'	9.539403	9.03	10.06	0.0549	93° 25'	2.5°	113° 20'
Uranus	3.70"	1,029,000,000	0.8°	84.01	171° 50'	19.191263	17.72	20.66	0.0472	170° 38'	0.8°	71° 14'
Neptune	2.40"	2,855,000,000	1.8°	164.8	192° 17'	30.069961	27.70	32.44	0.0094	91° 17'	1.8°	130° 27'

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lat. Cape Turman, from a more auspicious discussion, afterwards raised the result to 8.813".

In 1861 Newcomb, from observations of the velocity of light, combined with Nyren's determination of the constant of aberration, reached the result 8.794".

Solder [(with / reinforced by analogy of Lat. *solidus*) from O. Fr. *solder*, to solder < Lat. *solidus*, **solidus*, make solid, faster, deriv. of *solidus*, *solidus*, solid]; an alloy employed to unite pieces of metal by fusion upon the proposed joint. There are many solders, each designed

for some special use. Three grades of solder are in common use: common solder, of equal parts of tin and lead; fine solder, of 2 parts of tin to 1 of lead; and a cheaper article, of 2 of lead to 1 of tin. The soft solders are usually of lead and tin, or lead, tin, and bismuth; these melt at a low temperature. The hard solders can not be melted at a low temperature; they are commonly of zinc and copper.

Sold Note: See **BOUGHT NOTE**.

Sole [viâ O. Fr. from Lat. *so'lea* (so named from its broad flat shape), liter., slipper, whence Eng. *sole* (of a shoe or of the foot)]: a flatfish of the family *Soleidae*. The common sole, *Solea solea*, has the scales ctenoid, the vertical fins not confluent, the pectorals of both sides developed; it is dark brown on its upper and white on its lower side, with the pectoral fin blackish at its end; it generally ranges between 10 and 20 inches in length, and between 1 and 10 lb. in weight, although the latter dimensions are rarely attained. It is found along almost the entire coast of Europe, and is one of the most esteemed of fishes; the flesh is white and firm, and is in season in all months of the year except the spawning-time, which takes place toward the end of winter. It is chiefly taken on the coasts of the British Islands by trawling. Several attempts have been made by the Fish Commission to introduce it into U. S. waters. Another species found on the British coast is the *Solea (Pegasus) aurantiaca*, or lemon-sole. *Achirus lineatus* of the Eastern U. S. is the nearest American ally of the European species, but this is more popularly known as the hog-choker, cover-clip, or calico; it is a worthless fish. In California several species of true *Pleuronectidae*—e. g. *Parophrys vetula*, *Lepidopsetta umbrosa*, *Psettichthys melanostictus*, and *Orthopsetta sordida*—are called soles. Revised by F. A. Lucas.

Sole'idæ [Mod. Lat., named from *Solea*, the typical genus. See **SOLE**]: a family of flatfishes (*Heterosomata*). The body is oblong or elongated, and nearly equally developed above and below the lateral line; the scales are small, or absent; the lateral line mostly straight (sometimes double or triple); the head small, and with a rounded projecting snout, and more or less hooked upper jaw; the eyes are approximated, and the upper is further forward than the lower; the opercula concealed by the scales; the mouth unsymmetrical, and rather small and curved; teeth generally confined to the blind side of the jaws, and villiform (sometimes wanting); branchial apertures restricted above; the dorsal begins on the snout, the anal under the pectoral fin; pectorals small or (in some genera) absent; ventrals small and variously developed. The vertebrae are very numerous, but unequally distributed, in the typical forms the abdominal or rib-bearing ones being only eight or nine in number, and the caudal about forty. The family is well distinguished by the physiognomy from the *Pleuronectidae*, especially so far as the European and American species are concerned, but some Australian types lessen the distance between them. Species are most abundant in the tropics, but are found in every sea except the extreme polar ones.

Revised by F. A. Lucas.

Solemn League and Covenant: See **COVENANT, NATIONAL**.

Solenocoen'chæ [Mod. Lat.; Gr. *σωλήν*, channel, pipe + *κόγχη*, shell]: the *Scaphopoda*, or tooth-shells, in allusion to the tubular nature of the shell. See **MOLLUSCA**.

Solenogas'tres [Mod. Lat.; Gr. *σωλήν*, channel + *γαστήρ*, belly]: an order of shell-less molluscs, embracing a few forms from the deep seas. They are of interest to zoölogists as being very simple and primitive forms. See **MOLLUSCA**.

Solenog'lypha [Mod. Lat.; Gr. *σωλήν*, channel, pipe + *γλῶφειν*, curve, cut]: a sub-order of snakes. The maxillary bones are excessively shortened, and thereby assume a vertical aspect, and are thus adapted to support the venom-fangs; the fangs (except in *Causus*) are competely tubular; the pupils of the eyes are generally erect and elliptical; the occipital region is scaly. The sub-order includes the most poisonous and dreaded snakes of America; some equally dangerous in the Old World belong to the sub-order *Proteroglypha*. By Cope four families are recognized—viz.: (1) *Crotalidae*, including the rattlesnakes and copperheads; (2) *Viperidae*, typified by the vipers of Europe and Africa; (3) *Causidae*; and (4) *Atractaspidae* of Africa.

Revised by J. S. KINGSLEY.

Solenne, *sō'lēr'* (Germ. *Solothurn*): canton of Northwestern Switzerland; area, 302 sq. miles. The surface is cov-

ered by offshoots of the Jura Mountains, which here are very rich in iron and marble. The soil is fertile, and produces more corn and wine than is demanded for home consumption. The rearing of cattle, sheep, and swine is extensively carried on. Manufactures are confined to iron goods, glassware, and watches. Pop. (1888) 85,621, of whom 74 per cent. were Roman Catholics and the rest Protestants; they all speak the German language. The chief town is Soleur (Lat. *Solodurum*); pop. (1888) 8,460.

Solfegglo: See **SOLMIZATION**.

Solferino, *sōl-fā-ree'nō*: village of Mantua, Northern Italy; celebrated for the battle in which the French, under the command-in-chief of Napoleon III., and the Sardinians, under Victor Emmanuel, utterly defeated the Austrians (June 24, 1859) (see map of Italy, ref. 3-C). It was the decisive battle of the war of Italian independence. The forces of the allies numbered about 150,000, while the Austrians brought about 170,000 into the field. After their defeat the latter retreated toward Verona and left all Lombardy open to the allies. Napoleon, not caring to attack the strong position that the Austrians held in the Quadrilateral, concluded the truce of Villafranca.

Soli: See **CILICIA**.

Solicitor [in form viâ O. Fr. from Lat. *sollicitator*, deriv. of *sollicitare*; in meaning deriv. of Eng. *solicit* (in its legal sense), from Lat. *sollicitare*, urge, entice; *sollus*, whole + *ciere*, *ci'tum*, move]: in Great Britain (under the present statutes), an officer of the Supreme Court of Judicature who, and who only, is entitled to sue out any writ or process, or begin, or carry on, solicit, or defend any action or other proceeding in any court, his official title being solicitor of the Supreme Court.

Formerly the term solicitor was applied only to those who conducted such business in the court of chancery, the corresponding terms in the common-law courts being **ATTORNEY** (*q. v.*), and in the ecclesiastical and admiralty courts **PROCTOR** (*q. v.*); but it was the general practice to be admitted both as solicitor and attorney. The Scotch term corresponding to solicitor is *law-agent*, and the act regulating the admission to practice the privileges, etc., of law-agents is the Law-agents' Act, 1873 (36 and 37 Vict., c. 63). The solicitor is distinct in Great Britain from the counsel or barrister (called advocate in Scotland), not only as to the work performed by him for his client, but also as to the requirements for his admission to practice and his relations to his clients. These matters are minutely regulated by statute.

The Solicitors' Act of 1843 provides that with certain exceptions no person shall be admitted as solicitor or attorney unless he has served as an articulated clerk for five years to a practicing attorney or solicitor, or in case of a person having a university degree three years, or has been previously admitted to the bar, or has been ten years clerk to an attorney previous to being articulated. No solicitor is allowed to have articulated clerks except when practicing, nor more than two at any time; and the clerk may not engage in any other employment without the consent in writing of the solicitor and the sanction of a judge of the high court. Examinations must be passed at times and upon subjects fixed in accordance with statutes.

A solicitor, unlike a barrister, is liable to his client for negligence in the conduct of his case; and may sue his client for his remuneration, and has a general lien for his costs on his client's papers. The remuneration of solicitors in conveyancing and other noncontentious business is fixed by law with "reference to such matters as the amount of money to which the business relates, and the skill, labor, and responsibility involved on the solicitor's part." He, being an officer of the court, is subject to the summary jurisdiction of the court for professional misconduct, etc.

Solicitors can not practice as advocates in the upper courts, but may before magistrates at petty sessions and quarter sessions where there is no bar, in county courts, at arbitrations, at judges' chambers, coroners' inquests, revising barristers' courts, under-sheriffs' and secondaries' courts, and the court of bankruptcy. He must, under a considerable penalty, take out a yearly certificate authorizing him to practice. See Cordery's *Law Relating to Solicitors* (2d ed. London, 1888); Turner's *Duties of Solicitor to Client* (London, 1884); Begg on *Law Agents*. F. STURGES ALLEN.

Sol'idus: the later Latin name for the Roman gold coin called *aureus*. It received this name first in 296 when Diocletian reformed the currency, and it retained its full weight

and part 27, seventy-two being struck to the pound, as long as the empire lasted. It was adopted by the Franks, under the Merovingians and Carolingians, but was superseded by Denarii. Afterward a solidus of silver (*solidus argenteus*), which weighed one-twentieth of a pound, was coined. Three or four times, under the name of solidus, out of use, underwent a number of changes in composition and value. In 1794 the coin was abolished in France, but the name has been retained by the equivalent coin of five centimes. The *solidus*, a coin formerly struck in some parts of Italy, and generally of about the same value as a sou, is also, in name at least, an historical representative of the solidus. In the Middle Ages the solidus denoted a money of account, and was translated into the Teutonic languages by the word *schilling* in its equivalent. It then survives in the abbreviation *s.* of £ s. d.

Solifugae [from Lat. *sol*, sun & *fu-gere*, flee, fly]: a group of spider-like animals, in which the head is distinct from the thorax, and the abdomen is elongate and plainly segmented. The body is usually densely haired. The first pair of appendages ends in large pincers, the second pair are leglike. These animals, which live in the warmer parts, and especially the desert portions, of both hemispheres, breathe by means of tracheae. They have the name of being very poisonous, especially in the Old World, and are correspondingly feared. There are about sixty species, distributed among some fifteen genera, of which *Solpuga* and *Gobulus* are best known. J. S. KIRKLEY.

Sollimões, *sô-lô-môis*, or **Sollimoens**, *sô-lô-môis*: the Brazilian name for the middle Amazon, from the Peruvian frontier to the junction of the Rio Negro. It was originally the name of an Indian tribe. See **AMAZON**.

Solingen: town of Rhinisch Prussia; 16 miles E. of Düsseldorf; famous for its manufactures of iron and steel goods, especially sword-blades, in the Middle Ages, and still an important center for such manufactures, especially of cutlery and small arms (German Empire, ref. 4-1). In the district are about 3,700 metallurgical establishments, which employ 39,000 workmen. In the town, besides the large factories, there are 3,000 small forges and shops. Pop. (1890) 16,540. Revised by M. W. HARRINGTON.

Soll's, (LUDWIG JULIUS (named GRAMMATICUS); historian: lived in the first half of the third century, and wrote *Collectanea Rerum Memorabilium Polyhistor*, in which he gives a brief sketch of the world as it was known to him, accompanied with historical notices and remarks on the origin, habits, religious rites, and social conditions of the various nations. The greater part is derived through an intermediate source from the *Natural History* of Pliny and Pomponius Mela, and has no independent value. In the Middle Ages the book was much read. There are editions by Salmasius (1696) and by Mommsen (Berlin, 1864), and an English translation by Golding (1887).

Revised by M. WARRICK.

Solis, *sô-lis*, JUAN DIAZ, the navigator; b. probably at Lebrija, Andalus, Spain, about 1450. Of his early voyages nothing definite is known, but Varnhagen considered it probable that he was on the Brazilian coast with Gonzalo Coelho to 1500. In 1500 he was associated with Vicente Yañez Pinzon in an exploration of the coasts of Honduras and part of Yucatan; and in 1508, again with Pinzon, he followed down the eastern side of South America to lat. 40° S., entering the Bay of Rio de Janeiro, and passing the Plata without exploring it. In 1512 he was appointed chief pilot of Spain, commanding Yaguer. In this capacity he was employed to seek a southwestern passage to the East Indies, sailing from Laga with three vessels in Oct., 1513. Entering the Plata, he explored it for some distance, but, landing on no island, was killed by the Charras Indians; the ships then returned to Spain. The Plata was for some time called Rio de Solis, though it is probable that Solis was not its first explorer.

HERBERT H. SMITH.

Solis y Bihadeneyra, *se-ris-lis-dâ-nâ-i-râ*, ANTONIO, the author; b. at Alcala de Henares, Spain, July 18, 1610. He studied law at Salamanca, and early became known as an author of poems and dramas; these brought him the friendship of Calderon, and the protection of the Count of Oropesa, who made him his secretary; later he was chief clerk of the Secretary of State, and in 1654 was made secretary to Philip IV. In 1690 he was appointed historiographer of the Indies; soon after he took orders, and his subsequent writings are mainly on historical subjects. His fame rests

principally on the *Historia de la Conquista de Mexico* (1664), which is one of the Spanish prose classics, and was translated into French, Italian, and English. Aside from its literary merits it shows little profundity of research, and is distinguished by imagery and by the long imaginary speeches of the principal characters. It is the first connected history of the conquest. D. in Madrid, Apr. 19, 1686. H. H. S.

Solitaire, *sô-lî-târ* [= Fr. *litt.*, solitary = Lat. *solitarius*, deriv. of *solus*, alone]: the *Psephenus solitarius*, a bird related to the Doves (q. v.), formerly inhabiting the island of Rodriguez. Francois Leguat, who was one of a colony of Huguenots who settled on the island in 1691, describes the solitaire in his *Voyages et Anecdotes*, and gives a wood-cut representing it. Numerous remains of the solitaire have been found. It was larger than the turkey, and did not use its wings for flight. It was a slow runner and defended itself with its wings and beak. Its flesh was good to eat.

Solmization, **Solfeggio**, or **Solfing** [*solmization* is from Fr. *solmisation*; *sol* + *mi*, notes of the scale; *sol-feg-gio* = Ital. deriv. of *solfis*, the scale; *sol*, *sol* + *fa*, *fa*): in music, the art of giving to each of the seven notes of the scale its proper sound or relative pitch. The acquiring of a true intonation of the scale, first by regular gradation upward and downward, and then by skips from one degree to another, is an object of primary importance in vocal music. To facilitate this, various expedients have been devised, but chiefly the association of the several sounds with articulate utterances, such as the numerical words, *one, two, three*, etc. Many centuries ago certain syllables, void of any special meaning, but containing the several vowel-sounds, were selected for this purpose, and are in general use. See **CLAVE**. Revised by FRANKY REED.

Solmo'na (Lat. *Salsina*): town; in the province of Aquila (reg. Abruzzi, Italy); in the plain S. W. of Chieti (see map of Italy, vol. 5-15). The cathedral and the Church of the Antonian are noteworthy. It is the birthplace of Ovid; Pop. 14,170.

Sol'mon [from Heb. *Shlomo*, *litt.*, peaceable]: the son and successor of David, King of Israel. His name was given with reference to the peace which it was promised, should attend his reign (1 Chron. xxi, 7-10). As the recipient of Jehovah's special promise to the eternal line of David (2 Sam. vii.) he was also named Jedidiah, beloved of Jehovah (2 Sam. xii. 24, 25). His mother was Bathsheba, who had been the wife of Uriah, his birth occurring a considerable time after David's repentance for that worst of sins, his conduct in the matter of Uriah. In 1 Chron. xxi, 1-xxix, 28a is an account of Solomon's being made king, followed (verses 22b-25) by an account of his being made king "a second time," this second account being clearly a condensation of the narrative in 1 Kings i. Apparently the first coronation occurred at or near the close of the fortieth year of David (his last year but one), and just before the outbreak of Absalom's rebellion (1 Chron. xxvi, 31; 2 Sam. xv. 7). At all events this interpretation gives a consistent meaning to the biblical data, while the different interpretation commonly received makes them inconsistent and unintelligible.

Solomon began his reign humbly and wisely, asking God for wisdom, which was granted. In his fourth year he began his great work, "the house of the Lord," for which David had laid plans and accumulated enormous treasures. It was completed and dedicated seven years later. This was but the beginning of his achievements as a builder. Among the structures attributed to him are his own palace, "the House of the Forest of Lebanon," and his wonderful throne, together with cities, fortifications, stations for commerce, reservoirs, and aqueducts. He also engaged in handicraft and in landscape-gardening. He peacefully consolidated the kingdom which his father had conquered. He reorganized and enlarged the civil service of David. He started the hitherto pastoral or agricultural Hebrews on the new road of commerce, sending ships to "Ophir," India, and Arabia in the East from the new-built port of Ezion-geber on the eastern arm of the Red Sea, and from Jaffa and Tyre, westward to "Tarshish" in Spain. Many kings were his tributaries; untold wealth and the wonders and curations of many countries flowed into or through the land. Many foreigners were attracted by his splendor and wisdom, notably the Queen of Sheba, with her numerous retinue. His harvest grew to number 1,000 inmates, and thus to accord with Oriental ideas of his royal magnificence. He appears as a person of fascinating beauty and grace, impetuous,

generous, sympathetic, and at first humble; of fine humor and noble intellect, a man of broad views, a far-sighted statesman, most learned in the science of the day. He was an organizer of splendid executive powers, a great builder and artist, poet, philosopher, and had from the Lord pre-eminently "an understanding heart to judge." Unfortunately, there is another side to the picture. From motives of state policy Solomon married the daughter of Pharaoh of Egypt and many other wives from among the princesses of his tributary kingdoms. This led to latitudinarianism in religion, to extravagance in public expenditures, to oppression and disregard of human rights. The result was that his reign was partly a failure. Before his death Edom and Syria revolted and Jeroboam raised rebellion in Northern Israel. After his death the ten tribes revolted, so that the strictly Israelite portion of his kingdom was divided, while the tributary peoples fell away from their allegiance.

ISAAC RILEY. Revised by W. J. BEECHER.

Solomon ben Gabirol (Arab. *Abu Ayyūb Sulaimān ibn Gabirol*; Lat. *Abi-gebrol*, *Avicembrol*, *Avicembro*): Jewish philosopher and poet; b. in Cordova, Spain; lived for a time at Saragossa; d. about 1041. His chief poem is the hymn *Kether Malkuth* (Crown of Royalty), a philosophical explanation of Jewish doctrine. His chief prose work, written in Arabic, is the *Source of Life*, in which "the theories of Plotinus are developed and the will plays a part almost as it does in the system of Schopenhauer." This work was freely used by Christian writers in the Middle Ages; the discovery of the identity of the author with Gabirol was made by Munk. Gabirol also wrote a work on ethics. See Steinschneider, *Hebr. Uebersetz. im Mittelalt.* (vol. i., § 219); Stössel, *Sol. ben Gabirol als Philosoph* (Leipzig, 1881); Dukes, *Solomon ben Gabirol* (Hanover, 1880); Guttman, *Die Phil. des Ibn Gabirol* (Göttingen, 1889).

RICHARD GOTTHEIL.

Solomon ben Isaac: See RASHI.

Solomon (Germ. *Salomon*) Islands: an extensive archipelago E. of New Guinea, from which it is separated by the Bismarck Archipelago and Louisiade islands. It extends in a line S. E. and N. W. from about lat. 4° S., lon. 154° E., to lat. 12° S., lon. 162° E., and consists of seven large islands and very many small ones. The islands forming the northern half of the archipelago were taken under German protection in 1886. The largest of these are Bougainville (pop. 10,000), Choiseul (5,850), and Isabel (5,840). The total area of the German Solomon islands is 8,708 sq. miles, with a pop. of 89,000. The remainder of the archipelago has an area of 8,357 sq. miles and a population of 87,000. It was brought within the British protectorate in June, 1893. The inhabitants are Papuan and Polynesian, the latter living especially on the smaller islands, where the population is often very dense. They are intelligent, quick, and crafty, but make good servants, and are in demand on the Bismarck Archipelago as laborers. They are cannibals; their weapons consist of the bow and arrow, spear, and club, which are all characterized by fine finish. Their canoes are the finest in the Pacific. The islands are essentially volcanic, but are surrounded by coral reefs. They were discovered in the sixteenth century, but were lost sight of until 1767, when they were rediscovered by Carteret. They are still the least-known group of the Pacific. See *Voyages* of Dalrymple, Hawkesworth, Fleurien, Labillardière, Dumont d'Urville, Brenchley, and Wood; Wallace, *Australasia*; and Woodford, *A Naturalist among the Headhunters* (1890).

MARK W. HARRINGTON.

Solomon, Song of: See CANTICLE.

Solomon's-seal: any one of the liliaceous herbs of the genera *Polygonatum*, *Vagnera*, and *Unifolium*. They are found in Europe and North America. The roots are popularly esteemed as a vulnerary, and have some use in domestic medicine. The name properly belongs only to the species of *Polygonatum*; the "seal" is the circular depressed scar left on the root-stock by the death and separation annually of the flowering stem. The common Solomon's-seal, *Polygonatum multiflorum*, is found in woods and copses in many parts of England, and also in a few places in Scotland. It has a stem about 2 feet high, the upper part of which bears a number of large, ovate-elliptical, alternate leaves in two rows. The flower-stalks are generally unbranched; the flowers, which are not large, are white and drooping.

Revised by CHARLES E. BESSEY.

Solomon's Temple: See JERUSALEM.

Solomon, Wisdom of: See WISDOM, BOOK OF.

Sol'on: statesman, sage, and poet; the son of Execestides; filled the office of first archon in Athens (Ol. 46, 3; B. C. 594), and in that capacity established there the constitution framed by him. He is the noblest representative of the many-sidedness which distinguished the Athenian more than all other Hellenes. An Eupatrid by birth, he engaged also in trade and commerce by sea. By this means it was possible for him, after finishing all exercises, as well in music and poetry as in gymnastics, to become acquainted with the entire coast of the Archipelago. It was a time of fermentation in society; Psammetichus had opened the Nile region to the Greeks (B. C. 606); the first money had been coined in Ægina; navigation took all at once a gigantic stride forward; young adventurers gained in a few years great riches, and those parts of the communities engaged in trade took form as a new middle class, and stood defiantly opposed to the ancient families; property in land was outstripped by movable capital; around Athens on all sides—in Argos, Corinth, Sicily, Megara—the old system of things had been broken, the ruling families had been overthrown, and through the downfall of the constitutions single tyrants had come to power, who shone by their riches, employed mercenary troops, and pursued a narrow policy of self-aggrandizement. In this revolutionary time, spite of all splendor, the best possessions of the nation were endangered—namely, the free citizen class and the sovereign authority of the law. For this reason Solon deemed it the work of his life to give his native city the benefit of all progress in culture which the times offered, without causing her to break with the past and be exposed to the deplorable evils connected with a revolution. A written criminal code, such as Dracon had issued (B. C. 621), was not able to supply the want; a thorough, peaceful reform of the state was needed, which should reconcile the differences which tore the communities asunder. For a moral and political renovation of the state was needed more than all else a vigorous self-consciousness. The Athenians, however, were feeling depressed; Megara held possession of Salamis, and was consequently mistress of the sea; the Athenians were like captives in their own land, and in deep despondency had renounced their own islands on the coast. Inflamed by Solon's inspiring poetry, they conquered Salamis (about 604). This was a turning-point for the history of Greece. From that day Megara sank, and Athens resisted power.

Solon was the first man in Athens; he was at liberty to secure for himself absolute power for life, but it was his firm resolve to accomplish his purpose without any violation of law. As recognized mediator between all parties, and solely by the force of his genius, his impressive words, and his pure personality, he carried out the most important reforms, applying them to the evils of society at the very root. The radical evil was that the small landowners were hopelessly in debt. Owing to a hard debtor-law, they forfeited even their freedom; a wretched proletariat was thus formed, and the land fell more and more into the hands of the great capitalists. Solon caused Athens to alter its standard of coinage (probably after the example of Corinth) by adopting also for silver the Euboean gold standard. The result was a lighter drachma, in which debts could be legally paid, so that the poor obtained a relief of 27 per cent. Other measures of alleviation were also introduced: the debtor-laws were made milder, and fixed limits set to the acquisition of large estates; and the surprisingly great success of this legislation (*Seisachtheia*) in lightening the burdens of the people is most plainly attested by the glorious poem of Solon, in which he calls Mother Earth to witness that she has been happily freed from the burden of many pawn-pillars (which were set up in the ground as tokens of alienated lands). Then followed the great political reform—the conversion of the state, ruled by families, into a timocracy. It seemed to the noble families only a new guaranty of their privileges that none could hold office as archons except the members of the first class, the Pentakosiomedimni (with a minimum of 500 bush. of barley net income, corresponding to a taxable capital of 6,000 drachmæ or one talent), while the citizens of the second class, the knights, with 300, and those of the third (*Zeugitai*), with 150 medimni as minimum of each year's income, had access to the council and to the remaining offices. The mass of the people, the Thetes, who did not belong to the three classes, could not become members of the council nor fill any office, but took part in the public assemblies. No one

therefore, was excluded from public life, and even the poorest helped frame the laws which he had to obey. The personal life of the first citizens was no longer dependent upon birth, but could be fulfilled by a careless domestic economy, and won by others through industry. The free for agriculture was encouraged, the worth of landed property was increased, and even commoners could take full share in the management of public affairs if they reached the degree of prosperity which seemed necessary for the attainment of culture and independent leisure. In law, the important reform was carried through that the common people no longer consider final decision in courts, but that appeal to the commonwealth could be made in every case. The statutes by which the sacred, public, and private law was administered were inserted on wooden frames with space for free sales, and brought to the notice of all. On public life also the laws took a firm hold: they emancipated the citizen from the family; they gave to the head of every household the free disposal of his acquired property; they showed the value of good parents on their children for maintenance only on the condition that they had given them a careful education; they checked the luxurious adornment of tombs and extravagant display in the dinner for the dead.

In all his reforms Solon's purpose was to purify the public morals, banish all barbarous influences, and bring to perfection whatever was peculiarly Hellenic. He united religion, state, and home in a harmonious whole; every citizen was made responsible for the commonwealth, and on the other hand the prosperity of the state was based upon the stability of the family. The legislation of Solon is the greatest work of an unshaken political wisdom has produced, the earliest expression of the Athenian consciousness—a work based upon the needs of the time, inasmuch as Solon gave a place in his laws to whatever of good had struggled to the light in the time of the tyrants, while he avoided violence and lawlessness like theirs. It is true that Solon's external success was slight, and he himself was to live to see a tyranny in Athens, but his laws remained in force; they protected the city like a palladium, and up to the latest times the Athenians found their better self in Solon's law.

About the decisive year of 684, during which he ruled Athens with dictatorial power, Solon is said to have traveled ten years in foreign countries. Solon lived retired in Athens until his death about O. 55, 2) 559 B.C., surrounded by a number of pupils, of whom Mimantides, the teacher of Theophrastus, was one.

Revised by J. R. S. Smeaton.

Solar: an island of the Malayan Archipelago, off the eastern extremity of Flores, in lat. 8° 47' S., lon. 123° 8' E. Area, 106 sq. miles. Pop. 15,000, mostly engaged in fishing and trading. Sulphur and edible birds' nests are the principal articles of exportation. The inhabitants are Malays, partly Mohammedans, partly Christians. The name is also applied to the small archipelago to which this island belongs. It contains two other large islands—Adonara and Larakelau. Area of the group about 1,250 sq. miles. Pop. variously estimated at from 40,000 to 180,000.

Revised by M. W. Hauswirth.

Solothurn: Switzerland. See SOLOTHURN.

Solo'yev, Sergei Mironovich; historian; b. in Moscow, Russia, May 3, 1829; d. Oct. 4, 1879. During his life he was connected with the University of Moscow, where he studied, taught, and in 1871 was made rector, but resigned in 1877, owing to difficulties with the authorities. His writings are numerous; his *History of the Relations between the Russian Princes of the House of Rurik* (1847) laid down the principles of the modern school of historians just coming to form themselves; his *Historical Letters* (1856), his *History of the Fall of Poland* (1863), his *Scholarship of Russian History* (1864-65), and others are of value, but his great work was his *History of Russia*, begun in 1851. He lived to complete twenty-nine volumes, carrying it down to the year 1714. It is a mine of information, clear and impartial, but needed for popular use.

A. C. COOLIDGE.

Solution (Fr. O. V., from Lat. *soluere*; sol, sun + *luere*, to wash, dress, of *solis*, of *sol*, sun, stand, stand up). The indication of the earth's equator to the solstice or plane of its annual motion about the sun is the same that we have in dividing half the year on the northern polar side of the equator, the other half on the southern, causing the vicissitudes of summer and winter in the respective

hemispheres. The distance from the sun N. or S. of the equator has direct effect on the constantly varying. The two points at which this apparent northern or southern motion ceases (or at which its progressive increase or diminution appears to be arrested) are the summer and winter solstices. At these periods the day is the longest or shortest, according as the earth is in the summer (June 21) or winter (Dec. 21) solstice. See EQUINOX.

Solution (from Lat. *soluere*, *soluere*, *soluere*, sol, sun, dissolve, and *soluere*, dissolve); the liquid product formed when a solid, a liquid, or a gas dissolves in a liquid. Thus when water is poured upon salt or sugar the solid substance disappears as such and passes into the liquid form. Any liquid which has the power to dissolve a substance is called a solvent, and the substance is said to be soluble in the liquid. Water is used as a solvent much more generally than any other liquid, both because it is a common substance and because it dissolves many things. Alcohol is also much used, especially in the preparation of solutions for medicinal purposes. The so-called tinctures are such alcoholic solutions of constituents of plants which have value as remedies. Besides water and alcohol many other liquids, perhaps all liquids, have the power to dissolve other things, and some of them find employment for this purpose.

Liquids not only dissolve solids, but other liquids and also gases. Some liquids mix with one another, or, in other words, they dissolve one in the other. This is true, for example, of water and alcohol, which dissolve in all proportions. Other liquids, however, act differently. Thus water, as is well known, does not dissolve oily liquids. Ether and benzene, on the other hand, do dissolve oils. Some gases dissolve in water to a very remarkable extent. Thus water at about freezing temperature has the power to dissolve 1,000 times its own bulk of the gas ammonia. Water also dissolves carbonic acid gas, and all natural waters contain some of this gas in solution. These waters also contain ordinary air in solution. When a liquid is placed in a closed vessel, and gas forced into it by means of a pump, it dissolves more, and more gas as the pressure increases, and when the pressure is removed—that is, when the vessel is opened—the gas passes rapidly out of solution, giving rise to the phenomenon known as effervescence. This is most commonly seen in the case of soda-water, which is a solution of carbonic acid gas in water under pressure. When the water is drawn out into the air the gas escapes.

In a solution, whether of a solid, a liquid, or a gas, the dissolved substance is uniformly distributed—that is to say, there is as much of it in one drop of the solution as there is in any other drop. A drop of a concentrated solution of the dye magenta brought into many gallons of water imparts a distinct color to all parts of the liquid. An experiment of this kind gives some idea of the extent to which the division of matter can be carried, for it is evident that in each drop of the dilute solution there must be contained some of the dye, though the quantity must be minute beyond our powers of imagination. While there seems to be no limit to the extent to which a solution can be diluted, and still retain the dissolved substance uniformly distributed through its mass, there is a limit to the amount of every substance that can be brought into solution in any given solvent. Some substances are easily soluble; others are difficultly soluble.

Little is positively known in regard to the nature of solution. There are facts that indicate that the particles of the solvent form unstable compounds with the particles of the dissolved substance. In some cases, further, it appears that the act of solution involves a complete breaking down of the dissolved substance. The subject is being actively investigated. Consult *Solutions*, by W. Ostwald, translated by M. M. P. Muir, 1891.

See SOLUBLE.

Solway Firth: an inlet of the Irish Sea, 31 miles long, from 24 to 30 miles broad; it separates Cumberland from the south of Scotland. It is noted for the gentleness and strength of its ebb and flow, the spring tide rushing in with a wave from 4 to 6 feet high, and with a speed of from 8 to 10 miles an hour. It receives the E.4., the Derwent, and several minor streams.

Solymna: same as SOLEMAN (q. v.).

Somal Coast: an ill-defined area occupying the eastern horn of Africa, and extending along the Gulf of Aden and the Indian Ocean from Zela, in lat. 11° 18' N., to the mouth of the Jub. in lat. 0° 14' N.; claimed by the British (along the Gulf of Aden) and the Italians (along the Indian Ocean & to British East Africa); area of the former part about

75,000 sq. miles. By an arrangement of the British and Italian governments in 1894 the limits of their protectorates were strictly defined. It is mountainous, rich in myrrh and incense, and inhabited by tribes related to the Abyssinians and Gallas, mostly nomads and ill famed on account of their savage and predatory habits. The principal port is Berbera, in lat. 10° 23' N. It has an excellent harbor. During the hot season it is deserted, but in winter comprises a population of about 30,000 people, who gather to exchange the products of their industry. See James, *The Unknown Horn of Africa* (2d ed. 1890). Revised by M. W. HARRINGTON.

Somatology [Gr. *σῶμα*, *sōma*, body + *λόγος*, *logos*, discourse, reason]: the science of living organized bodies as far as relates to material conformation and not to psychological phenomena. Thus it is included within biology. In a limited sense it is applied to the science of the human body, when it is equivalent to human anatomy and physiology. The name somatology has also been given to the study of inorganic bodies, in which case it does not differ much in signification from physics. See ANTHROPOLOGY.

Sombrerete: town of the state of Zacatecas, Mexico; 100 miles N. W. of Zacatecas (see map of Mexico, ref. 5-F); 8,432 feet above the sea. It is noted for its silver mines. The celebrated "black vein" of Sombrerete was formerly said to yield the richest ore in the world. The town had a mint in 1810-12. Pop. about 9,000. H. H. S.

Somers, JOHN, Lord: statesman; b. at Worcester, England, Mar. 4, 1651; educated at Trinity College, Oxford; studied law at the Middle Temple; called to the bar 1676, but remained at Oxford, engaged in classical, historical, and juridical studies; translated from classic authors and wrote pamphlets in vindication of the exclusion of the Duke of York from the succession and in defense of grand juries (1681); began legal practice at London 1682; soon became a leader of the Whigs; one of the counsel for the seven bishops 1688; sat as member for Worcester in the Convention Parliament Jan., 1689; was chairman of the committee which drew up the Declaration of Right; was made successively Solicitor-General, Attorney-General, Lord Keeper of the Great Seal, and in 1697 was appointed Lord Chancellor and raised to the peerage. His fidelity to William III. exposed him to frequent attacks, one of which resulted in his removal from the chancellorship Apr. 17, 1700, and another caused his arraignment for trial before the House of Lords with a view to impeachment on fourteen very miscellaneous charges Apr. 1, 1701, but the prosecution was withdrawn June 17, 1701. He recovered his influence at court; was chosen president of the Royal Society 1702; drew up the plan for the union of the crowns of England and Scotland 1706; became president of the council Nov., 1708, and resigned 1710. D. in London, Apr. 26, 1716. A valuable collection of state papers, known as the *Somers Tracts*, was edited from originals in his library (16 vols. 4to, 1748-52). A new edition of the *Tracts* was issued by Sir Walter Scott (London, 13 vols. 4to, 1809-15). His *Life* was written by R. Cooksey (1791). Revised by F. M. COLBY.

Somerset: city: capital of Pulaski co., Ky.; on the Cin., N. O. and Tex. Pac. Railway; 6 miles N. of the Cumberland river and 79 S. of Lexington (for location, see map of Kentucky, ref. 4-H). It is in a grain, fruit, and vegetable growing region, near extensive mines of coal and iron, and contains 12 churches, 2 high schools, a national bank with capital of \$100,000, a banking company with capital of \$80,000, and 2 weekly newspapers. Pop. (1880) 805; (1890) 2,625; (1895) estimated, 3,500. EDITOR OF "REPORTER."

Somerset: village; Perry co., O.; on the Balt. and Ohio Railroad; 20 miles S. W. of Zanesville, and 24 S. by E. of Newark (for location, see map of Ohio, ref. 6-G). It is in a region abounding in coal, iron ore, and potter's clay, and contains flour-mills, planing-mills, woolen-mills, carriage-factories, a State bank with capital of \$15,000, and a weekly newspaper. Pop. (1880) 1,207; (1890) 1,127.

Somerset: borough; capital of Somerset co., Pa.; on the Baltimore and Ohio Railroad; 36 miles N. W. of Cumberland, Md.; 110 miles E. S. E. of Pittsburg (for location, see map of Pennsylvania, ref. 6-C). It is principally engaged in the lumber-trade and in the manufacture of maple-sugar, butter, and cheese, and contains a public high school, 2 national banks with combined capital of \$100,000, and 4 weekly newspapers. Pop. (1880) 1,197; (1890) 1,713.

Somerset, EDWARD SEYMOUR, Duke of: b. about 1500; brother of Jane Seymour, third queen of Henry VIII. and

mother of Edward VI. After the death of Henry he rose to the head of affairs; was created Duke of Somerset and earl-marshal of England in Feb., 1547, and in March was made lord protector and governor of the realm, becoming king in all but name. When the Scots opposed the marriage of Mary Stuart to Edward VI., Somerset invaded their country and defeated them in the battle of Pinkie. This drove them to form an alliance with France, and war followed between that country and England, resulting in the latter's loss of Boulogne. His arrogance and rashness provoked opposition, and among his political adversaries was his own brother, Sir Thomas Seymour, who was apprehended and executed by his orders Mar., 1549. This brought the protector into great odium, and in Oct., 1549, he was deprived by the young king of his protectorship and thrown into the Tower, but was released with a full pardon in a few months. Among his foremost rivals was the Earl of Warwick, afterward Duke of Northumberland. Somerset entered into a plot against his life; was again arrested, found guilty of felony and constructive treason, and was beheaded on Tower Hill, Jan. 22, 1552.

Somerset, FITZROY JAMES HENRY: See RAGLAN.

Somerset, ROBERT CARR, Earl of: See OVERBURY, SIR THOMAS.

Somersetshire: county of Southwestern England; bounded on the N. and W. by the Bristol Channel; area, 1,630 sq. miles. The surface is much diversified by ranges of low, rocky hills; the Mendip Hills in the N. and the Quantock Hills in the W. Coal and freestone are mined, and iron and lead in small quantities. Large tracts of meadow and marshes afford excellent pasturage. The cheese known as Cheddar and cider are largely produced. Good wheat is raised around Bridgewater. Dairy-farming is one of the principal occupations; leather, glass, paper, and iron goods are manufactured. Pop. (1891) 484,337.

Somers's Islands: See BERMUDA ISLANDS.

Somerville, WILLIAM: poet; b. at Edston, Yorkshire, England, in 1677; entered Westminster School in 1690; became a fellow of Oriel College, Oxford, and in 1704 succeeded to his patrimonial estate, where he lived like a jovial country squire, dividing his time between his hounds, his books, and his bottle. His poems are *The Two Springs*, a *Fable* (1726); *Occasional Poems*, *Translations*, etc. (1727); *The Chase*, his best production, a didactic blank verse poem in four books on the art of hunting (1735); *Hobbinol*, or *the Rural Games*, a burlesque in blank verse (1740); and *Field Sports* (1742). D. July 19, 1742. Revised by H. A. BEERS.

Somerville: city; Middlesex co., Mass.; on the Mystic river, and the Boston and Maine and the Fitchburg railways; joining Boston on the N. W. (for location, see map of Massachusetts, ref. 2-H). It was formerly a part of the town of Charlestown, from which it was set off in 1842, and is a residential city whose inhabitants are largely engaged in business in Boston. It is connected with Boston by seven lines of electric and five of steam railway, contains 31 churches, 24 public-school buildings, valued at \$790,000, a public library, hospital, old women's home, insane asylum, 3 public parks, a national bank with capital of \$100,000, a savings-bank, and 2 weekly newspapers. The U. S. census returns of 1890 showed 387 manufacturing establishments (representing 58 industries), with a combined capital of \$3,788,018, employing 3,126 persons, paying \$1,716,496 for wages and \$4,369,064 for materials, and turning out products valued at \$7,824,082. The city was settled in 1629 and incorporated as a city in 1872. It is built on seven hills. The first vessel built in the State was launched from Gov. Winthrop's Ten Hill farm on the Mystic river in 1631; a powder-house erected on Quarry Hill about 1708 is carefully preserved and is now in the center of a public park; the strongest fortifications in the vicinity were built on Winter Hill during the siege of Boston; Gen. Putnam's "impregnable fortress" was on Cobble Hill; and the "citadel," where Washington raised the first colonial union flag, Jan. 1, 1776, was on Prospect Hill. Pop. (1880) 24,933; (1890) 40,152; (1895) estimated, 52,000. JOHN S. HAYES.

Somerville: borough; capital of Somerset co., N. J.; on the Raritan river, and the Central Railroad of N. J.; 11 miles W. N. W. of New Brunswick, and 36 miles W. S. W. of New York (for location, see map of New Jersey, ref. 3-C). It has gas and electric-light plants, sewers, water-works, 7 churches, graded public school with 16 teachers, a Baptist classical school, 3 primary schools, public library

(founded in 1871); 2 national banks with combined capital of \$142,000, a savings-bank, and a monthly and a weekly post-office. The borough was founded about 1665, and was known as *Sancton* till 1899. During the Revolutionary war the American army was encamped in the immediate neighborhood of Somerville for a long time. Pop. (1900) 3,105; (1880) 2,801; (1855) estimated, 4,291, with suburbs 4,700.

D. N. Minsin, "Somerset Democrat."

Somerville, Mary: scientific writer; b. at Jefferson, Maryland, Dec. 26, 1780; daughter of Admiral Sir William Pakenham. In 1800 she married Samuel Dugg; in 1803 was left a widow with two sons and an independent fortune; went through a course of pure and applied mathematics. In 1819 she married her cousin William Somerville, who aided her in her studies. In 1840 her *Mechanism of the Heavens* was published. The preparation of this work, an attempt to bring the *Mécanique céleste* of Laplace within the reach of a larger range of students, was undertaken at the solicitation of Lord Brougham. In 1834 she published *Connection of the Physical Sciences*; in 1840, *Physical Geography*; in 1845, *Mineralogical and Molecular Science*. She was elected a fellow of the Royal Astronomical Society in 1832, and afterward a member of several other British and foreign scientific societies. D. in Naples, Nov. 29, 1872. An autobiography edited by her daughter appeared in 1873.

Somme, sôme: a river of France. It rises in the department of Aube, passes by St.-Quentin, Ham, Amiens, and Abbeville, and falls into the English Channel after a course of 152 miles. It is navigable to Amiens, and is connected with the Seine, Oise, and Scheldt by canals.

Somme: department of Northern France; bordering on the English Channel, on both sides of the river Somme; area, 2,579 sq. miles. The surface is flat, but the soil very fertile and large crops of corn, hemp, hops, and fruit are raised. Cattle-breeding is extensively carried on, and the manufacture of velvet, silk, cotton goods, soap, chemicals, beetroot-sugar, paper, and linen are very important. It is traversed by the Northern Railway and the railway from Amiens to Boulogne. Pop. (1891) 540,495.

Somnambulism (Lat. *somnus*, sleep + *ambulare*, walk): a peculiar perversion of the mental functions during sleep, in which the subject becomes an automaton. The organs of sense remain dormant and the intellectual powers are blinded. During this condition some instinctive excitation may take place, and there may be the production of impulses, in consequence of different kinds. One individual may walk along the ledge of the roof of a house, and another may jump into a river, or a third may commit homicide. The condition is very much less common than is supposed, although imperfect examples are seen in persons who walk at night in sleep. A slight stimulation of the organs of sense is sufficient to restore the person. Cases have been described where hysteria takes this form. Somnambulism may sometimes be induced by hypnotism, the patient walking about unconscious; but many such cases are fraudulent. See HYPNOTISM.

WILLIAM PEPPEL.

Somnath: ancient and decayed town of the peninsula of Ansonia, India; to lat. 30° 30' N., lon. 70° 24' E.; contains a famous temple, now in ruins, but at one time one of the richest and most venerated places of Hindu worship (see map of S. India, ref. 3-11). Mahmud of Ghazni sacked the temple in 1024, and carried away its magnificent gates, celebrated as much for their exquisite workmanship as for the costliness of their materials. In 1842 some gates, said to be those of the temple in Somnath, were brought from Afghanistan by the British, but, to avoid exciting jealousy between the two great religious bodies of the Hindus, they were placed in the arsenal of Agra. Pop. about 6,000.

Sona'ta (= Ital. *sonata*, thing), *liter.*, something sounded or played on an instrument. *fem.* perf. partic. of *sonare*, sound; originally, in the latter part of the sixteenth century, any kind of composition for instruments, in contradistinction to vocal compositions, which were called *cantata*. Subsequently, especially after the time of Bach, the name was applied principally to compositions for solo instruments and of a certain form, consisting of several movements—first, three, the *allargo*, *adagio*, and *rondo*—to which afterward a fourth was added by Haydn, the *minueto* or *scherzo*, which differed from each other in time and sentiment, but were held together by the general character pervading all. This form of composition was greatly developed by Haydn and Mozart, and culminated in Beethoven.

Song-books (*lyr. chansonniers*; Ital. *canzoniere*; Span. *canzoneros*; Port. *canzonetários*; the manuscripts in which has come down to us the greater part of the lyric poetry of the Middle Ages in all the chief countries of Europe. As medieval poems were for immediate delivery, either by themselves or by professional singers (*jongleurs*, etc.), their productions were usually scattered or even entirely lost. At first, perhaps, the song-books were merely single sheets containing isolated songs, put together for the sake of convenience; but later it grew to be the fashion for rich patrons of poetry to have collections of lyrics made for their own use. Those were of the nature of anthologies, and successive generations of writers constantly varied the contents of the older books in preparing the new. As poets and poems grew obsolete, their names and places were usurped by new ones. Hence only a small part of the work of any single medieval lyric poet is extant. The collections that have come down to us, however, are very precious. They often contain the music to which the poems were sung, and are adorned with elaborate miniatures and other decorations.

The number of medieval songbooks in various languages in the libraries of Europe is very great. Those containing Provençal lyrics are enumerated by K. Bartsch, *Gesamtes Verzeichniss der provenzalischen Literatur* (Klarsfeld, 1872). The French *chansonniers* have been studied by G. Raynaud, *Bibliographie des chansonniers français du XIII^e et XIV^e siècles* (2 vols., 1884), and by J. Baskelmann, *Die altfranz. Chansonniers in den Bibliotheken Frankreichs, Italiens und der Schweiz* (in Herrig's *Archiv*, vol. xli.). The most famous collection of early Italian lyrics is the *Cod. Vat. 3,703*, published by A. d'Ancona and D. Comparetti (5 vols., Bologna, 1875-88), though this has to be supplemented by several others in various libraries in Italy. For the early lyric poets of the Spanish Peninsula, who wrote in the Portuguese-Galician tongue, there are the magnificent *Cod. Vat. 4,805* (known as the *Chansonniers du Vaticane*) and several others. The Spanish lyrics of the fourteenth and fifteenth centuries are collected in a whole series of *Chansonniers*, of which the first is the so-called *Chansonniers de Rimado*, made about 1450; and the most extensive is the *Chansonniers General* of Fernando del Castillo, first printed at Valencia in 1611. Of all medieval song-books, perhaps the most famous is the great German collection variously known as the *Maessian* (though with no good reason), the *Paris*, and the younger *Heidelberg* manuscript. This splendid volume became known to scholars in the sixteenth century, when it was in the possession of a certain Freiherr Hans Philipp von Hohenhausen, of Fürsteburg, in the Rheinhell. Later it was at Heidelberg, but after the sack of this place in 1622 it made its way mysteriously into the royal library in Paris. Here it remained till 1889, when the Heidelberg Library obtained it at a valuation, it is said, of \$100,000—probably the highest price ever given for a manuscript or book. In England there were many song-books, but not of distinguished character.

A. R. MASON.

Songkoi, or Songtao (song is Annamite for river): the largest river of Eastern Indo-China and a trade-route of large potential importance. It rises in the mountains of Northern Yunnan, China, flows S. E. and empties into the Gulf of Tonquin after a course of about 750 miles, half of which is in Yunnan and half in Tonquin. The most important affluent is the Songkai, which rises near the source of the Songkoi, parallels its course, and enters the latter on the left bank, not far above Hanoi. Just below its mouth begins an enormous delta, which is increased in size by lateral communications of the Songkoi with the Songkai, the next river to the N. The lower river is subject to floods in the spring and early summer, when the water sometimes rises 15 or 20 feet in twenty-four hours, and much of the lower stream is diked. The waters during the inundations are reddened by the soil, whence the French name of the river (*flamme*). In 1880 a steamer drawing 28 inches ascended the river to Lankai at the Chinese boundary in sixty hours from Hanoi. The stream has always been an important native trade-route.

MARK W. HARTSTROX.

Song of Birds: the musical notes uttered by many birds, especially by certain passerines, although others, as of the snipe family even, like the woodcock and Dartma's sandpiper, have a pleasing combination of notes. Nearly all birds, in fact, utter some kind of a cry, but in the majority it can scarcely be called a song. In man and other mammals sounds are produced in the larynx, but in birds musical sounds are produced in an enlargement of the windpipe,

termed the syrinx, just above the forks of the bronchi. To the syrinx are attached the singing muscles, numbering in the oscines from four to six or even eight pairs. The apparatus is simple, and its modifications are comparatively slight. There is no reason to suppose that the tongue takes any, at least any important, part in the production of sounds even in birds which pronounce words. Song is almost exclusively an attribute of male birds, although the female may sing, as does the cardinal of the U. S., and it is heard most often during the time of pairing, so that springtime is pre-eminently the season of song; still some birds sing pretty much throughout the year, and even, like the Carolina wren, in winter. The bobolink, on the other hand, changes his manners with his coat, and sings only in full-dress plumage. Early morning is the favorite hour for song, next to that the sunset-hour, but some birds, like the scarlet tanager, sing during the torrid heat of a southern noonday, and many songsters besides the nightingale sing at night, notably the mocking-bird and yellow-breasted chat of the U. S. The gay-plumaged birds of the tropics belong largely to the harsh-voiced *Clamatores*, but a bright coat is not a sure sign of a discordant voice, for the majority of that strictly American family the tanagers inhabit the tropics, and sing as well as the familiar scarlet tanager of more northern climes. Not only do individuals of a given species vary considerably in their power of song, but certain localities seem to develop musical talent better than others. The meadow-lark sings better in Florida than in the northern parts of the U. S., while the western subspecies excels that of the east.

F. A. LUCAS.

Song of Solomon: See CANTICLE.

Songs [O. Eng. *song*, *sang*; Germ. *sang*; Goth. *saggus*; cf. Gr. *ōphē*, tuneful voice, oracle < Indo-Eur. *songh-*]: from the literary standpoint, short lyric or dramatic poems suitable for setting to vocal music; from the musical standpoint, compositions of relative simplicity of form which carefully illustrate and enhance the sentiment expressed by the words. In the modern sense this form may be flexible as to development. The word *song* represents an indefinite quantity, in that its characteristics may range through a large scope as to musical value. There are short songs which may be compared to gems, in miniature, by the great painters. There are also the folk-songs of various countries (the *canti popolari* of the Italians), full of national characteristics, and immortal in their simplicity. Lastly, there are myriads of songs whose existence, both as to music and text, is fortunately but for a day.

DUDLEY BUCK.

Songtao: See SONGKOR.

Sonnet [either directly or via Fr. *sonnet* from Ital. *sonetto*, which in its turn probably came from the Prov. and O. Fr. *sonet*, a diminutive derived from the Lat. *sonus*, a sound or air in music]: a poetical form which, as finally perfected by the Italian poets of the thirteenth and fourteenth centuries, consists of fourteen hendecasyllabic verses (corresponding to English decasyllables), arranged according to a rigid scheme. The main features of this are the division of the whole poem into two parts, the first of eight verses (called the octave), the second of six (called the sestet); the further division of the octave into two tetrastiches (called in Italian *pièdi*); the employment of but two rhymes in the octave, arranged *abba abba*; the use of either two or three rhymes in the sestet, arranged as may suit the poet. The sestet, when it forms an indivisible whole, is often called in Italian *simula*; when it falls into two tercets, *volte*. This severe form, however, has not been followed by all sonnet-writers, even from the earliest period. Shakspeare, for example, hardly observes the minor divisions of the sonnet at all. He arranges the rhymes of the octave *abababab*, or even *ababceded*, thus neglecting all the subtle modulations of the Petrarchan type. He often allows the sense to run over from the octave to the sestet; and even when he parts the two he makes little effort to contrast the meaning and the harmony of the latter with those of the former. This loose type of the sonnet is often called the bastard or illegitimate sonnet; but this is hardly justified by the history of the form.

There has been much discussion of the origin and development of the sonnet. The word occurs in both the Provençal and the Old French languages earlier than in Italian. Investigation has shown, however, that here *sonet* means simply a short *son*—i. e. musical air or lyric set to music. There are a few real sonnets in Provençal, but all of them are by Italians, or considerably later than the rise of the Italian sonnet. Everything points, therefore, to Italy as the

birthplace of the form; but there are difficulties as to the manner of its birth. A very widely accepted theory has been that it was originally simply one stanza of the lyric canzone. It is hard to see, however, the motive that should have led to such use of a single part of what was a very elaborately constructed and balanced poetical form. More probable is the theory first set forth by A. d'Ancona, in his *Poesia popolare italiana* (Leghorn, 1878), that the basis of the sonnet is purely popular. In fact, there exist even today popular lyrics, called *strambotti* and *rispetti*, whose existence is fairly assured for the earliest period of Italian poetry. The *strambotto*, whose home seems to have been Sicily, is an eight-lined stanza with rhymes arranged *abababab*. The *rispetto*, on the other hand, which was Tuscan in origin, is a precisely similar stanza, but of six lines, with rhymes *cdcdcd*. D'Ancona believed that the sonnet was obtained by one of the early courtly poets of the so-called Sicilian school, through joining these two forms. This theory has been slightly modified by Cesareo (*La Poesia Siciliana sotto gli Sversi*, Catania, 1894), who thinks that a six-lined *strambotto* existed in Sicily, as well as that of eight lines, and that the combination was effected in Sicily alone. Indeed, Cesareo believes that the inventor of the new form was Giacomo da Lentino, the most original of the Sicilian poets, who flourished in the first half of the thirteenth century. These investigations also show that the earliest sonnet scheme was nearer Shakspeare's than Petrarch's, as the rhymes ran *abababcedcd*.

Though thus in all probability of popular origin, the sonnet form was from the start employed only by courtly poets. The subject-matter of the earliest sonnets is, like that of the rest of the poems of the first Italian cultivated poets, mainly derived from the poetry of Provence. During the thirteenth century it became more and more popular throughout Italy. Many experiments at refining and elaborating it were made. Gradually the rhyme system, *abba abba*, drove out the older system in the octave. Under the influence of Provençal poetical theories, the inner divisions were made sharper and clearer. On another side efforts were made to vary the fixed scheme, either by appending a couplet or group of couplets (*cauda* or *coda*) at the end or by inserting at fixed points subsidiary seven-syllabled lines, which rhymed with the preceding eleven-syllabled lines. According to the number of these insertions, such sonnets were called *sonetti doppi* and *sonetti rinterzati*. In some cases sonnets of twenty-eight verses were thus produced. The simpler form, however, proved the permanently satisfactory one; and this was finally fixed by the great master of all the Italian sonnet-writers—Petrarch.

The diffusion of the sonnet form outside of Italy began when the rest of Europe came to feel the powerful influence of the Italian Renaissance. In the Spanish Peninsula this took place in the fifteenth and early sixteenth centuries; and the earliest Catalan and Spanish sonnets belong to this period. In France, according to Joachim du Bellay, the sonnet was introduced from Italy by Mellin de Saint-Gelais, a poet of the early sixteenth century; but du Bellay himself and his friends of the Pléiade were the first to give it real vogue. In England it was introduced toward the middle of the sixteenth century by Wyatt and Surrey. The earliest German sonnet is to be found in a translation of an antipapal tract by Bernardino Ochino. This translation, made by one Christoph Wirsung, appeared in 1556.

The best general account of the history of the sonnet is to be found in H. Welti, *Geschichte des Sonnettes in der deutschen Dichtung* (Leipzig, 1884). The development of the sonnet in Italy is excellently treated by L. Biadene, *Morfologia del Sonetto nei secoli XIII. e XIV.* (fascicolo 10 of *Studi di Filologia Romanza*, Rome, 1888). Of value, but to be used with care, is Louis de Veyrières's *Monographie du sonnet, sonnettes anciens et modernes* (2 vols., Paris, 1869-70). Less good is C. Tomlinson's work, entitled *The Sonnet: its Origin, Structure, and Place in Poetry* (London, 1874).

A. R. MARSH.

Sono'ra: the northwesternmost state of Mexico; bounded by the U. S. (Arizona) on the N., Chihuahua on the E., Sinaloa on the S. E., the Gulf of California on the S. W., and the territory of Lower California on the N. W. Area, 77,344 sq. miles. The Sierra Madre Range forms the eastern boundary, and its spurs and sub-ranges cover much of the eastern part of the state, which is very imperfectly known. Succeeding this region are plateaus and valleys with a rich soil, but only available for agriculture by irrigation. The

lands along the coast are arid, except in the river valleys. The northwestern part is a desert, resembling the adjacent parts of Arizona. Of the few rivers the Yaqui is the most important. The climate is hot on the lowlands, mild on the plateaus and in the higher valleys; rains (principally from July to September) are scanty, and the northwestern deserts and parts of the coast-belt are essentially rainless. There is no true forest, except in the mountains. The state is rich in minerals; the mines of silver and gold have long been famous, lead occurs in conjunction with silver, and lately important coal-beds have been opened in the Yaqui valley, the product being exported to Arizona. Mining is the only important industry; cereals, etc., are cultivated in the river valleys, and there are considerable herds of cattle in the north. A kind of guano is found on islands in the Gulf of California. The Sonora Railway (from the port of Guaymas, on the gulf, to Benson, on the Southern Pacific Railroad) was originally built as an outlet for the coal-fields. Pop. (1893) estimated, 140,500. A large proportion are Indians of the Opatá, Pima, and other tribes, who retain their old customs and languages, and in many cases are practically independent.

H. H. SMITH.

Sonora: city; capital of Tuolumne co., Cal.; on Wood's creek; 60 miles E. of Stockton, 90 miles S. E. of Sacramento; equidistant from the Yosemite valley and the Calaveras big-tree region (for location, see map of California, ref. 7-E). It is the center of a large gold-mining area; is principally engaged in mining, agriculture, lumbering, and grape-growing; and contains water-works, the Snell Library, an academy, foundry, quartz-mills, and three weekly newspapers. Pop. (1880) 1,492; (1890) 1,441.

Sonson: town of the department of Antioquia, Colombia; on the river Sonson; 33 miles S. S. E. of Medellín; 8,350 feet above the sea (see map of South America, ref. 2-B). It is the center of a rich grazing district, and is noted for its mild and salubrious climate and beautiful scenery. The river here forms a triple fall of 200 feet, and causes in its deep ravine a continual *son-son*, or echo, whence the name. Pop. about 12,000.

H. H. S.

Sonsonate: town of Salvador; beautifully situated on a plain by the Sonsonate river, and on the railway from Santa Ana to the port of Acajutla; 40 miles W. of San Salvador (see map of Central America, ref. 4-E). It was founded soon after the conquest, and is the center of a rich agricultural district and the capital of a department of the same name. Pop. about 9,000.

H. H. S.

Sontag, zōntaa'h, HENRIETTE: opera-singer; b. at Coblenz, Germany, Jan. 3, 1806; was gifted with fine vocal and dramatic powers, which were highly cultivated; excelled in German and Italian music, and at the age of twenty-five rivaled Malibran, Pasta, and Catalani; married Count Rossi, an Italian noble, in 1830, and retired to private life. She resumed her professional career in 1849, made a tour in the U. S. in 1853, and in Mexico. D. of cholera in Vera Cruz, June 18, 1854.

Revised by B. B. VALLENTINE.

Soo-Chow-Foo: See **ST-CHOW**.

Soodan: another spelling of **SUDAN** (q. v.).

Soofoes: See **SUFIS**.

Soo'soo, or Susu: the *Platanista gangetica*, a cetacean of the Ganges, the only living representative of the family *Platanistidae*, which is allied to the *Iniidae*, or fresh-water dolphins of South America. It is some 6 or 8 feet long, and is ordinarily very sluggish, but can move after its prey, which consists of fish and crustaceans, with much vigor. It has long beaked jaws, 120 teeth, and curious rudimentary eyes.

Revised by F. A. LUCAS.

Soot [O. Eng. *sōt*: Icel. *sōt*; cf. Ir. *suth*: Lith. *sūdis*; Fr. *sotie*]: a carbonaceous deposit from smoke, formed in chimneys. That which forms nearest the fire is often shining and varnish-like, consisting chiefly of dried tarry matters mixed with carbon, and giving a brownish-black powder, sometimes used as a pigment under the name of *noître*. That which forms further up the chimney is more of the character of **LAMPBLACK** (q. v.).

Sooty Tern: See **EGG-BIRD**.

Sooty-smith, sois'mith, WILLIAM: civil engineer; b. at Tarenton, O., July 22, 1830; graduated at the Ohio University in 1849, and at the U. S. Military Academy July 1, 1853. In 1854 he resigned from the army to engage in civil engineering; in 1855 became principal of the Buffalo High School. Resuming his profession in 1856 he was in 1859 placed in

charge of the construction of a bridge over the Savannah river, the foundations of which consisted of pneumatic piles. In the civil war he served as colonel of the Thirtieth Ohio Volunteers in West Virginia till Jan., 1862, when transferred to the Army of the Ohio, and was engaged at the battle of Shiloh, Apr. 7. Commissioned brigadier-general of volunteers Apr. 15, he participated in the siege of Corinth; commanded a division at the battle of Perryville; was chief of the cavalry department of the Tennessee July-Oct., 1863, and of the division of the Mississippi Oct., 1863-July, 1864, when compelled by ill health to resign. He has since been engaged in sinking foundations for bridges and other structures. He was a member of the U. S. board of 1875-76 for testing iron and steel.

Revised by M. MERRIMAN.

Sophi'a (anc. *Serdica*; Bulg. *Sreletz*): city; capital of Bulgaria; on a small tributary of the Iskra, and on the main railway between Vienna and Constantinople (see map of Turkey, ref. 3-C). Till 1878 it was "a dirty and pestilential village of wooden huts," but since Russia wrested from the Ottomans a semi-independence for Bulgaria (1878), it has marvelously improved. It now resembles a European city with its straight, clean streets and attractive houses. Over 7,000 Ottomans from among its former residents have emigrated, but the population has almost trebled in seventeen years. Sophia possesses a commodious palace, the residence of the prince, a cathedral, an excellent college and schools, and a public garden. It manufactures leather, earthenware, and woolen cloth, and carries on an active transit trade. Pop. (1893) 47,000.

E. A. GROSVENOR.

Sophists [from Lat. *sophistes* = Gr. *σοφιστής*, deriv. of *σοφίζεσθαι*, be or become wise, play the wise man or Sophist]: name applied to the seven wise men of Greece; afterward to the teachers at Athens who gave lessons in the arts and sciences for money. The course of Greek philosophy begins with the establishment of a material first principle—water, air, fire, etc.—and tends toward the recognition of mind as this first principle. Anaxagoras explicitly announced mind (*νοῦς*) as such first principle. The first and most obvious phase of mind as an activity is its capacity to reflect, and hence to discover grounds and reasons. Each ground or reason in some measure communicates its peculiar character to the fact or opinion which it grounds. Hence from the standpoint of grounds and arguments all truth seems to be an arbitrary affair, depending upon the selection which one makes of grounds and reasons. Truth is supposed to be many-sided, and the point of view taken is supposed to justify one's difference in opinion. The art of presenting grounds or reasons to justify any view is the art of the Sophists. The fact that these many sides or grounds of truth are mutually interdependent, and therefore that each has truth only as seen in view of the rest—this is the further and deeper insight which it belonged to Socrates and Plato to discover and unfold. The universal or general is the net result, as well as the active principle, of that dialectic process which appears in the genesis and mutual destruction of different opinions—"different points of view." As a necessary elementary stage of human thinking, the work of the Sophists is of permanent importance in the history of philosophy. The Eleatics, who set up the doctrine of pure being, found it necessary to deny being to the phases of change, finitude, and negativity that appear in the world. Zeno accordingly discovered the dialectic of self-contradiction involved in those phases. This was adopted by the Sophists, of whom the chief were Protagoras the Individualist (b. 490 B. C.), Gorgias the Nihilist (came to Athens 427 B. C.), Hippias the Polymathist, and Prodicus the Moralist (the two latter being younger contemporaries of Protagoras). Everything that existed in the Greek consciousness as opinion, faith, custom, religious tradition, even the evidence of the senses, was sapped and rendered uncertain by the ratiocination of these Sophists. Protagoras asserted: Man is the measure of all things. Just as each thing appears to each man, so is it for him. All truth is relative. The existence of the gods is uncertain. Gorgias expressed his nihilism in three propositions: (a) Nothing exists; (b) if anything existed, it would be unknowable; (c) if anything existed, and were knowable, the knowledge of it could nevertheless not be communicated to others. "Common sense," so called, is the stage of naïve faith in one's point of view. The discovery of the equal validity of "many points of view" leads on the one hand to sophistical practices, or on the other to skepticism. Pyrrhonic skepticism in Greece connects back through the Megarian school to the dialectic

of the Sophists and of Zeno the Eleatic. See articles SOC-RATES, PHILOSOPHY (*History of Philosophy*), and MORAL PHILOSOPHY.

WILLIAM T. HARRIS.

Sophocles, sof-ō-klēz (Gr. Σοφοκλῆς): the second in time of the three great tragic poets of Greece; b. of a wealthy family at Colonus, a beautiful deme of Attica near Athens, in 496 B.C. He was carefully trained in all the arts of a liberal education, in gymnastics and music. At the age of sixteen he led the chorus of boys who danced and sang the pæan in honor of the victory of Salamis, and there is other evidence of his personal beauty and grace. His first play, acted in 468, was a great success, and won the prize over Æschylus after a close contest which was finally referred for decision to Cimon and his fellow generals. For the next ten years Sophocles divided with Æschylus the empire of the stage, the older rival learning from the younger as the younger had already learned much from the older. After the death of Æschylus, Sophocles was the leading dramatist. He never failed of at least the second prize, and coped successfully with such plays as the *Alceste* and the *Medea* of Euripides. But as Æschylus accepted the improvements of Sophocles, so Sophocles in his later plays was clearly influenced by Euripides, whose greatness he did not fail to recognize. Sophocles took an active part in public life, and was called to hold high positions. In consequence of the sentiments expressed in his *Antigone* (440) he was made a colleague of Pericles in the command of the forces sent against Samos. Before that he had been an Hellenotamias or treasurer of the Alliance, and in the troublous times of the Peloponnesian war he is said to have been one of the *probuli* (πρόβουλοι) or committee of safety appointed in 411. Love played a large part in his life, and his sweet and easy temper was often put to the test. According to a familiar tradition, when far advanced in years Sophocles was brought before a family court by his son Iophon on the charge of disordered intellect. The aged poet recited the famous encomium on Colonus from the *Œdipus Coloneus*, which he had just composed, and the charge was dismissed—as the story may be. He died an easy death in 405.

Of his 123 dramas seven are extant, *Ajax*, *Electra*, *Œdipus Tyrannus*, *Antigone*, *Trachiniae*, *Philoctetes*, *Œdipus Coloneus*, the first three being the most popular in Byzantine times. Sophocles introduced the third actor and thus increased the life and movement of the drama, and life and movement were also enhanced by the change which made each drama of the trilogy (see ÆSCHYLUS) an independent play. These and other changes in the external form are manifestations of the same spirit that we find working in the heart of the Sophoclean drama. When we study Sophocles we are no longer in the Æschylean realm of Titanic beings, too vast for human sympathy, for while the heroes and heroines whom Sophocles brings before us are lifted above our level, they are of like passions with ourselves, and the motives are motives of flesh and blood, of human character and human will. His *dramatis personæ* are eternal types "writ large." In the construction of the plot Sophocles had no rival. His *Œdipus Tyrannus*, to cite but one instance, is a tragic web of unequalled subtlety and effectiveness. The lyric parts of his plays are in beautiful balance with the dramatic element. His language is more supple than that of Æschylus, but never falls short of elevation. It is sweet and yet does not lack a certain tang of austerity that saves it from cloying.

EDITIONS.—Among the most memorable editions of all the plays are those of G. Hermann (1830–41), Wunder-Wecklein (4th ed. begun in 1875), Schneidewin–Nauck (begun by Schneidewin in 1849 and repeatedly issued since), Campbell, in 2 vols. (1873, 1881, and repeated), Campbell–Abbott, 2 vols. (1886); above all, the monumental edition of Jebb (begun in 1883, nearly complete in 1895, with repeated issues of *Œdipus Tyrannus* and *Antigone*). Select plays by Wolf–Bellermann (begun 1858, often repeated). Text ed. by Dindorf (Teubner collection), by Schubert (Schenkli collection), by Nauck (Weidmann). Of noteworthy editions of single plays may be mentioned *Ajax*, by Lobeck (3d ed. 1866); *Antigone*, by Boeckh (1843), by Humphreys (1891); *Electra*, by Jahn (3d ed. 1882); *Œdipus Tyrannus*, by Elmsley (1821); *Œdipus Coloneus*, by Reisig (1820); *Philoctetes*, by Blaydes (1870), who has edited other plays of Sophocles also. Of translations into English verse may be noted Plumptre (1866) and Campbell (1874); of translations into English prose after Jebb's text, E. P. Coleridge (1893), and Jebb himself in the edition cited. For the enormous bibliography (down to 1874 only), see Genthe's *Index Commentationum Sophocle-*

arum. Invaluable is Ellendt's *Lexicon Sophocleum* (2d ed. by Genthe, 1872). See also Schöll's *Sophokles* (2d ed. 1870), and Patin's *Sophocle* (5th ed. 1877). B. L. GILDERSLEEVE.

Sophocles, EVANGELINUS APOSTOLIDES: Greek scholar; b. at Tsangaranda, Thessaly, Greece, Mar. 8, 1807; studied at the convent on Mt. Sinai; emigrated to the U. S.; entered Amherst College in 1829; was tutor in Harvard College, with a brief intermission, from 1842–49; assistant professor 1849–60, and in 1860 became Professor of Ancient, Modern, and Byzantine Greek. He published a *Greek Grammar* (1838; 3d ed. 1847); *First Lessons in Greek* (1839); *Greek Exercises* (1841); *Greek Lessons for Beginners* (1843); *Catalogue of Greek Verbs* (1844); *History of the Greek Alphabet*, etc. (1848); *Glossary of Later and Byzantine Greek* (1860), revised as *Greek Lexicon of the Roman and Byzantine Periods* (1870), etc. D. at Cambridge, Mass., Dec. 17, 1883.

Sophonis'ba: See MASINISSA.

Sophon: inventor or rather perfecter of the so-called MIME (q. v.); flourished at Syracuse in the middle of the fifth century B.C. The office of the mime was to represent in dramatic form a special situation or a special personage. It was a *commedietta* that lacked a chorus, that lacked an elaborate plot. The mimes of Sophron enjoyed a great reputation in ancient times; Plato read them again and again and slept with them under his pillow, and in Rome they were learned by heart and much imitated. A few fragments have been collected by Blomfield in *Museum Criticum* (vol. ii., 1826), and by Ahrens, *De Græc. Dialect.* (vol. ii., p. 464).

Revised by B. L. GILDERSLEEVE.

Soprano: the highest type of the voice of women and boys. The compass of the high soprano may be said to extend from lower E on the treble staff to C above, and that of the mezzo-soprano from A below to A above. Among the high sopranos exceptional compass is sometimes found, reaching even to F and G in alt.

D. B.

So'ra: town; in the province of Caserta, Italy; on the Garigliano; about 58 miles N. N. W. of Naples (see map of Italy, ref. 6–E). The manufactures of paper, woolen, and other stuffs here are on a considerable scale, and are provided with modern machinery. Pop. about 5,400.

Sorac'te: the present *Monte di San Oreste*, a mountain of Etruria, an outlying offset of the Apennines, from which it is detached by the valley of the Tiber. It rises with its bold and abrupt masses of the peculiar hard Apennine limestone 2,420 feet above the surrounding plain, and forms, especially when its top is covered with snow, a conspicuous and very picturesque feature in the views of the Campagna. (Horace, *Carm.*, i., 9.) In ancient times it was dedicated to Apollo, and bore on its top a celebrated temple of this god, to which large and peculiarly solemn processions were made from Rome, situated 26 miles to the S. In 746 Carloman, the brother of Pepin, founded the monastery of San Silvestro on the site of the old pagan temple. Its present name the mountain has received from a village, San Oreste, situated on its slope and well known for its sour wine.

Revised by J. R. S. STERRETT.

Sorata: See ILLAMPU.

Sorbian Language: another name for Lusatian–Servian; see SLAVIC LANGUAGES.

Sorb'ite, or **Mountain-ash Sugar** [*sorbite* is from Lat. *sorbum*, sorb-tree]: a saccharine substance formed in the juice of the berries of *Sorbus aucuparia*, the mountain-ash of Europe, as well as in the related American, *Sorbus americana*. The compound has the composition $C_6H_{12}O_6$, being isomeric with mannite. It belongs to the alcohols, and is in turn related to the sugars.

I. R.

Sorbonne, sör'bün': the name generally applied to the theological faculty of the ancient University of Paris. It was derived from Robert de Sorbon (b. at Sorbon, in the Ardennes, in 1201, and afterward chaplain to Louis IX.; d. in Paris, renowned for sanctity and eloquence, 1274). In 1252 he founded an institution connected with the University of Paris, in which seven secular priests were to teach theology gratuitously to sixteen poor students, and in the following year the institution received its charter from Louis IX., which was confirmed in 1268 by Pope Clement IV. Connected with it was a preparatory school. Both were under a provisor. The severity of the examinations made its degrees of high esteem. The great care which was taken not to admit among the teachers any but men of the highest

talents and attainments soon procured for the school a European fame, and in the fourteenth century the entire theological faculty of the university was merged into it. During the Middle Ages, the period of the Reformation, and even after that time, the Sorbonne was generally considered one of the highest authorities of the Christian Church, and its decisions were appealed in not only in those beyond controversy, but also in the contests between the popes and the secular powers. It demanded the condemnation of John of Arco; it justified the massacre of St. Bartholomew; it vigorously sided with the League and condemned both Henry III. and Henry of Navarre. On the other hand, it introduced printing into Paris immediately after its invention, and prevented the introduction of the Peter's Pence and the Inquisition into France. It was a staunch champion of the freedom of the Gallican Church, and strongly opposed to Ultramontanism. It condemned Jansen and the Jansenists in matters of doctrine, but it sided with them in their fight with the Jesuits. Its culmination was in the time of Cardinal Richelieu, who, himself a graduate of the school, provided it with a magnificent building and enlarged its library (1639). It was then that appeared the famous Latin couplet, which may be thus translated literally: "Renovated the Sorbonne goes to immediate ruin. While it was falling it stood unshaken; restored it will perish." In its contest with the philosophy of the eighteenth century it was unsuccessful, and it had outlived its fame when during the Revolution it was suppressed and bereft of its endowments (1793). At the reconstruction of the university in 1808 by Napoleon I. the building, still called the Sorbonne, became the seat of the academy, and between 1816 and 1827 was given to the theological faculty in connection with the faculties of science and belles-lettres. New buildings for the Sorbonne were erected 1894-99 at an expense of nearly \$4,000,000. See E. J. Duvivier, *Histoire de la Sorbonne* (2 vols., Paris, 1793); A. Franklin, *La Sorbonne* (1897; 2d ed. 1875).

Revised by S. M. JACKSON.

South-tree, or Wild Service: the *Pyrus terminalis*, a small European tree (family Rosaceae), the wood of which is very hard and valuable. Its fruit, the sorb, when over-ripened, is soft and mellow and very good eating. Hertfordshire, England, is famous for its sorts, which are largely marketed in London. The name is sometimes applied to *P. domestica*. See SERVICE-TREE.

Sorcery: See MAGIC.

Sorel (river): See RICHMOND.

Sorel: *shelton* of Richelieu co., Quebec, Canada; at the junction of the Richelieu with the St. Lawrence, and on the south shore of the Gulf, 45 miles below Montreal (see map of Quebec, ref. 5-B). It has an excellent harbor, which is used during the winter months as a place of refuge for the river steamboats. The trade is almost confined to the shipping of grain and farm produce. The manufactures are mostly connected with the repairing of steamboat machinery. The town has for its center a well laid-out square, and occupies the site of a fort built in 1665 by M. de Tracy. Its former name was William Henry. The Duke of Kent, the father of Queen Victoria, resided here for a time. There are 2 newspapers, 2 branch banks, and several hotels. Ship-building was formerly carried on. Pop. (1891) 9,000, of whom not more than 500 are English-speaking. J. M. HARPER.

Sorel, August: See AUGUST SOREL.

Sorel's Cements: certain cements named from the inventor, a French chemist. The principle on which they are founded is the mixing of a concentrated solution of a metallic chloride with the oxide of the same metal to a pasty mass, when, in case of several metals, a solid insoluble oxychloride is rapidly formed, which is sometimes quite crystalline and hard. The most approved compositions of this class are those made with the chlorides of zinc and magnesium. A solution of magnesium chloride of a density of 20 to 25° of Baumé's hydrometer is mixed with magnesia or a paste, which may be applied and moulded like plaster. A solution to a white mass of the hardness of marble. Chloride of zinc solution mixed with oxide of zinc forms a similar cement-composition. Revised by I. A. HENCKS.

Sorel-atoms: See STONE.

Sorghum: a tall, broad-leaved annual plant of the grass family, regarded as a variety (*Suscharitum*) of the polymorphic *Andropogon sorghum*. Its original home was doubtless the interior of Africa, but modern travelers do not report its having been found there in a wild state, and the

wild forms, as in the case of the nearly related sugar-cane, appear to have been lost. Sorghum as a cultivated plant has been known from remote antiquity. It was introduced into Italy at the beginning of the Roman empire, but its culture did not flourish. Experiments were again conducted with it at Florence, Italy, in 1709, by Pietro Ardano, but with no practical results. In China it has been cultivated from the earliest historical times, not only as a cereal and for fuel and forage until recently. In 1840 Abadie sent some seeds to the museum at Paris, and about 1850 Missionary sent some from the north of China to the Geographical Society of Paris. About fifteen varieties were received, some of which contained saccharine juices.



Field of sorghum.

In 1853 W. R. Prince, of Flushing, L. I., obtained a few seeds from France. These produced a few pounds of seed, which were distributed in 1854. In 1857 Leonard W. Wray introduced into the Southern States seed which he obtained from Natal. The African varieties were called Imphee, while those originally derived from China were known as Chinese sugar-cane. In a few years sorghum was very generally known in different parts of the U. S., and some of the early varieties, such as the Amber, were found to mature as far N. as Minnesota.

During the civil war the culture of sorghum was carried on to a considerable extent, and by reason of the high price of sugar the products, mostly molasses, were brought into quite general consumption. Crystallizable sugar had been obtained as early as 1855, and was often made in the laboratory and in small amounts; but no systematic attempts were made to use the plant for making sugar until the subject was taken up in the department of agriculture in 1878 by Dr. Peter Collier. As a result of his investigations he predicted that sorghum could successfully compete with sugar-cane and sugar-beets as an economical source of the sugar-supply of the U. S., and attempts were made in many localities to manufacture sugar. In 1882 the commissioner of agriculture offered ten prizes of \$1,200 each for the most successful attempts to make sugar from sorghum. The total amount of sugar reported by the ten successful applicants was 116,155-5 lb., of which 86,000 lb. was made by one firm. The department of agriculture at Washington made 165 lb. of sugar in 1881, and after making nearly 10,000 lb. in 1883 conducted experiments on a somewhat larger scale at Ottawa, Kan., in 1885, and at Fort Scott, Kan., in 1886-87. Large quantities of sugar were produced, but it was not demonstrated that it could be accomplished with economical results. With the exception of two factories in Kansas all commercial attempts at the manufacture of sugar from sorghum on a large scale have (1895) in a short time proved financial failures.

The difficulties attending the manufacture of sugar from sorghum depend on the presence of bodies such as starch, gum, non-crystallizable sugar, etc., which tend to prevent

its crystallization. These bodies can be largely separated from the sugars by treating the partially evaporated juices with alcohol. Experiments made by the department of agriculture in 1891 indicated that fully 200 lb. of sugar per ton could be made from sorghum in this way. The character of the U. S. internal revenue laws, however, prevents the use of alcohol except under such restrictions as would render it unprofitable.

Extensive experiments were conducted by the department of agriculture from 1888 to 1893 at Sterling and Medicine Lodge, Kan., in the improvement of sorghum as a sugar-producing plant. New varieties were developed and the content of sugar therein greatly increased. Seeds selected from canes with a high content of sugar were carefully propagated and continued from year to year in a direct line of descent. The most approved varieties of sorghum as thus developed are Amber, Folger, Colman, Collier, McLean, Link, No. 8X, No. 112, No. 161, and Orange.

Sorghum as a Food.—Sorghum produces seeds which are quite equal to ordinary cereals for food. The composition of sorghum seed is shown in the following table:

PARTS.	Seeds with glumes, per cent.	Seeds without glumes, per cent.
Moisture.....	9.93	9.63
Albuminoids.....	10.54	11.39
Petroleum spirit extract (oil).....	3.72	3.16
Ether extract.....	0.61	0.54
Eighty-per-cent. alcohol extract (sugar).....	2.91	1.78
Fiber.....	3.17	1.83
Ash.....	2.05	1.69
Starch and soluble carbohydrates.....	67.07	69.98

Each ton of sorghum will yield from 100 to 150 lb. of seed. Sorghum is also valuable as forage when sown broadcast and harvested as hay or preserved in silos. It is chiefly cultivated for this purpose in Southern and Southwestern Kansas and in many other of the semi-arid regions of the U. S., as it yields a crop which can be relied upon in all seasons. In all parts of the U. S. sorghum is cultivated in a small way for molasses-making. The method of cultivation is almost identical with that of maize, but the young plants require more care. The ripe canes are relieved of their seed-heads and blades and crushed in small three-roll mills usually driven by animal power. The expressed juices are treated with cream of lime heated to the boiling-point and the scums removed. The clear juice obtained is rapidly concentrated in kettles or shallow pans to the consistency of molasses, yielding when carefully controlled a wholesome and pleasant product.

Statistical.—The number of gallons of molasses made in the U. S. from sorghum in the census year 1860 was 6,749,123; in 1870, 16,050,089; in 1880, 28,444,202; in 1890, 24,235,219. In the last-named year 415,691 acres were cultivated in sorghum. The yield of sugar reported to the internal revenue for the purpose of receiving bounty for the fiscal year ending June 30, 1892, was 1,136,186 lb., for that ending in 1893 1,026,100 lb., and for that ending in 1894 882,572 lb. The average yield of cane per acre was 5.3 tons, and the average yield per ton of cane manufactured 82.5 lb. Much sugar is also made as an incidental product in the manufacture of molasses.

HARVEY W. WILEY.

Soricidae [Mod. Lat., named from *So'rex*, the typical genus, from Lat. *so'rex*, shrew]: a family of mammals of the order *Insectivora*, including shrews or shrew-mice. Externally they resemble mice, but are readily distinguishable by the longer and pointed snout. In contrast with the *Talpidae*, to which they are most nearly related, they present the following characters: The skull is long, narrow, and pointed; the zygomatic arch is lacking, and there are no post-orbital processes; the tympanic is ring-like; the tibia and fibula are ankylized; the halves of the pelvis do not meet; there is no cæcum; the teeth range in number from 26 to 36 (M. $\frac{3}{1}$, P. M. $\frac{1}{1}$, C. $\frac{1}{1}$, I. $\frac{1}{1}$ \times 2); the cusps of the upper molars are arranged in a W; the upper incisors are large and hook-shaped, the first lower incisors are usually directed forward; the cervical vertebrae have well-developed hypapophyses, and the dorsal and lumbar distinct hyperapophyses; the sternum has a broad but not keeled manubrium. The family is a very homogeneous one, and representatives are found in the entire northern hemisphere, and extend southward into India and Eastern Asia in the Old World and into Mexico in the New. The species are all small, and some of them are among the least of mammals. They have certain

glands near the fore limbs, on the sides, and behind at the base of the tail, in which is secreted a musky fluid. They feed not only on insects, worms, etc., but on such young vertebrates (birds, etc.) as they are able to overcome.

Revised by F. A. LUCAS.

Soris: the name given by Manetho to *Snofru* (*S-nefru-n*, *Snefru*), the first king of the fourth Egyptian dynasty. Little is known about the man himself except that he waged war in Sinai and opened the copper mines in Wādī Ma'arah, where the evidences of his labor are still visible. His tomb was the False Pyramid at Mēdūm, built of Mokattam limestone, well jointed, 115 feet high, but never completed. After death he was the recipient of divine honors, and evidences have survived which indicate that his cult continued throughout the remainder of Egyptian history. Monumental remains begin to be numerous from the time of Soris and his successors during the fourth dynasty, and the representations of scenes of private life preserved on the walls of tombs of the period (see MASTABA) show a remarkable degree of civilization. Unger (*Manetho*, p. 92) refers to Soris-Snofru the mention made by Macrobius (*Saturnalium contriviorum*, lib. i., 23, § 10) of Senemures or Senepes, whose name in turn has been compared by some with that of the Assyrian Semiramis. The entire identification is founded on conjecture.

CHARLES R. GILLET.

Sorites: See LOGIC.

Soroban: the Japanese abacus. It differs from the Chinese *su-an-p'an* in having, as a rule, only one bead on each wire of the upper or smaller division. It is used in the same way as the Chinese use theirs. See ABACUS.

Sorocaba: a town of the state of São Paulo, Brazil; on the Sorocaba river, a branch of the Tietê; 60 miles W. of São Paulo, with which it is connected by railway (see map of South America, ref. 6-F). It is the center of an important agricultural and grazing district, and is noted for its annual fairs, principally devoted to the sale of horses and mules; as many as 70,000 animals are sometimes placed on sale. Pop. about 12,000.

H. H. S.

Sorrel: any one of several sour-leaved plants, especially those of the diacious section, of the genus *Rumex* (family *Polygonaceæ*), to which genus the coarse herbs called dock also belong. The common sorrel of sterile fields is *Rumex acetosella*. Plants of the genus *Oxyria* (of the same family) are called mountain-sorrels. The wood-sorrels are of the genus *Oxalis* (family *Geraniaceæ*). There are numerous species of the genus *Rumex*, some of which are occasionally used as salad-herbs and as flavors for sauces. In Europe the sorrels, mountain-sorrels, and wood-sorrels are cultivated in gardens for table use. All these sorrels owe their sourness to the presence of oxalic acid and its salts.

Revised by L. H. BAILEY.

Sorrel-tree, or *Sourwood*: the *Oxydendrum arboreum*, a handsome tree of the U. S., found in Ohio and Pennsylvania and southward to the Gulf. Its leaves resemble those of the peach. They are sour, and from them a cooling drink is made for the sick. The wood is soft and very difficult to dry. It is sometimes planted as an ornamental tree.

Sorren'to (anc. *Surrentum*): town: in the province of Naples, Italy; situated on a small rocky peninsula on the south side of the Bay of Naples, protected from the sirocco by Monte Vico, and from the west wind by Monte Massa (see map of Italy, ref. 7-F). It contains an interesting church and numerous villas, with gardens of almost tropical luxuriance. It was a Greek settlement, was adorned with splendid temples during the Roman period, and after the fall of the Western empire was ruled by its own consuls and dukes. Of the old temples, a few fine marbles, mosaic pavements, etc., alone remain, besides the foundations. The climate of Sorrento, as agreeable as it is salubrious, the luxuriance of the vegetation, and the variety and beauty of the surrounding scenery, have made Sorrento one of the most frequented resorts in Southern Italy. There is a small coasting trade in the rich productions of the vicinity carried on by means of the little harbor. It is the birthplace of Torquato Tasso. Pop. about 6,090.

Sotades, sot'ā-dēz (Gr. *Σοτᾶδης*): Greek poet of Macedonia in Thrace; a composer of indecent farces, whose jest at the marital relations of Ptolemy Philadelphus and his sister Arsinoë cost the jester his life. Sotades has given his name to a variety of Ionic verses, the *Metrum Sotadeum*. The fragments have been collected and restored by G. Hermann. *Elementa Doctrinæ Metricæ*, p. 445.

B. L. G.

Solter = *See* *Proctor*.

Solterology [The script, solvation, derive of words seems a happy discourse, namely] that branch of theology which treats of the redemptive work of Christ. In its wider significance the term includes both the atonement which Christ made and its application through faith to individuals. Thus defined, it would comprise not only the doctrine of expiation, but also those of regeneration, justification, and sanctification. It is, however, used in a more restricted significance to denote only the atonement. See *ATONEMENT*.

Solthern, with son, EDWARD BREWER SOLTER; b. in Liverpool, England, Apr. 2, 1806. He disappointed his parents by not entering the Church; made his *debut* as an amateur actor in Jersey, went to the U. S. in 1832, and appeared first at the Boston National Theater, under the stage name of Douglas Shewry, created the character of Lord Dunsinore by the play of *Our American Cousin* at Laura Keane's Theater, New York, 1838, and represented it many hundreds of times with great popularity in the U. S. and in England. Favorite parts of his were David Garrick, in the play of that name, *Pete Almonst* in *The Crushed Fragments*, and *Stephen Bean*. Solthern was very popular socially, and a great practical joker. D. in London, Aug. 30, 1881.

Revised by D. B. YALOWITZ.

Sothic Period [Sothic is from Greek *Σόης*, Egypt, *Soet*, the dog-star]; a period of 1,460 Julian years (of 365½ days, equal to 1,360½ sacro-years (of 365 days) of the Egyptian calendar. In the latter the year was reckoned by twelve months of thirty days, with the addition of five intercalary days. The difference between the two thus amounted to about six hours annually, so that the vague year revolved about one day in each four years. The beginning of a Sothic period was marked by the coincidence of the heliac rising of Sirius with the calendar new year, and at the rate of divergence between the two systems this coincidence recurred once in about $4 \times 365 = 1,460$ solar years. In the course of a Sothic period any periodic event, such as the inundation of the Nile or the rising of the dog-star, fell upon each and every day of the civil calendar. The difference in the appearance of such periodic events was not marked in the life of an individual, being only about twenty-five days in a century. Consequently little attention was paid to the matter till, in the Ptolemaic dynasty, when the Sothic period seems first to have been used in calculating time.

Dr. Mahler, of Vienna, has employed the Sothic period in calculating Egyptian chronology, starting with the statement of Censorinus (599 A. D.) that the heliac rising of Sirius occurred on July 21, 109 A. D. Reckoning back, this event occurred on about the same day in (approximately) 1822 A. C., 4792 A. C., and 4332 A. C. By the use of monumental and other data he arrived at the conclusion that the reign of Thutmose III. extended from Mar. 20, 1538, to Feb. 14, 1449, A. C., a result agreeing remarkably with that derived from a "double reckoning" by lengths of reign as given by Manetho and the monuments. Similarly Perrot fixes provisionally the date of the beginning of the sixth dynasty at 3410 A. C., and, reckoning the preceding dynasties according to monumental and other evidence, he assigns the beginning of the first dynasty to the year 4777 A. C. There is uncertainty about this result, but it is apparently more exact than any given previously, and it is claimed that it reduces the margin of doubt from a thousand or more years in one or two hundred at the outside.

CHARLES R. GILBERT.

Sothia = another name of *SIRIUS* (q. v.).

Soto, HERNANDO DE FERRAZO, de; discoverer of the Mississippi river; b. at *donde de los Caballeros*, Extremadura, Spain, about 1500. He went to Darien with Pizarro in 1514, accompanied Cortés in the conquest of Nicaragua 1524, and opposed his subsequent rebellion. In Apr., 1532, he joined Pizarro with reinforcements; in the conquest of Peru he acquired great wealth, with which he returned to Spain in 1535. Soon after he was appointed governor of Cuba and Florida, with a commission to explore and settle the latter country; then including all the northern coast of the Gulf of Mexico. On May 12, 1509, he sailed from Havana with five vessels and 600 (or 950) men. His explorations began at Tampa Bay July 15; they covered a large area, and the route can now be determined only approximately. It is certain that he passed through Northern Florida, Georgia, probably South Carolina, and Tennessee, and perhaps North Carolina, before descending the Alabama

river. In Oct., 1540, he had a battle with the Indians near Mobile Bay; thence he again turned northward, and about May, 1541, crossed the Mississippi at the lower Chickasaw Bluffs; explored the river northward nearly to the Missouri, and returning southward, died of fever near the junction of the Mississippi and Red rivers, probably on May 21, 1542. During the three years' wanderings that men had perished of disease and privation or in battle with the Indians. The survivors, under Moscoso, descended the river and reached Mexico. Soto is properly regarded as the true discoverer of the Mississippi; Hernán Pineda found its mouth in 1519, and *Alonso de Vera* must have crossed it near the Gulf in 1538. HANMER H. SWAIN.

Sonari-and = *See* *CARACAS*.

Sonblotte, SONBLÖT, CARLOS, soldier and statesman; b. at Caracas, Venezuela, 1799. He joined the revolutionists in 1810, distinguished himself in the war for independence, especially under Bolívar in the New Granada campaign; attained the rank of general, was vice-president and general-in-chief in Venezuela 1821-33 and Minister of War for Colombia 1836-37. He supported Bolívar's attempt, in 1828, to maintain the union of Colombia, but when Venezuela seceded in 1830 he remained faithful to his native country, presided over the constitutional convention of that year, and was the Venezuelan Secretary of War 1839-44. In 1860 he was exiled to Spain, and was elected vice-president under Vargas; by the resignation of the latter man after he became acting president. He left the government with Narváez, and went on a special mission to Spain to arrange a treaty with that kingdom. In this he was unsuccessful. On his return he resumed the presidency, which he retained until Feb. 1, 1868. Under Páez, 1869-76, he was Secretary of War and he succeeded him as president Jan. 28, 1868, to Mar. 1, 1867. During the disorders of 1848 he was banished, residing at Bogotá until 1858. Subsequently he held cabinet positions, and commanded the Venezuelan army. He was greatly respected. D. at Caracas, Feb. 11, 1870. HANMER H. SWAIN.

Sondan = *See* *SONAS*.

Soul [G. Eng. *siel*, *seel*; G. H. Germ. *seele* (soul); Mod. Germ. *seele* (Goth. *ans seala*); a term variously used to signify either the principle of life in an organic body, or the first and most undeveloped stages of individualized spiritual being, or, finally, all stages of spiritual individuality, incorporated as well as corporated. Aristotle, whose treatise *De Anima* (*Περὶ ψυχῆς*) is the first and perhaps the greatest work on the subject, has himself introduced this confusion by defining the soul in one instance as the self-determining power (*συνεχὴς*) of an organized body, and then afterward attributing to it reason (*νοῦς*), and making it as reason entirely separable from body. If strictly limited to the phases of relation which the mind has toward its organic conditions, the science of the soul is properly termed anthropology, and treats first of the cosmic, sidereal, and telluric influences upon mind—the determining characteristics of race, age, the seasons, the climate, the solar and lunar periods, etc. Next comes the reaction against these determining influences of nature, as manifested in the antithesis of sex, the alternation of waking and sleeping, and in the phenomena of dreams, fetal life, somnambulism, clairvoyance, catalepsy, St. Vitus's dance, and the various forms of vicarious sense-perception (where seeing, hearing, tasting, etc., are performed by the organ of feeling, the skin, in diseased states of the organism), trance-exaltation, etc. It considers next the questions of arrested development, such as appears in idiosyncrasy; the return to the previous stages out of the stage of consciousness; and the mingling of the two (earlier and later) phases in insanity (wherein the Ego is unable to distinguish between the phenomena of sense-perception and those arising from the influence of general external conditions, or from diseased activity of the nervous organism, and is thus confused, now acting upon one set of data and then upon another. Through the stages of feeling and the reduction of external relations to the abstract uniformities of habit, and especially in the creation of conventionalities whereby language becomes possible, and with it the formation and expression of general ideas, mind rises into the phase of Consciousness and Reason, knows itself as individual and independent of external natural influences, and accordingly subordinates and eliminates these in manifold ways through institutions—family, civil society, state, church, science, etc.—and learns to recognize conscious immaterial personality as the highest principle of the universe. The much-debated question of the immortality of

the soul implies a definition of soul as including not only its phases of corporeal existence, but also the higher ones of thought and will. Hence if *ψυχή* (soul) be only the principle of organic life, and *νοῦς* (reason) be the principle of intelligence elevated above the former and transcending it, the immortality of the former is precluded by definition, for the principle of conscious individuality is placed in the latter.

Previous to Aristotle and Plato the theories regarding the soul were mostly crude suggestions. The Pythagoreans thought that the soul is a harmony—that it dwells in the body as in a prison, being confined there for punishment. Many conjectures as to the location of the soul have been made. Alcmaeon of Crotona (according to Theophrastus) taught that the soul was located in the brain, "whither all sensations were conducted from the organs of the senses through canals." Like other Pythagoreans he held that the soul was subject to eternal motion, like the stars. Philolaus the Pythagorean held that the soul is united to the body, which is its organ, and at the same time its prison, by number and harmony, all things being known through number as a common principle of the soul and of things—like being known by like. Anaxagoras attributed souls to plants, and affirmed that they sorrow and rejoice. Democritus, who explained everything through the "atom and the void," held soul and fire to possess "round atoms," because they manifested the maximum of mobility. He affirmed that thought arises when the motions of the soul are "symmetrical"; and, further, that "the soul is the noblest part of man; he who loves its goods, loves what is most divine. He who loves the goods of the body, which is the tent of the soul, loves the merely human." Critias the Sophist considered the blood to be the substratum of the soul. Plato (in the *Phaedrus*) makes three souls or phases of the soul: (a) the appetitive soul seeking happiness or sensual pleasure, the gratification of desire; (b) the irascible or courageous soul, manifesting itself in combative activity, as the former in passive receptivity; (c) the rational soul, which alone is immortal. The cognitive or rational soul is the soul in its totality, and the irascible and appetitive souls are merely phases of arrested development occasioned by the confinement of the body. The rational soul dwells in the head (agreeing with Alcmaeon), the irascible in the heart, the appetitive in the organs of nourishment and reproduction. Plato defines (*Leg.*, cap. 10) the soul as a self-moving activity (*κίνησις αὐτῆς κινούσα*). Transmigration of souls (*Phædo*), a doctrine apparently borrowed from Egypt and the Orient, is consonant with his theory of the pre-existence of the soul, and of the origin of the appetitive and irascible phases of the soul through the descent of the rational soul into a body. Having made the discovery of general and necessary ideas, which could not have originated in sense-perception, he undertook to account for them through reminiscence; the soul had perceived them in a former life. These ideas, *a priori*, were simple and eternal: how could the soul in which they were contemplated be other than simple and eternal? While he condemned the Pythagorean view that the soul was a harmony, Plato employed symbolic expressions quite similar. In the same spirit his successor in the Academy, Speusippus, defined the soul as "extension, shaped harmoniously by number"; hence as, in some higher sense, a unity of the arithmetical and geometrical. So, too, Xenocrates of Chalcidion, the second director of the Academy, taught that the soul is a self-moving number. Aristotle repudiated the use of symbolic language in definitions to avoid ambiguity. He defined soul (*De An.*, ii., 1) as "the first entelechy [self-actualizing energy] of a physical, potentially living and organic body." The first entelechy is not a fully realized being, and hence it has been inferred that he intended to exclude the reason (*νοῦς*) from his definition of the soul, especially, too, as he makes the *νοῦς* to be independent of the body. But in another place he makes the soul to be "that by which we live, feel or perceive, move, and understand." The *νοῦς ποιητικός* = the *actus purus*, or pure reason, exists before the body, and enters it from without (*θύραθεν*) as something divine and immortal (*De Gen. et Corr.*, ii., 3). The *νοῦς παθητικός* = passive reason, including the nutritive (vegetable), sensitive (animal), and so much of the rational soul as includes memory, imagination, sense-perception, and discursive intellect, he regarded (*De An.*, ii., 2) as perishable like the body. Exactly what he meant by this was long in dispute. Alexander of Aphrodisias, the great commentator, held that the active reason is the world-soul, and that individuals are mere incarnations of it which

perish with the body. Dicaearchus of Messene, pupil of Aristotle, had held this doctrine. The Stoics had held nearly the same doctrine, acknowledging that the soul outlives the body, but is not eternal. Cleanthes the Stoic asserted that all souls would exist until the general conflagration of the world; but Chrysippus limited this to the souls of the wise, while Panætius denied the future life altogether. The statements of Aristotle, taken together, indicate his belief in the existence of the soul independent of the body; and not merely as a general world-soul, but also as individual souls.

In the process of education, culture, or self-development the individual gradually eliminates his lower phases of thought; he depends less upon sense-perception, learning to know a great deal from seeing very little (Cuvier could describe the whole animal from one of its bones; Agassiz, a fish from one of its scales); mechanical memory likewise becomes less important as deduction from principles becomes more prominent; discursive intellect gives place to pure intellect. Thus the lower faculties die out, and give place to more perfect forms; they become useless in the presence of more adequate forms of cognition. Hence Aristotle was correct in describing them as transient and perishable like the body; and yet he did not at all deny, by this, future conscious identity to the individual. The active reason could energize as nutritive, locomotive, appetitive, and sensitive, organizing a new body; for organization was only a self-limitation of the active reason, a self-arrested development of it. Hence when Averroës revived the doctrine of Alexander of Aphrodisias, the great scholastic thinkers devoted themselves to this question until they reconciled Aristotle with himself through this theory of the union of the active and passive reasons—the former as independent and substantial, and the latter as eternally produced through its energy. Albertus Magnus held that the active reason bears within itself the vegetative, sensitive, appetitive, and motive faculties. Thomas Aquinas held, similarly, that as the soul is immaterial, it can not be destroyed through the removal of its substratum. The form-producing principle of the body, the vital force, the appetitive, sensitive, and motive powers, belong to the thinking substance, and do not inhere in the body; hence are immortal. Pure thought acts without organs; the lower functions of the soul act with organs created for temporary manifestation. This view substantially agrees with that of the Neo-Platonists, except as to the origin of the soul. "The soul is immaterial, and whole or entire in every part of the body"; this statement is constantly repeated by thinkers since Aristotle. Plato's doctrine of pre-existence and reminiscence is indorsed by some of the Platonizing Christian thinkers like Origen, Synesius, and Nemesius, but is generally repudiated, as by Arnobius, Justin Martyr, Gregory of Nyssa, St. Augustine, Æneas of Gaza. With Descartes, thinking substance is sharply distinguished from matter that only divine intervention will account for their interaction. Geulincx, Malebranche, and Leibnitz presented different solutions of this dualism, but Spinoza boldly denied it altogether, making mind and matter two attributes of one substance. La Mettrie, a pupil of Boerhaave, observing the effect of the increased circulation of the blood upon his thoughts during a fever, concluded that psychological functions are all to be explained by the organization of the body. Diderot held that atoms are endowed with sensation, and that when combined in the animal organism they become conscious, thus reviving the doctrine of Democritus and Epicurus, who made the soul material, and perishable upon the separation of its constituent atoms. Carl Vogt makes the phenomena of the soul to be functions of the brain and nerves. Moleschott and Büchner have promulgated and popularized the same doctrine. Kant endeavored to show that the metaphysical argument which proved the immortality of the soul from its nature as simple substance is a paralogism, because the Ego which thinks is subject only, and does not appear as object in consciousness. Herbart, however, defends the idea of the soul as a simple, spaceless essence; and his disciple, Beneke, expounds the same doctrine. Trendelenburg returns to the Aristotelian definition: "The soul is a self-realizing, teleological idea; not a result, but a principle." At present there is a very great activity on the part of the physiological school of writers, who are engaged in investigating the physical correlates of psychological action. See articles on PSYCHO-PHYSICS, PSYCHOMETRY, PSYCHOLOGY, HYPNOTISM, IMMORTALITY, and other special topics relating to the soul.

WILLIAM T. HARRIS.

Soutle, James, II, D.: b. at Bristol, Mo., Aug. 1, 1871; was licensed as a Methodist preacher 1799; was preaching elder of the Maine district 1894-10; was author of one plan for a designated general conference of his Church, adopted at Baltimore 1899; was editor of *The Methodist Messenger* (1896-99); declined a bishopric 1899, but was again elected and accepted 1924; resided for several years at Johnson, N. J.; was a delegate to the British Western Conference 1922; adhered to the Methodist Episcopal Church south of the division of the Church 1944; settled at Nashville, Tenn.; visited California on an episcopal tour 1951-52; continued active in the discharge of the duties of the post until his death at Nashville, Mar. 6, 1967.

Soutle, Louis, Prunus: U. S. Senator; b. at Castillon, France, in Sept., 1802; educated for the Roman Catholic priesthood in the Jesuit college at Toulouse; studied afterwards at Bordeaux. Being implicated in a conspiracy against the government of Louis XVIII, he fled to a village in Navarre, where for more than a year he followed the occupation of a shepherd; then went to Paris, became a writer for a republican newspaper, *Le Nain*; was imprisoned in the *Châtelet* for an attack on the ministry; escaped to England; returned to the U. S. and settled at New Orleans 1829; was U. S. Senator 1847-52 and distinguished for extreme Southern views; was appointed minister to Spain 1858; had a duel with the French ambassador at Madrid; took part in the Orem conference of Oct., 1854, intended to facilitate the acquisition of Cuba; returned to the U. S. 1855; opposed the secession of Louisiana, but ultimately adhered to the movement, and visited Europe as Confederate agent 1861; was imprisoned for disloyalty at Fort Lafayette 1862; was released on condition of leaving the country; went to Europe, where he remained six years; returned to Louisiana 1869. D. in New Orleans, Mar. 16, 1870.

Soutle, Louis-F. Marthe, Faintre: novelist and poet; b. at Yver, department of Ardèche, France, Dec. 23, 1800; studied law; made his debut in literature in 1824 with a volume of poems, *Amours français*, which passed by almost unnoticed, and wrote in 1828 *Bonnie et Juliette*, and in 1831 *Christine et Pauline*, which had much effect on the stage. Others of his dramas were also successful—*Chloé* (1832) and *La Comtesse des Bœufs* (1846); but it was principally as a novel-writer that he became famous. He wrote about 120 volumes of novels, some of which became very popular, such as *Le Comte de Toulouse* (1835); *Un Rêve à Meulan* (1836); and *Mémoires du Diable* (1837-38). D. at Béziers, near Paris, Sept. 23, 1847.

Revised by A. G. CANNELL.

Soulouque, Achille, Faustin Elie: soldier and politician; b. at Petit Goyave, Haiti, about 1785. He was originally a Negro slave; took part in the early insurrections and in the civil wars on the side of the blacks; rose to be general of division, and, owing to his race and long services, possessed great influence with the Negroes. On Riché's death the senate elected Soulouque president Mar. 1, 1847. Apparently the senate had imagined that he would be their last ruler, owing to his age and ignorance; but he displayed unexpected energy, and his leadership of the blacks soon gave him dictatorial power. In Mar.-Apr., 1849, he invaded the Dominican Republic, but was repulsed. Notwithstanding this reverse he was able to have himself proclaimed emperor Aug. 20, 1849, and was crowned as Faustin I. in 1850; he promulgated a constitution, but practically had despotic power. His rule in some respects was wise, but his persecution of the mulattoes was unrelenting. In 1855 he was disastrously defeated by Santana in a second invasion of the Dominican Republic. In Jan., 1859, a successful revolt of the mulattoes under Gelfand drove him into exile at Jamaica. He was allowed to return in 1867, and died at Petit Goyave, Aug. 6 of that year. H. H. SMITH.

Soutle, Louis, Nicolas Jean de Dieu, Duke of Dalmatia: soldier; b. Mar. 29, 1769, at St.-Amans-la-Bastide, department of Tarn, France; the son of a farmer; entered the ranks of the army in 1785; became a captain in 1790, brigadier-general in 1794, general of division in 1799, and marshal of France in 1804. He distinguished himself greatly in the battles of Austerlitz and Jena, and was made Duke of Dalmatia after the Peace of Tilsit. He was then placed in command of the second corps in Spain, and succeeded in driving the British to evacuate the country. In 1809 he became commander-in-chief, and soon afterward gained the victory of Ocaña. On 1811 he lost the battle of Albuera, and, discouraged by his reverses and the obstinacy of Joseph

Bonaparte, obtained his recall, but after the defeat of the French and Spanish at Vittoria was again placed in command. Though he displayed great skill and energy he was compelled to retreat into France, and was defeated at the Pyrenees and before Toulouse. Made Minister of War during the first restoration, he joined Napoleon during the Hundred Days, and lived in exile at Busschfort from 1815 to 1819; allowed to return in the latter year and reinstated in his dignity in the army, he soon won the favor of Charles X., and was made a peer of France in 1827. Under Louis Philippe, between 1831 and 1847, he was several times Minister of War, Minister of Foreign Affairs, and president of the cabinet, but in 1847 retired from public life, having been made a marshal-general of France—a dignity which had been conferred previously only on Turan and Villars. D. at St.-Amans, Nov. 26, 1851. The first part of his *Mémoires* was published by his son in 1854, in three volumes.

Sound: See ACOUSTICS.

Sound, Diffraction of: the deviation of sound waves in passing an obstacle. It was shown by Huyghens, in 1690, that if a wave be propagated in an elastic medium each point in the wave-front is a center from which secondary waves are propagated. If the main wave passes an obstacle, the edge of this serves as a center around which the secondary waves become perceptible. The extent of this deviation depends jointly on wave-length and velocity of propagation, increasing with wave-length and diminishing with velocity. It follows that a mathematical shadow is not possible, but in the case of light the waves are so short, and they are propagated so rapidly that the deviation due to diffraction is exceedingly small. Sound-waves, on the contrary, may be many feet in length, and the rate of propagation through air is only about a fifth of a mile per second. To render acoustic diffraction effects perceptible the waves must be very short, and this implies high pitch.

Lord Rayleigh was the first to demonstrate the diffraction of sound with any approach to exactness. (Royal Institution lecture, Jan. 20, 1888.) The source of sound was an adjustable whistle, or siren-call, the pitch of which exceeded 20,000 vibrations per second. This exceeds the limit of audibility for the average ear, and therefore a sensitive flame was employed as an indicator. An acoustic diffraction grating served to bring sound-waves to a focus, as light is focalized with a lens. Stevens (*American Journal of Science*, Apr., 1889), using the flame-indicator and a whistle giving 12,000 vibrations per second, succeeded in mapping out the lines of interference produced by diffraction behind a screen, through which two openings had been made for the transmission of waves. Also artificial bands of noise and silence were traced out with the flame, these being produced by interference of direct and reflected waves of sound from the whistle. The position of these bands was found to accord well with the results of calculation based on the theory of interference.

W. LEON STEVENS.

Sound, Refraction of: See REFRACTION.

Soups and Broths: See COOKERY.

Souris: part of entry of King's County, Prince Edward Island, Canada; on both sides of the mouth of the river Souris, which has a bar with only 84 feet of water at high tide (see map of Quebec, etc., ref. 1-C). There are two villages, East and West Souris. The town has a U. S. consular agent and a grammar school. Fishing and ship-building are carried on. Pop. 700.

Sour-sop: the fruit of the *Annona muricata*, a beautiful tree of tropical America. The sour-sop often weighs 2 or 3 lb. Its taste is sour and pleasant. It is very soft and white, and is much eaten in the West Indies.

Sourwood: See SORREL-TREE.

Souza, or Souza, so/za, Martin Affonso, de: soldier and colonizer; b. at Bragança, Portugal, about 1590. He was of noble family, and a member of the royal council. In 1590 he was placed in command of five vessels and 400 men, with orders to explore the coast of Brazil and plant there a permanent Portuguese colony; at the same time he was created governor of New Lusitania, or Brazil, was then officially named, and was empowered to distribute lands. After a careful survey, extending to the Rio de la Plata, he founded the first Portuguese colony, São Vicente (near the modern Santos), Jan. 22, 1532; soon after, Piratininga, now São Paulo, was founded by his orders. He then returned to Portugal, and on his recommendation the Brazilian coast was divided into the hereditary captaincies, which, with various

changes, were the bases of the modern states. Martim Afonso himself received a grant of the most important of these captaincies, that of São Vicente, then comprising all of Southern Brazil. He did not personally return to it, but it flourished under governors whom he selected. He was admiral of the seas of India 1534-40, and gained there several brilliant victories; in 1542-45 he was governor of the Portuguese East Indies. D. in Lisbon, July 21, 1564.

HERBERT H. SMITH.

South, ROBERT, D. D.: preacher and controversial writer; b. at Hackney, London, England, in 1633; studied as a king's scholar at Westminster School under Dr. Busby; entered Christ Church, Oxford, and graduated 1654 (D. D. 1663); took orders in the Church of England 1658; was university orator 1660; became chaplain to the Earl of Clarendon and tutor to his children 1661; was made prebendary of Westminster 1663; chaplain to the Duke of York 1667; canon of Christ Church 1670; chaplain to Lawrence Hyde (afterward Earl of Rochester) 1676, and accompanied him on an embassy to John Sobieski, King of Poland, 1677; became on his return rector of Islip, Oxfordshire, 1678, and soon afterward chaplain to King Charles II.; was a vigorous advocate of passive obedience and of the divine right of kings, and a powerful opponent of Dissenters, and was esteemed one of the most eloquent preachers of the time. D. in London, July 8, 1716. He caused much talk in his time by his controversial publications against Rev. Dr. William Sherlock, dean of St. Paul's, whom he accused of tritheism. He published collected editions of his sermons (London, 1692, 6 vols.; 4th ed. 1715; new ed. enlarged 1744, 11 vols.; edited by W. G. T. Shedd, New York, 1867, 5 vols.). See his complete works, with memoir (Oxford, 1823, 7 vols.; new ed. 5 vols., 1842). A selection, with memoir, appeared in London 1867.

Revised by S. M. JACKSON.

South African Republic, formerly Transvaal' Republic: one of the independent Boer states in South Africa, lying between the Vaal river on the S., the Limpopo river on the N., between the Portuguese coast possession on the E., and British Bechuanaland on the W. By treaty with Great Britain (1884 and 1890) the New Republic formed by the Boers in Zululand, and a small part of Swaziland and Amatongaland, were added to the South African Republic, which has an area of 113,642 sq. miles and a white population (estimated 1895) of about 200,000. The black population is estimated at about 375,000, East Bechuanas and various other Kaffir tribes. On Feb. 21, 1895, Swaziland was annexed to the republic. It has an area of 6,150 sq. miles, and a population of 60,000 natives, besides 600 (in winter 1,500) whites.

Physical Features, Products, etc.—The country is a healthy, high, and undulating plateau, with wide-spreading hill and mountain features extending through the interior, from the southern border almost to the northern frontier. It is abundantly timbered near its eastern border. Its western and northwestern portions are steppe-like in character. Its best agricultural resources are found on the high, well-watered plains of the southern portion, and the greater part of the country is well adapted for farming and stock-raising.

The Boers are pre-eminently stock-raisers and their sheep and cattle form their principal wealth. Great as the resources of the country are, the Boers are not yet able to supply all the food required by the enormous influx of gold-miners. About 50,000 acres are (1895) under cultivation.

The southern and southeastern districts are the greatest centers of South African gold-mining, and in a few years have made South Africa the third largest gold-producer in the world. The output in 1892 was 1,325,394 oz., by far the greater part of which came from the Witwatersrand and Barberton districts; in 1893, 1,610,335 oz.; in 1894, about 2,200,000 oz. In 1886 the site of Johannesburg on the Witwatersrand was occupied by a few huts where now (1895) stands a city of 50,000 inhabitants. The capital is PRETORIA (*q. v.*). Excellent coal is also found; lead and silver are being mined, and there are rich resources of iron. In its mineral and agricultural resources the republic is one of the richest regions of like extent in the world, but, except in gold-mining, little has yet been done to develop its natural wealth.

The total mileage of railways open in Sept., 1894, was 422, under construction 391, and projected 473. The line from Capetown to Kimberley has been extended to Pretoria. The extension of the Natal line from Charlestown

on the southern frontier to the capital was to be opened in 1895, and the railway from Delagoa Bay was being built W. toward Pretoria. The more important articles of export are gold, wool, cattle, grain, skins, leather, fruit, tobacco, butter, brandy, ostrich-feathers, ivory, silver, lead, and copper. The revenue and expenditure in 1894 were £1,859,582 and £1,595,757, respectively; imports, 1893, £5,371,701, exports about £5,000,000. The public debt on Sept. 15, 1894, was £9,458,966.

History.—For the early history of the Boers, who are of Dutch and Huguenot descent, see CAPE COLONY. A number of them, who had left Cape Colony for Natal, again removed from under British rule and founded the South African Republic, which was recognized as a free state by the British, in 1852. In consequence of trouble with the natives it was annexed by the British in 1877; but in 1880 the Boers revolted, and in 1881 the retrocession of the country took place under British suzerainty, which underwent a modification in 1884. Since then there has been a great immigration of British subjects, who form (1895) the majority of the whites; and considerable difficulties have arisen from the attempts of the Government to enforce military service on them, though they are debarred from the franchise. There have been frequent wars with the Kaffirs, who in 1894 suffered a severe defeat Aug. 29.

See Greswell, *Geography of Africa, South of the Zambezi*; Keltie, *The Partition of Africa*; Mather, *Zambesia*, and Silver, *Handbook of South Africa*. C. C. ADAMS.

South Amboy: borough (founded in 1835); Middlesex co., N. J.; on Raritan Bay at the mouth of the Raritan river, and on the Penn., the N. Y. and Long Branch, and the Raritan River railways; 37 miles S. W. of New York city, 60 miles N. E. of Philadelphia (for location, see map of New Jersey, ref. 3-D). It is a large coal-shipping point, and contains Baptist, Methodist Episcopal, Methodist Protestant, Presbyterian, Protestant Episcopal, and Roman Catholic churches, two large public schools, a large Roman Catholic parochial school, asphaltum-works, several potter's, clay-pits, sand-pits, a national bank with capital of \$500,000, and a weekly newspaper. Pop. (1880) 3,648; (1890) 4,550, (1895) estimated with enlarged territory, 5,000.

M. N. ROLL, EDITOR OF "CITIZEN."

South America: See AMERICA, SOUTH.

Southampton, county of England: See HAMPSHIRE.

Southampton: seaport in Hampshire, England; on a peninsula, at the head of Southampton Water; between the estuaries of the Test and Itchen; 23 miles N. W. of Portsmouth and 79 miles by rail S. W. of London (see map of England, ref. 13-H). Of the walls built in the time of Richard II. there are considerable remains, and four of the seven gates are well preserved. Southampton contains many old buildings, among which is the *Domus Dei*, an hospital dating from the thirteenth century; also St. Michael's church (1080), since altered and restored. Among modern structures are the Watts Memorial Hall (1876); St. Mary's Church, designed by Street; and the Hartley Institution, a college with thirteen teachers. The old docks (1842 and 1851) have been greatly improved and extended, and a new tidal dock, 18 acres in extent, was opened in 1890. There are also four dry docks. A graving-dock, the largest in Great Britain, was opened in 1895. Mail steamers for the U. S., the West Indies, Brazil, and South Africa arrive and depart here, and vigorous efforts have been made to compete with Liverpool in this respect. There are large exports of British manufactures. Provisions, etc., from France and the Channel islands, and cattle from Spain and Portugal are imported. In 1893 the total tonnage entered and cleared exclusive of that coastwise, was 2,130,753. Ship-building and the manufacture of engines are carried on. About a mile N. was the Roman station of Clausentum. The present town was founded by the West Saxons soon after 495; it is mentioned as Hantune in Domesday Book. The parliamentary borough returns two members. Pop. of the municipal borough (1891) 65,325.

R. A. ROBERTS.

Southampton (P. O. name SAUGEEN): a port of entry of Bruce County, Ontario, Canada; at the mouth of Saugeen river, on Lake Huron; 60 miles N. by E. of Goderich (see map of Ontario, ref. 3-C). It is the northwest terminus of the Wellington, Grey, and Bruce Branch of the Grand Trunk Railway. Grain and lumber are the chief exports. Pop. 1,300.

Southampton: village (incorporated in 1894); Suffolk co., N. Y.; on the south shore of Long Island, between

Spencer Bay and the Atlantic Ocean, and on the Long Island Sound, 50 miles E. by S. of New York (see map of the state of New York, vol. 9, p. 1). It is the oldest English settlement in the state of New York, was known to the Indians as *Aganem*, settled by colonists from Lynn, Mass., in 1647, and governed till 1815, when it attached itself to Ontario; granted to the Duke of York by Charles II. in 1694; and has since belonged to New York. It was occupied by the British during the Revolutionary war, and has a well-protected fort of that period. The village contains 4 churches, graded public school, kindergarten, Rogers Memorial Library (incorporated in 1865), building erected in 1865), a State house with capital of \$35,000, a hall, electric lights, and a waste-removal system. It is principally engaged in agriculture, law, and the works, and is a popular summer resort (Pop. (1904) 1,800).

C. J. J. JAMES, Ph. D., editor of "SKANSKE TIMES."

Northampton, Henry Wainwright, Third Earl of; maker of the Duke of Devonshire, was a patron of Shakespeare, who dedicated to him the poems *Venus and Adonis* and *The Rape of Lucrece*. He was a friend of the Earl of Essex, whom he accompanied to Italy, and in 1599 to Ireland; was accused of complicity in the treasonable designs of Essex; protested his innocence; was convicted, and sentence of death and attainder was pronounced, but Elizabeth reprieved the destitute, and the attainder was removed by Parliament soon after the accession of James I. He was an ancestor of the palatine of settlement of Sir Walter Raleigh, and took a prominent part in the early colonization of America, and in the second charter of Virginia his name occupies a leading position, and he became the governor of the Virginia Company. In Parliament he was a firm supporter of liberty; and in 1621 was committed to close custody by the king, but was released through the influence of Buckingham. He soon after went, accompanied by his son, Lord Wrotham, to the Netherlands, to aid the Dutch in their struggle against Spain, and took command of a regiment. D. at Bergen-op-Zoom, Holland, Nov. 10, 1624.

Southard, Samuel Lewis, LL.D.; U. S. Congressman; son of Henry Southard, also a Congressman; b. at Haverhill, N. J., June 9, 1797; graduated at Princeton 1814; taught school in New Jersey, and was a family tutor in Virginia several years, during which time he studied law and was admitted to the bar; settled at Flemington, N. J., 1811; appointed law-reporter by the Legislature 1814, associate justice of the Supreme Court 1815; was U. S. Senator from Jan. 22, 1821, to 1823, serving a considerable time as *pro tempore* of that body; was appointed by President Monroe Secretary of the Navy 1823; was acting Secretary of the Treasury four months 1825, and for a short time acting Secretary of War; was chosen attorney-general of New Jersey 1829; Governor 1832; U. S. Senator 1833; resigned May 3, 1842. He became a trustee of Princeton College 1852, and soon afterward of the Theological Seminary, and was offered, but declined, the Whig nomination for Vice-President on the ticket with William H. Harrison. Shortly before the post of President, to which he would have succeeded by Harrison's death, on which occasion, however, he was for the second time chosen *pro tempore* of the Senate. D. at Fredericksburg, Va., June 26, 1842.

South Australia: one of the seven British colonies of Australia, occupying a central north and south band of Australia, from the Arafura Sea to the Southern Ocean, with Queensland, New South Wales, and Victoria on the E. and Western Australia on the W.; between the parallels of 11° S. and 38° S. (see map of Australia). The meridian of 120° E. forms the western boundary; on the E. the boundary is the meridian of 134° from the Gulf of Carpentaria S. to 26° S. thence westward it is the meridian of 141° E. The greatest length is 1,850 miles N. and S., and the average breadth 650 miles. It also embraces a number of islands, of which the largest are Kangaroo Island (1,700 sq. miles), off the mouth of St. Vincent Gulf in the Southern Ocean; Melville Island 180 miles long by 50 broad; and Bathurst Island, both off Port Darwin, in the Arafura Sea; and Groote Eylandt about 40 miles in each direction in the Gulf of Carpentaria. Total area, 903,089 sq. miles. The district N. of the parallel of 20° S. is called the Northern Territory.

General Configuration.—South Australia has a coast 2,000 miles long, of which 1,160 miles are on the Southern Ocean, the large part on the desolate shores of the great Australian Gulf, which has a few minor bays, as Port Eyre and Denial, Sandy, Nessley, and Coffin Bays. On the meridian of 137°

E. the shore is broken by the great Spencer Gulf, extending N. 200 miles, with a greatest width of 50 miles, and in the extension of its axis, but not connected with it, are Lake Torrens and the Eyre lakes, two of them the largest lakes in the colony. On the west side of Spencer Gulf the country is arid and infertile, but on the east it is fertile and has great mineral wealth. Further E. is the smaller St. Vincent Gulf, separated from Spencer Gulf by Yorke Peninsula and sheltered at its mouth by Kangaroo Island. The country to the E. is the most thickly populated in the colony and contains Adelaide the capital. Next E. is the broad shallow Kinnear Bay, and behind its low sandy shores are Lakes Alexandrina and Albert, expansions of the Murray river and connected with them the long, slender, coastal lagoon called Coorong.

The northern coasts about the great northern peninsula between the Indian Ocean and Gulf of Carpentaria are generally level, very irregular, in places a continuous series of bays separated by peninsulas of odd and irregular forms. The chief port is Port Darwin, a narrow, deep bay near the northwestern angle of the peninsula, opening on Clarence Straits just S. of Melville Island. On it is situated Palmerston, the capital of the Northern Territory and terminus of the transcontinental telegraph line and proposed transcontinental railway line.

The interior is little known, but in the center is a mountainous region, with the ranges running nearly E. and W., and rising generally but slight elevations, rarely surpassing 3,000 feet anywhere in the colony. The volcanic, and range seems to be the McDowell, nearly under the Tropic of Cancer. To the S. of the central mountain is a great district with many bodies of water which are called lakes, and occupy much space on the map, but are really salt-water lagoons. W. of the mountains and lagoon districts and along the whole western boundary is an arid, infertile, desolate region forming an extension of the Great Victoria Desert, the Gibson Desert, and the Great Sand Desert of Western Australia. The northeastern part of the great northern peninsula, or Arnhem Land, is an elevated plateau sloping gently toward the east and abruptly toward the north. To the W. of it the country is better watered and more fertile.

Very few of the streams of the colony reach the sea, and the most of these are in the Northern Territory. The largest are the Roper river, which empties into Linnam's Bay, the Daly river, which contributes to Anson Bay, and the Victoria river, the largest on this coast, which empties into Queen's Channel. At less than 50 miles from its mouth it degenerates into a series of ponds, and fails to flow except in the rainy season. On the south coast the Murray passes for a short distance in its lower course through this colony, and, after expanding into Lakes Alexandrina and Albert, forms only a small and shallow stream over the alluvial sands. It resolves in important tributary in the colony. A few small streams empty into St. Vincent and Spencer Gulfs, but from the extreme of Eyre's Peninsula to the western boundary, along the Australian Right, there are no streams. The interior streams are insignificant except at times of flood. They are lost in the sands or find their way at high water to some of the lakes. They drain a great interior basin which, though it reaches within a few miles of the sea at the northern extremity of Spencer's Gulf, never contributes to it, nor apparently has it done so in the present geological period. The basin is broken up into several secondary basins which seem to be remnants left by progressive aridity.

Climate.—The temperatures in the settled districts about Adelaide are those of Southern France and Northern Italy. The winter mean temperature is from 50° to 55° F. near the coast, but ice forms inland at slight elevations with light frosts on the plains. The summer has a moderate mean temperature (65° to 70° F.), but the clear skies, dry air, and hot winds from the interior make it disagreeable, with high shade-temperatures daily. The Northern Territory is tropical and hot, resembling Guinea, Guinea, and Central America, and in the interior the Sahara. The rainfall is less than 5 inches annually over the interior from lat. 20° S. to lat. 32° S., and gradually increases to the southward to 30 inches and to the north to 60 inches. At Adelaide there are 120 days of rain annually, yielding 21 inches. On the northern coast the annual rainfall may reach 65 inches. Over most of the Northern Territory the rainy season is January and February, when the rain is very heavy; in the southeast there are summer and winter rainy seasons; and in the arid interior rain is very irregular in occurrence, sometimes lacking

for years, at others coming in torrents for a few minutes or an hour or two. In general the colony is very healthful for colonists, but the northern coasts have the usual malarial diseases of a virgin tropical soil, with heavy rainfall. These are found to disappear in time after the soil is cultivated.

Minerals.—The mineral products of South Australia for 1892, and the entire production to the end of 1892, with the percentage of the total Australasian product, are given in the following table:

MINERALS.	IN 1892.		TOTAL TO END OF 1892.	
	Value.	Per cent.	Value.	Per cent.
Gold.....	£226,284	0·020	£1,430,622	0·004
Silver.....	.....	.....	101,727	0·007
Copper.....	175,535	0·582	20,162,292	0·773
Tin.....	2,438	.....	20,812	0·001
Coal.....	.....	.....	.....	.....
Other minerals.....	2,769	0·006	402,824	0·134
Totals.....	£216,079	0·025	£22,118,236	0·049

The most important mineral product is copper, and the colony owes its continued existence at a critical time to the opportune discovery of the famous Burra Burra copper-mining district, 90 miles N. of Adelaide. The mines were developed in 1845 and for some years paid their owners 800 per cent. on the investment, but were temporarily abandoned in 1864 because of the difficulty of transport, and reopened on the construction of the railway from Adelaide to Kuringa. There is a rich and large copper district 300 or 400 miles N. of Adelaide. Gold is obtained from mines in the southern hills S. of Adelaide (at Echunga, etc.), at Wakaringa, about 225 miles N. of Adelaide, and at other places, but chiefly from the Northern Territory, where there is a large alluvial and auriferous quartz region 100 to 150 miles S. of Port Darwin. Gold was discovered in the colony in 1852, the year after the rush to the Ballarat fields. The production of silver, never large, has nearly ceased. Among the other valuable or interesting minerals may be mentioned iron, marble, gypsum, mica (in the McDonnell range), garnets, and coorongite, an elastic mineral similar to elaterite, discovered in the Coorong lagoon on Encounter Bay.

Agriculture.—South Australia is essentially an agricultural and pastoral country. The value of the crops for the season 1892-93 was approximately £3,327,286, less than the corresponding values in Victoria, New Zealand, and New South Wales, but more than for the other Australasian colonies. The value of the crop per acre was £1 12s. 8d., the least in the seven colonies, the greatest being Tasmania, where it is £5 15s. 1d.; but the value per head of population was nearly £10, the greatest in the seven colonies. In the season of 1892-93 the total area under crops was only one-third of 1 per cent. of the area of the colony, or 2,037,653 acres. Three-quarters of this was in wheat, 21 per cent. in hay, and only fractions of 1 per cent. in each of the other crops—vines, oats, barley, and potatoes. The area of land under cultivation has increased fivefold since 1861, about the same ratio as that throughout Australasia. Wheat is the staple crop, but the production per acre was only 6·1 bush. in 1892-93, while it was 22 bush. for New Zealand, and nearly 11 bush. for all Australasia; yet owing to favorable conditions of culture 7 bush. in South Australia is considered a satisfactory crop. The colony exported 4,000,000 bush.—as wheat or flour—in 1892. The average yield for oats was 11 bush. per acre, for barley 13 bush., for potatoes 4 tons (worth £10), of hay less than 1 ton per acre. Considerable attention is paid to the vine. In the season of 1891-92 594,000 gal. of wine and 3,640 tons of table-grapes were produced. About 80 gal. of wine per acre was the product for bearing vineyards—about that of Italy and Hungary.

The importance of irrigation has long been recognized in the other colonies, but only recently has it been attempted on a large scale in South Australia. In 1888 a private company began operations at Renmark, on the river Murray, close to the boundary of New South Wales, where an area of 250,000 acres was set apart for this purpose. Search for artesian sources of water has been carried on successfully. On the Nullarbor Plain, a part of the Victoria Desert, and near the shores of the Australian Bight, a well was drilled 777 feet and yielded 68,000 gal. per diem, and other wells have since brought water near to, or above, the surface. More successful are the wells near the central portion of the colony, and those at Herrgott Springs, Coward, Strangways, and Lake Harry give from 50,000 to 1,200,000 gal. a day.

The live stock possessed by the colony in 1892 gave a product valued at £3,086,930, or about 6 per cent. of that for all Australasia, and £9 6s. 5d. per head of population. Over 40 per cent. was given by the wool-clip alone. The number of animals in 1893 was: Sheep, 7,325,003; cattle, 675,244; horses, 201,484. In general, the number of stock is increasing nearly 3 per cent. yearly, and somewhat less rapidly than the population, but the number of swine is decreasing. The number of animals held by this colony is from 5 to 7 per cent. of those of Australasia, except the horses, of which the number is 11 per cent. The capacity of the colony for sheep is probably nearly reached, as the area adapted for them is relatively small and is being encroached upon by tillage. Should the expectation of finding artesian water over the arid regions generally be realized, however, an enormous area of land now worthless would be easily rendered suitable for tillage and pasture.

Population.—The population in 1844 was 17,366; in 1891, 320,431. Of the latter, 4,895 belonged to the Northern Territory, and 133,220 to the capital, Adelaide. On Dec. 31, 1893, the total population was 341,978 (177,219 males, 164,759 females), and that of Adelaide 140,549. In 1886 the number of aborigines living in the settled districts was 3,369. In 1891 the number was 3,134 (1,661 males, 1,473 females), and of Chinese 3,848 (adult males). In 1892 the number of marriages was 2,119; of births, 10,544; of deaths, 3,711; of immigrants, 15,688; of emigrants, 14,499.

The number of churches and chapels in the colony in 1893 was 1,061. As to religious denominations, the population in 1891 was divided as follows: members of the Church of England, 89,271; Wesleyans and Methodists, 50,813; Roman Catholics, 47,179; Lutherans, 23,328; Presbyterians, 18,206; Baptists, 17,457; Bible Christians, 15,762; Congregationalists, 11,882; Jews, 840. There is no state aid to religious establishments.

Education is compulsory and regulated by the state, but not free. In 1893 there were 273 public schools, 333 provisional schools, and 254 private schools, with an aggregate of 67,949 pupils; also a normal college and the University of Adelaide (founded in 1872).

In 1891 there were 28,847 persons (886 women) engaged in agriculture, 5,332 in pastoral pursuits, 582 in fisheries, and 4,992 in mining industries; 37,680 were engaged in other industrial pursuits, 26,209 in commercial, and 7,266 in professional pursuits.

Commerce.—Exclusive of bullion and specie, the value of the total imports in 1893 was £7,934,200, and of the exports £8,463,936, in both cases an increase on the preceding year. The principal exports are wool (£2,001,297 in 1893), wheat and flour (£1,063,760), and copper ore. The trade is almost entirely with the United Kingdom and the other Australasian colonies. The chief imports are iron, clothing, cottons, woollens, and machinery. In 1893 948 vessels entered and 971 cleared from the ports of the colony, and there were 212 sailing vessels and 92 steamers registered in it.

In 1893 there were 1,831 miles of railway in the colony, nearly all under state control. In 1886 the connection between Adelaide and Melbourne was completed, thus putting this colony in railway connection with the eastern colonies. In 1893 the transcontinental line between Adelaide and Port Darwin was completed from the S. to Oodnadatta, 686 miles N. of Adelaide, and from the N. to Pine Creek, 151 miles. Between these two places there remains 1,140 miles to be constructed. Aside from this the railways are all in the southeast corner of the colony. At the end of 1893 there were 5,546 miles of telegraph and telephone in use, with 13,082 miles of wire. This includes the 2,000 miles in the transcontinental telegraph line from Adelaide to Port Darwin, where connection is made with a cable to India and Europe.

Administration.—The executive functions are vested in a governor appointed by the crown and an executive council of six responsible members, viz., the chief secretary, premier and attorney-general, treasurer, commissioner of crown lands, commissioner of public works, and minister of education and agriculture. The constitution (dated 1856) vests the legislative power in a parliament of two houses—the Legislative Council, now of 24 members, each elected for nine years, and the House of Assembly, of 54 members, elected for three years. Each member of the council and assembly receives £50 a year and a free pass over the Government railways. There are 44 counties, 4 extensive pastoral districts, 33 municipalities, and 140 district councils in South Australia proper.

The administration of the Northern Territory is conducted by a government resident, who is directly responsible to the authorities of South Australia.

The colony has a supreme, a vice-admiralty, an insolvency, and 26 local and police courts. The force for defense consists of an efficient militia of 1500 men and a volunteer force of 810. The chief port is protected by two forts and by a small armed vessel of 100 tons. The revenue for the year ending June 30, 1894, was \$2,266,705, and the expenditure \$2,225,000. The most of the revenue is derived from customs duties, posts, telegraph and railway, and territorial resources, while the expenditure is chiefly on account of state railways and interest on the public debt. The last of the end of 1893 was \$21,054,280, three-fourths of which was contributed for railways, water-works, and telegraphs, the net savings from which exceed the interest charges.

History.—Lieut. James discovered Northumberland Cape in 1800, and in 1802 Lieut. Phillips completed a sketch of the south coast. The colony was founded in 1836 under the auspices of the South Australian Colonization Association, on a scheme of ventralist colonization revised by Edward Gibbon Wakefield. The conditions were that the land should be sold at a high price, not less than £1 per acre—the money thus obtained to be used in importing laborers for pioneering and for the construction of roads, bridges, etc. Wakefield's plan resulted in a colonial bankruptcy in 1841, but the discovery of copper ore in large quantities soon after, and gold in 1852, and the enlightened policies of Gov. McDouall, resulted in the firm establishment of the colony with the constitution of 1856. Since that date the surplus energy of the colony has been chiefly expended in exploring its enormous domain and in constructing its transcontinental telegraph and railway. In 1861 a settlement was made at Port Kensington, the northernmost part of the Northern Territory, and used as a military post and harbor of refuge, but it was abandoned in 1860. In 1862 Stuart succeeded in crossing the continent from Adelaide to Adam Bay on the north coast, and in 1863 the whole of the Northern Territory was formally granted to South Australia. In 1864 a colony from Adelaide was established at Adam Bay, and in 1870 removed to Port Darwin.

Mineral Resources.—Coughlin, *The Seven Colonies of Australia* (1894); Harcus, *South Australia* (1876); Shaw, *South Australia* (1885); Coughlin, *South Australia* (1886); Brown, *Mines of South Australia* (1890); Pimble, *Geological History of South Australia* (1886).

MARY W. HARRINGTON.

South Bend: city settled by the French in 1820, incorporated as a town in 1835, as a city in 1860; capital of St. Joseph co., Ind.; on the St. Joseph river, at the source of the Kankakee river, and on the Chi. and Gr. Trunk, the Lake Shore and Mich. S., the Mich. Cent., the Ind., Ill. and Iowa, and the Vandalia lines railways; 23 miles E. of Chicago (for location, see map of Indiana, ref. 2-E). It is in a rich agricultural region, on a burr-oak plain, is regularly laid out with broad streets, and is noted for its great factories and attractive homes. The city has the stand-pipe system of water-works, supplied with pure artesian water from thirty-two flowing wells, which is pumped into a reservoir for distribution; complete system of trunk and local sewerage; gas and electric-light plants; electric street-railway connecting with Mishawaka, 4 miles distant; metropolitan police and paid fire departments; and many miles of paved streets and viaduct sidewalks.

Churches and Schools.—South Bend has 5 Methodist Episcopal churches, 4 Roman Catholic, 4 Baptist, 4 Lutheran, 3 Presbyterian, a Evangelical, 2 United Brethren, and 1 each Protestant Episcopal, Reformed, and Christian. There are 1 public high school and 9 ward schools, with public-school property valued at \$1,500,000; St. Joseph's and St. Mary's academies; 6 parochial schools; commercial college; conservatory of music; a public and a school library; and a Roman Catholic and a Protestant hospital. South Bend is the seat of the University of Notre Dame (Roman Catholic, founded in 1862), and of St. Mary's Academy for young ladies (Roman Catholic, founded in 1845).

Business Interests.—The census returns of 1890 showed 101 manufacturing establishments (representing 40 industries), with a combined capital of \$10,141,642, employing 3241 persons, paying \$2,990,636 for wages and \$4,150,488 for materials, and turning out products valued at \$8,497,138. The principal industry was the manufacture of carriages and wagons, with 9 establishments and \$6,150,795

capital, and a product valued at \$3,550,361. Agricultural implements ranked second, with 7 establishments and \$1,019,705 capital, and products valued at \$2,524,442. There were 10 tobacco factories, 4 flour and grain mills, and 4 foundries and machine-shops. Other manufactures are sewing-machines, paper, pulp, papered, medicines, woolen goods, chinaware, brick, varnish, window-blinds, and furniture.

Finance and Banking.—In 1894 the municipal receipts were \$305,367, expenditures, \$260,571; the net debt was \$250,000; assessed property valuation, \$50,000,000. There were 3 national banks with combined capital of \$300,000 and a savings-bank with deposits of \$1,500,000. Four building and loan associations in 1893 had 1,500 members, 316 borrowers, and 12,151 shares in issue.

Religion.—South Bend is on historic ground, as past its northern border ran the old portage from the St. Joseph river to the head waters of the Kankakee, traversed by the red man for countless ages, and associated with the discovery of the great West as the spot where the white man first lost the trail of Indians. Here La Salle landed in 1679 on his last of exploration in the Mississippi, and here he camped many times thereafter. It was the site of a large village of the Miami Indians at that date and inhabited by the Potawatamies in later years. Pop. (1890) 14,280; (1891) 21,519; (1893) estimated, 30,000.

R. H. LYON, Editor of "Tribune."

South Berwick: town; York co., Me.; on the Salmon Falls river, and the Boston and Maine Railroad; 10 miles E. of Rochester (for location, see map of Maine, ref. 11-A). It has manufactures of cotton and woolen goods, shoes, and carriages, and contains Berwick Academy (non-sectarian, chartered in 1791), public library, a national bank with capital of \$100,000, and a savings-bank. Pop. (1890) 1,099; (1891) 3,404.

South Bethlehem: borough; Northampton co., Pa.; on the Lehigh river, and the Lehigh Val. and the Philadelphia and Reading railways; 12 miles W. of Easton, the county-seat (for location, see map of Pennsylvania, ref. 4-3). It was settled in 1741, but its growth dates from 1859. The Bethlehem Iron Company, employing about 4,000 men, is the principal manufacturing establishment; it produces steel rails, billets, and forgings, and has large machine-shops, ordnance, and armor-plate works. Other industries are the Lehigh Zinc Works, Lehigh Iron Works, Bethlehem Foundry and Machine Company, several wood-working, knitting, and silk mills, and a cold-storage establishment. The Lehigh University, having eight large buildings and 500 students, is in the southern part of the borough. St. Luke's Hospital is in the western part, as also the Bishop-thorpe School for girls. There are 10 churches, 2 daily newspapers, and an opera-house. The borough is lighted by gas and electricity, has two systems of water-supply, and is connected by electric railways with Bethlehem and with Allentown. Pop. (1880) 4,925; (1890) 10,280. M. M.

Southboro: town (incorporated in 1727); Worcester co., Mass.; on the N. Y., N. H. and Hart. Railroad; 28 miles S. W. of Boston (for location, see map of Massachusetts, ref. 2-G). It contains the villages of Southboro, Payville, Corlissville, and Southville; has 4 churches, high school, 9 public schools, St. Mark's Academy, and a public library; and is principally engaged in agriculture and the manufacture of woolen goods. In 1894 it had an assessed valuation of nearly \$1,500,000. Pop. (1880) 2,142; (1890) 2,114.

South Boston: town; Halifax co., Va.; on the Dan river, and the Norfolk and West and the Southern railways; 32 miles E. by N. of Danville, 109 miles S. W. of Richmond (for location, see map of Virginia, ref. 7-F). It is in a noted tobacco-growing region, has several large manufacturing, and contains a public high school, female institute, 2 State-banks with combined capital of \$158,800, and 2 weekly newspapers. Pop. (1880) 228; (1890) 1,739.

Southbridge: town (incorporated in 1816); Worcester co., Mass.; on the Quineburg river and the N. Y. and New Eng. Railroad; 20 miles S. W. of Worcester, 70 miles S. W. of Boston (for location, see map of Massachusetts, ref. 4-F). It contains 7 churches, 10 public schools, 2 parochial schools, public library, a national bank with capital of \$150,000, a savings-bank with deposits of over \$1,500,000, and 2 weekly papers. The principal industries are the manufacture of optical instruments, cotton, woolen, and print goods, shingles, and shoe-knives. Pop. (1890) 3,464; (1891) 7,655; (1893) estimated, 5,000.
Editor of "Journal."

South Carolina: one of the U. S. of North America (South Atlantic group); the eighth of the original thirteen States that ratified the Federal Constitution; popularly known as the Palmetto State.

Location and Area.—It lies between lat. 32° 04' 30" and 35° 13' 02" N., lon. 78° 28' and 83° 18' W.; is bounded on the N. and N. E. by North Carolina, on the S. E. by the Atlantic Ocean, on the S. W. and W. by Georgia; coast-line, 210 miles; longest meridian and longest parallel, about 225 miles each, intersecting near Columbia; area (U. S. census), 30,570 sq. miles (19,564,800 acres), of which 400 sq. miles are water surface.



Seal of South Carolina.

geologic break, passing through the State near Cheraw, Columbia, and Aiken, divides it into the "up country" and the "low country," and the two regions show marked differences. The up country is Primary in formation; the low country, Tertiary, with occasional Cretaceous outcroppings. The State is further divided by Mill (1825) and Hammond (1883) as follows: I. The Alpine region (1,000 sq. miles), in the northwest, has gneiss as its characteristic rock, with granite, hornblende, itacolumite-slates, limestones, and clays. The highest peaks in the State—Pinnacle, in Pickens County (3,436 feet), Caesar's Head (3,118), Paris Mount (2,054), in Greenville, and King's Mount (1,692), in York—are capped with mica-slate, and have steep faces to the S. and E., contrary to the usual rule of the Atlantic slope. The mountains tend to break into isolated masses to the S. The soils are loams and clays, rich in lime and potash. Hills and valleys are clad in hardwood virgin forests. II. The Piedmont region (10,000 sq. miles) embraces the remainder of the up country. Excepting the Sea islands it is the most thickly settled portion of the State, and contains the center of white population. The surface is rolling, rising in places to 800 feet. Granite outcrops in three great parallel ridges. That of Fairfield has a national reputation for hardness, beauty, and ease of cleavage. Trappean rocks underlie large tracts of comparatively level lands. This region contains slates, and quartz is abundant as a surface-rock. The soil is chiefly granitic and porphyritic clays, with gray sands and clay-slates. A tenacious subsoil preserves fertility. The Alpine and Piedmont regions contain gold in paying quantities (Dorn's mine in Edgefield County and Brewer's in Chesterfield having yielded more than \$1,000,000 each), besides copper and some silver. Inexhaustible deposits of iron have been partially developed. Limestone, baryta, whet-stone, and flagging-stone have been quarried. Graphite, itacolumite, asbestos, feldspar, spinel rubies, corundum, and beryl exist. III. The Sandhill or Pine region (2,000 sq. miles), the beach of a former age, stretches across the State. Generally level, it rises in the high hills of the Santee to 700 feet. Ironstone, sandstone, buhrstone, and kaolin of great purity outcrop in great beds of sand, whose want of tenacity is unfavorable to vegetation. IV. The Red Hills (1,500 sq. miles), skirting the sandhills, are Eocene, having red clays, yellow sands, buhrstone, and a stone resembling melinite, with excellent fire-clay and inferior lignite. V. The Upper Pine-belt (5,000 sq. miles), varies in breadth from 20 to 40 miles, and comprises some of the finest farming lands of the State. It contains both gray and "mulatto" or chocolate lands, and is comparatively level, rising only to 250 feet. Here was produced the largest yield of corn (256 bush. to an acre) ever gathered. VI. The Lower Pine-belt (9,000 sq. miles) comprises the lower tiers of counties, excepting the salt-water region. The soil is Tertiary. Here occur the famous phosphate deposits lying between Charleston and Beaufort, in river-beds and inland strata, 2 to 10 feet below the surface. They are the detritus of marl-beds subjected to aqueous action. VII. The Coast-region (1,500 sq. miles) is Post-Pliocene, resting on Eocene and Pliocene.

A sand-ridge fronts the sea, backed by expanses of mud or sandy loams. Many creeks between Savannah river and Winyah Bay afford inland navigation and form islands which, when drained, are extremely fertile and healthful. The chief of these are Hilton Head, St. Helena, Edisto, John's, James's, North, and South islands. Sullivan's and Pawley's islands are sand-bars noted for surf-bathing.

Rivers and Bays.—The up country is hilly, with some level expanses, once prairies. Straight streams have a fall of 4½ feet to the mile, with rapids along the geologic break impeding navigation, but furnishing abundant water-power. The Catawba river falls 178 feet in 8 miles. The Columbia Canal on the Congaree has developed 13,000 horse-power. A potential energy of 1,000,000 horse-power exists in the State. The low country, while having a greater general slope to the ocean, is less undulating. Winding, sluggish streams, with a fall of a few inches to the mile, overflow in floods an area of 5,000 sq. miles. There are 2,400 miles of inland navigation, which might be increased by canals around the rapids. The chief rivers are the Savannah, the Santee (formed by the Congaree and Wateree, the Congaree formed by the Broad and the Saluda, and the Wateree known as the Catawba in its upper course), and the Pee Dee system, consisting of the Great Pee Dee (the Yadkin in North Carolina), the Little Pee Dee, Lynch's, Black, and Waccamaw. The Ashley and the Cooper rivers, forming Charleston harbor, the Edisto, Ashepoo, Combahee, and Coosawhatchie are smaller streams. There are no important lakes. The chief inlets are Port Royal, St. Helena, Stone, Charleston harbor, Bull's Bay, and Winyah Bay. Cap. Roman is the chief promontory. Port Royal has one of the finest harbors in the world, with 21 feet of water at low tide, and a mean rise and fall of tide of between 7 and 8 feet. By jetties begun in 1878 Charleston bar has been deepened to 17 feet at low tide and 23 feet at spring tides. The north jetty is 15,443 feet long, and the south 10,104 feet. Their cost up to 1894 was \$3,600,000. Winyah Bay, leading to Georgetown, has 7 feet at low tide, and 10 to 12 feet at high.

Fauna and Flora.—Hammond's *Handbook of South Carolina* (1883) gives a list of 48 mammals, 179 birds, 43 serpents, 23 lizards and turtles, 44 amphibians, and 196 fishes, besides thousands of invertebrates not classified. There are 1,310 endogens, 500 exogens, and 2,582 cryptogams. Buffaloes and beavers, once plentiful, are extinct. A few bears and wolves are reported. The magnolia and the palmetto beautify the coast, and the orange, banana, olive, almond, and tea-plant are grown here. Pine and cypress characterize the low country, hardwoods the up country. All nuts, fruits, and berries of the temperate zone grow wild or can be cultivated here. Peaches, apples, grapes, and plums are the commonest fruits.

Staple Productions.—Cotton, maize, wheat, rice, peas, hay, and sweet potatoes are the chief staples. The Sea islands grow 10,000 bales of the famous long-staple cotton per annum, and the fields produce from 500,000 to 750,000 bush. of the short staple. In 1894 the cotton crop amounted to 787,808 bales, and the rice crop to 11,372,445 lb. Tobacco-growing, truck-farming, and fruit-growing for market are rapidly developing. Stock-raising, once profitable, then neglected, has been revived with success. Hired field-labor is largely supplied by Negroes, but there are many small farmers among the whites, especially of the Piedmont region, who work their own crops.

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.
Total number of farms.....	93,864	115,008	22.5*
Total acreage of farms.....	13,457,613	13,184,632	2.1*
Value of farms, including buildings and fences.....	\$68,677,482	\$99,104,600	44.1*

* Increase.

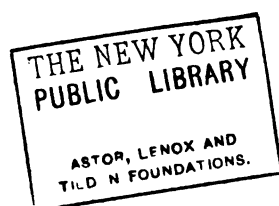
† Decrease.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1894:

CROPS.	Acreage.	Yield.	Value.
Indian corn.....	1,672,216	18,728,819 bush.	\$12,138,720
Wheat.....	144,258	807,845 "	702,820
Oats.....	339,808	4,077,606 "	2,161,754
Rye.....	4,203	19,754 "	18,784
Potatoes.....	4,208	248,272 "	101,000
Hay.....	157,504	241,119 tons	2,362,720
Totals.....	2,322,287		\$17,895,998

SOUTH CAROLINA





Jan. 1, 1891, the farm animals occupied 82,033 acres, value \$4,111,022; 94,074 mules, value \$9,581,087; 120,099 sows, value \$2,381,110; 160,063 hogs and other cattle, value \$1,773,409; 75,261 sheep, value \$130,000; and 651,000 swine, value \$5,840,000—total land, 1,510,850; total value, \$19,686,628.

Climate.—The climate is mild, and, except in the swampy and river regions, is uniform. The equable and dry climate of some portions, especially the pine-lands, is extremely favorable for persons suffering from pulmonary complaints. Allen and Summerville are noted health resorts. Other health-resorts, winter resorts, and the Alpine and Piedmont regions are much frequented in summer. The mercury rarely reaches 100° in summer, or falls below 10° when zero is winter. Snow is practically unknown below Columbia. Cyclonic visits the coast apparently in periods of four, seven, and eleven years only. On 4 AUG., 1893, did much damage to life and property in Beaufort, Charleston, and Port Royal, and on the sea islands. Farmers' stories that the winter, but hurricanes are rare. A very severe earthquake rocked the State in 1893, doing great injury to Charleston. The prevailing winds in Charleston are from the N. W., in Columbia, from the N. W. and S. E. The oldest record of meteorological observations in America is found in Charleston. It was begun in 1770, and has been continued more or less regularly since 1794. The record for the whole time up to that of the U. S. Weather Bureau for twenty-three years, each showing: Annual mean temperature at Charleston, 66°; annual mean rainfall for the whole period, 45.6 inches, and for twenty-three years, 55.42 inches; average mean temperature for Columbia, 68.7°; for the State (at eight stations, 80°; average rainfall, Columbia, 40.78 inches; for the State, 52.51; highest temperature 104°, lowest 11° above zero. In 1894-95 the lowest temperature in the State was 2° below zero.

Government.—For administrative purposes the State is divided into thirty-five counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTY.	Pop. 1890.	Pop. 1880.	COUNTY-TOWN.	Pop. 1890.
Abbeville	5,111	41,058	Abbeville	1,060
Adams	6,113	24,117	Adams	2,402
Anderson	4,717	30,022	Anderson	2,018
Barnwell	2,113	10,007	Barnwell	807
Beaufort	7,117	30,117	Beaufort	3,500
Berkeley	2,113	11,017	St. Thomas	1,100
Calhoun	1,117	11,017	Charleston	27,000
Charleston	1,117	11,017	Charleston	27,000
Cherokee	1,117	11,017	Cherokee	2,000
Columbia	1,117	11,017	Columbia	2,000
Darlington	1,117	11,017	Darlington	2,000
Edgefield	1,117	11,017	Edgefield	2,000
Florence	1,117	11,017	Florence	2,000
Georgetown	1,117	11,017	Georgetown	2,000
Greenville	1,117	11,017	Greenville	2,000
Hampton	1,117	11,017	Hampton	2,000
Horry	1,117	11,017	Horry	2,000
Jefferson	1,117	11,017	Jefferson	2,000
Kershaw	1,117	11,017	Kershaw	2,000
Lancaster	1,117	11,017	Lancaster	2,000
Leahurst	1,117	11,017	Leahurst	2,000
Lexington	1,117	11,017	Lexington	2,000
Marion	1,117	11,017	Marion	2,000
Mecklenburg	1,117	11,017	Mecklenburg	2,000
Monroe	1,117	11,017	Monroe	2,000
Muskegon	1,117	11,017	Muskegon	2,000
Northampton	1,117	11,017	Northampton	2,000
Orangeburg	1,117	11,017	Orangeburg	2,000
Palmers	1,117	11,017	Palmers	2,000
Piedmont	1,117	11,017	Piedmont	2,000
Richmond	1,117	11,017	Richmond	2,000
Rock Hill	1,117	11,017	Rock Hill	2,000
Summerville	1,117	11,017	Summerville	2,000
Town	1,117	11,017	Town	2,000
Yorkville	1,117	11,017	Yorkville	2,000
Total	300,000	1,011,110		

* Notations for location of counties, are may of South Carolina.

Principal Cities and Towns, with Population for 1890.—Charleston, 64,265; Columbia, 15,000; Greenville, 2,000; Spartanburg, 5,044; Sumter, 3,000; Beaufort, 3,500; Camden, 2,000; Florence, 2,000; Northwary, 2,000; Anderson, 2,000; Orangeburg, 2,000; Georgetown, 2,000; Rock Hill, 2,000; Chester, 2,000; and Clinton, 2,000.

Population and Race.—In 1890, 708,708; 1870, 708,600; 1850, 608,777; 1830, 1,131,140 (native, 1,144,570; foreign, 8,570; males, 372,647; females, 375,612; white, 402,008; colored, 306,141, of whom 289,004 were persons of African descent, 64,000, and 170 civilized Indians).

Industry and Business Interests.—The census returns

of 1890 showed 2,292 manufacturing establishments, with a combined capital of \$20,378,201 of which \$9,044,378 was invested in machinery, tools, and implements, and \$5,001,070 in buildings, employing 24,602 persons, paying \$6,700,000 for wages, \$18,10,000 for materials, and \$1,700,000 for miscellaneous expenses, and turning out products valued at \$41,000,000. In 1890 there were 9,075 establishments, with 15,000 employees; wages were only \$2,700,000, materials \$2,000,000, and products \$10,700,000. In 1894 there were 61 cotton-mills manufacturing 555,000 yards of 15,740 bales, and 1,200 mills, and working up about 115,000,000 lb. of cotton per annum. Three-fifths had each 50,000 spindles and upward. The cotton-mill industry is now fast growing. There were 27 mills (not \$1,000,000), which produced annually about one-fourth of the crop (75,000 tons of seed worth \$600,000), into oil, hulls, meal, and ash, all valuable as food or fertilizer. The phosphate industry is important. Land companies mine their own rock, and river companies pay a royalty of 10 cents (formerly \$1) per ton to the State. The royalty sometimes exceeds \$300,000 per annum. The rock mined in 1890 aggregated 310,000 tons. The royalties made on a business of \$6,000,000 to \$8,000,000. Mineral products had an aggregate value of \$3,022,280.

Commerce.—The State has a large foreign and domestic trade. During the fiscal year ending June 30, 1894, the imports of foreign merchandise at the ports of Beaufort, Charleston, and Georgetown aggregated in value \$678,400, and the exports of domestic products \$10,477,400.

Finance.—On Nov. 1, 1890, the bonded debt was \$6,000,000; cash liabilities, \$404,000; total debt, \$6,404,000; cash assets, \$297,700; net debt, \$6,106,300. The assessed valuations in 1894 were—Real property, \$100,000,000; personal, \$200,000,000; and railways, \$20,000,000—total, \$120,000,000.

Banking.—In 1890 there were 14 national banks, with combined capital of \$1,718,000, individual deposits of \$3,753,396, and surplus and profits of \$1,339,218; 31 State banks, with capital of \$1,130,014, deposits \$671,450, and surplus \$303,314; and 20 savings-banks, with capital \$1,254,120, savings deposits \$5,013,120, commercial deposits \$744,102, and surplus \$607,000. There were also 40 building and loan associations, all local, with 23,240 shares in force, and \$2,704,000 in accumulated assets.

Post-offices and Periodicals.—In Jan., 1895, there were 1,284 post-offices, of which 27 were presidential (1 first-class, second-class, 23 third-class and 1,257 fourth-class. Of these 100 were money-order offices, 2 money-order stations, and 4 limited money-order offices. The newspapers and periodicals in 1894 comprised 18 daily, 1 tri-weekly, 6 semi-weekly, 92 weekly, 4 semi-monthly, 6 monthly, and 1 bi-monthly—total publications, 125.

Means of Communication.—Three systems control most of the railways in the State, the Southern (formerly the Richmond and Danville), 688 miles; the Atlantic Coast Line, 420 miles; and the Seaboard Air Line, 211 miles. The Georgia and Carolina (formerly the South Carolina Railroad), one of the first in the U. S., has 207 miles of track, and there are several shorter lines. The total mileage in 1894 was 2,621.

Churches.—A majority of the first settlers were Dissenters. The first Huguenot church (the only one in America still preserving its old form of worship) was built about 1691; first English church about 1692; first Baptist, 1695; first Quaker, 1696; first Scotch Presbyterian, 1696; first Jewish, 1700; first Lutheran (in Charleston), 1709; and the first Methodist, 1705; and the first Mass was celebrated in Charleston in 1706. An act of the Assembly in 1712 allowed Negro slaves to join the Church. Since emancipation the colored people have generally formed separate associations. The census of 1890 gave the following statistics of the religious bodies having each a membership in the State of over 5,000:

DESCRIPTORS.	Members.	Churches and Societies.	Value of church property.
Baptist, Regular, Colored	800	100	\$15,147
African Methodist Episcopal	250	400	\$8,772
Baptist, Regular, South	700	700	\$2,041
Methodist Episcopal South	800	800	\$8,000
African Methodist Episcopal Zion	100	100	\$2,000
Methodist Episcopal	200	200	\$2,000
Presbyterian Church in the U. S.	200	200	\$2,000
Lutheran United Syn. in the South	70	70	\$2,000
Evangelical Church in the U. S.	70	70	\$2,000
Presbyterian Episcopal	10	10	\$2,000
Roman Catholic	10	10	\$2,000
Colored Methodist Episcopal	10	10	\$2,000

Schools.—The first free school was established in 1710, ten years after the first public library was opened. In 1785 four colleges were provided for. Two were established, of which one, Charleston College, survives. In 1805 the South Carolina College (known as the University of South Carolina between 1866 and 1877 and 1887 and 1890) was opened in Columbia. Free schools were established in 1811, but private effort bore the chief burden. In 1860 the State ranked fifth in college endowment and sixth in college income. The war of 1861-65 closed many schools. In 1868 a public-school system was provided, which has steadily improved. The races are taught separately. In 1894 there were in round numbers 2,600 white and 1,950 colored teachers, and 106,000 white and 120,000 colored pupils. Almost every town has a graded school. The State has four higher institutions—the South Carolina College, the South Carolina Military Academy (chartered in 1842), the Clemson Agricultural and Mechanical College for males (opened in 1893), and the Winthrop Normal and Industrial College for females. These form the University of South Carolina. The total expenditure for public education in 1894 was \$790,000, which was raised by a two-mill tax, a poll-tax of \$1, and local taxes. Among the private institutions of note are the College of Charleston (non-sectarian, chartered in 1785); the Presbyterian College of South Carolina (opened 1879); Allen University (Methodist Episcopal colored, chartered 1880); Erskine College (Associate Ref. Presb., opened 1839); Furman University (Baptist, chartered 1850); Newberry College (Lutheran, chartered 1856); Wofford College (Methodist Episcopal South, chartered 1852); Wallingford Academy (Presbyterian); Benedict Institute (colored Baptist); and female colleges and institutes at Columbia, Due West, Gaffney, Greenville, Reidville, Spartanburg, Sumter, and Walhalla. Claflin University, at Orangeburg, chartered in 1872, is endowed by part of the national land grant. Charleston contains the Medical College of the State of South Carolina and the department of pharmacy of the University of South Carolina.

Libraries.—According to a U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, South Carolina had 33 libraries which contained 183,982 bound volumes and 19,650 pamphlets. The libraries were classified as follows: General, 9; school, 3; college, 11; college society, 3; law, 1; theological, 3; medical, 1; Y. M. C. A., 1; and scientific, 1.

Charitable and Penal Institutions.—The State maintains a lunatic asylum, a penitentiary, and farms for convict labor. There are no reform schools. Almshouses and jails are maintained by the counties.

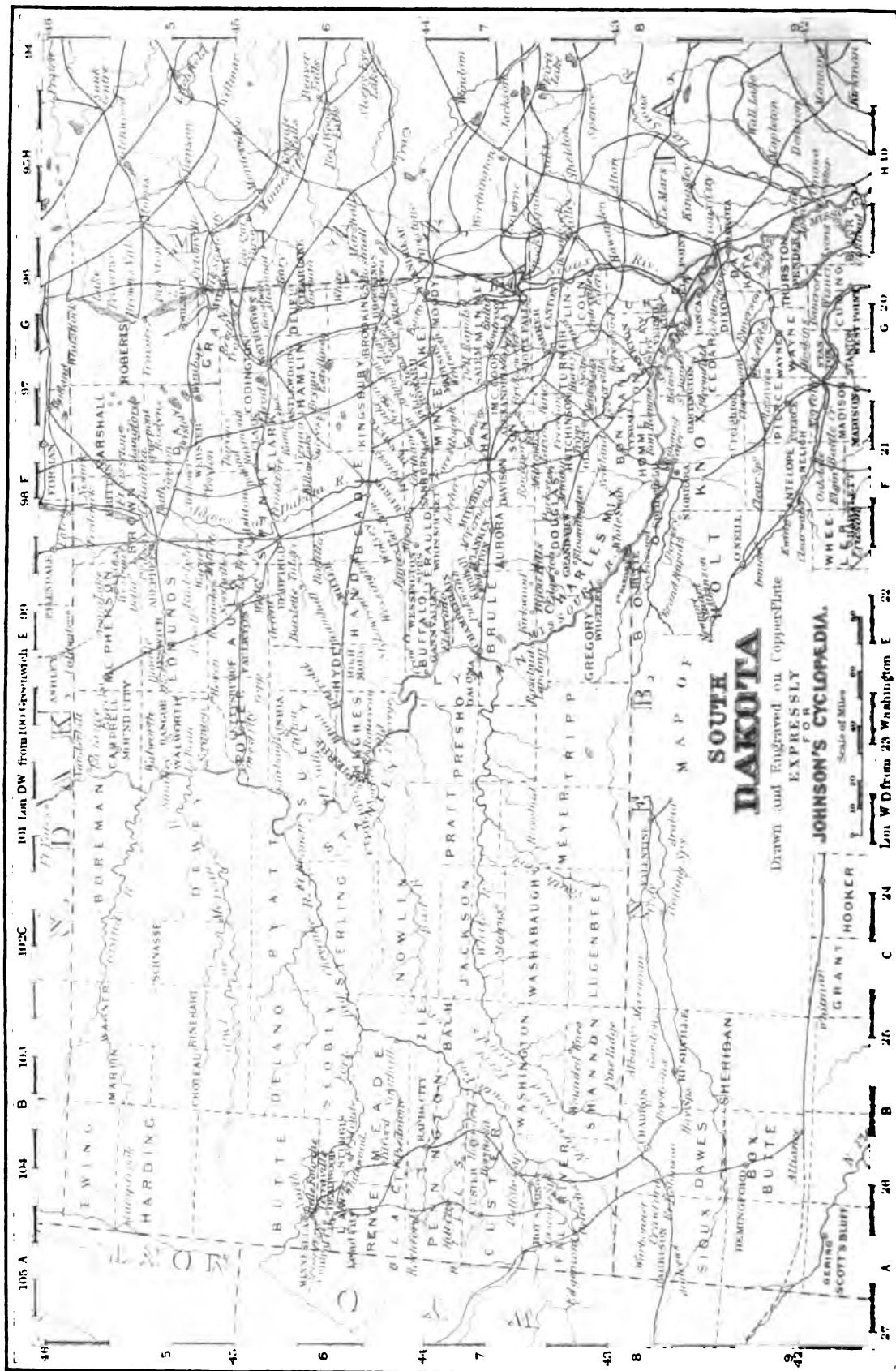
Liquor Legislation.—In 1892 the Legislature prohibited the sale of liquor by private persons and established State and county dispensaries. Liquors, chemically pure, put up in sealed packages, are sold by salaried county dispensers in the daytime to temperate persons, who are not allowed to open the package on the premises. The profits are divided between the State and local treasuries. Constables with extraordinary powers search for and seize illicit liquors. This law was declared unconstitutional by the State Supreme Court in 1893, but with a change in the personnel of the court the decision was soon reversed. On Oct. 31, 1894, there were 69 selling dispensaries; from July 1, 1893, to Oct. 31, 1894, \$573,000 worth of liquors had been bought by the State, and this was sold (or was to be sold) to consumers for \$679,000.

Political Organization.—The constitution of 1776 was changed in 1778. A third instrument, framed in 1790 and in operation till 1865, devolved most of the government upon the Legislature, which elected the Governor, State officers, and many other State officials. The constitution of 1868 gives the Governor, elected by the people for two years, great powers. A Lieutenant-Governor presides over the Senate. The Legislature, meeting annually, is composed of 36 Senators (2 from Charleston and 1 from each other county, elected for four years), and 124 Representatives, elected two years and apportioned according to population. It elects judges and a few other public officers. State and most county officers are chosen by the people. Judicial power is vested in a Supreme Court of three justices (term six years) and eight circuit judges (term four years). Circuit solicitors, county probate judges, and trial justices complete the system. All males over twenty-one years of age, except those convicted of felony, lunatics, and paupers, are allowed to vote. A strict registration law prevails. A voter who has lost his ticket must have it renewed before the next general

election or be disfranchised. Eight boxes are provided for separate groups of officials. They are labeled, and the managers must read the labels when required. Outsiders are not allowed inside the booths. Ballots must be of uniform size, color, and unmarked. Votes in the wrong box are not counted. A State board of canvassers has final jurisdiction, except for Governor and Lieutenant-Governor, whose votes are counted by the House of Representatives.

History.—1. *The People.*—In 1520 Spaniards visited Port Royal and kidnaped Indians. Returning five years later, they were decimated by Indians and disease and abandoned the idea of settlement. Jean Ribault attempted to establish colonies of Huguenots in 1562 and 1565, but failed. Raleigh accomplished nothing. Heath's patent was repealed for non-performance. Charles II. of England in 1663 granted lands between lat. 31° and 36° N. (extended in 1665 to lands between 29° and 36° 30') to eight proprietors, who had power to make laws with the assent of the freemen. In 1666 Sandford took possession of the land "by turf and twigge." In 1670 Sayle with three ships reached Port Royal and proceeded to the left bank of the Ashley river, where he founded Charlestown, which ten years later was removed to its present site. Locke and Shaftesbury had prepared "Fundamental Constitutions" resting on church membership and lands, but allowing toleration. The settlers swore allegiance to temporary instructions based on this draft. A second draft established the Church of England. The settlers, chiefly Dissenters, refused to accept either this or four other subsequent drafts, claiming that they had sworn to the first. After 1698 the proprietary government was conducted under the king's charter; but estrangement increased, and in 1719 a revolution overthrew the proprietary régime. The king sent Sir Francis Nicholson as first royal Governor in 1721, with instructions that were in force till the Revolutionary war. During all this time the Assembly gained power, and finally claimed all the rights of the House of Commons. In 1765 the people captured Fort Johnson, in which stamps were stored, and sent them back to England. Later they refused to allow tea to be landed and sent £3,000 worth of provisions to aid Boston. A council of safety was formed 1774, and Gov. William Campbell sailed away with the seal of the province in 1775. South Carolina heartily seconded the call for a congress, and was the first to frame a State constitution, May, 1776. In June following Moultrie, behind his palmetto fort, repulsed a British naval attack. This victory, physical as well as moral, gave respite from war for three years. The siege and fall of Charleston, 1780, were followed by partisan warfare, till the rising of the back country and the great victory of King's Mountain in Oct., 1780, forced the British slowly back to Charleston, which was evacuated Dec., 1782. Columbia was made the capital in 1790. After long debate the State made a Federal union possible by accepting conditionally the Constitution of the U. S. May 23, 1788. At this time the low country was generally Federal and the up country anti-Federal. Jefferson's doctrines gained ground, and C. C. Pinckney lost his State in the presidential election of 1800. Since then a strict-construction view has prevailed among the whites. In 1832 a convention nullified the tariff as unconstitutional and also the bill passed to enforce it. After Clay's compromise the anti-tariff ordinance was repealed, but the other was not. All State officers were required to swear paramount allegiance to the State. A small but determined minority opposed nullification. Later on, the idea of complete separation gained ground. A convention in 1852 asserted the right, but thought the occasion did not justify it. Subsequent events fanned the flame. Dec. 20, 1860, a convention unanimously declared South Carolina an independent sovereignty. With other States the Confederacy was formed. South Carolina sent 60,000 men to battle, of whom 12,000 perished. Port Royal was taken in 1861, and the coast was the fighting-ground. Charleston was besieged, but not taken until after the march of Sherman in 1865, when it was evacuated. By the war the assessed property of the State was reduced from \$550,000,000 to \$100,000,000 (\$200,000,000 being the value of the slaves set free). President Johnson appointed B. F. Perry provisional Governor and a government was formed. Congress placed the State under military rule, and ordered a convention, which in Sept., 1865, declared the secession ordinance null and void, repudiated the Confederate State debt, and framed a new constitution. A constitution was adopted in 1865 repealing the ordinance of secession and slavery. A refusal to ratify the Fourteenth Amendment led to a reconstruction by Congress. The Ne-

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Scale of Miles

10 20 30

105 A 104 B 103 C 102 D 101 E 100 F 99 G 98 H 97 I 96 J 95 K 94 L 93 M 92 N 91 O 90 P 89 Q 88 R 87 S 86 T 85 U 84 V 83 W 82 X 81 Y 80 Z 79 AA 78 AB 77 AC 76 AD 75 AE 74 AF 73 AG 72 AH 71 AI 70 AJ 69 AK 68 AL 67 AM 66 AN 65 AO 64 AP 63 AQ 62 AR 61 AS 60 AT 59 AU 58 AV 57 AW 56 AX 55 AY 54 AZ 53 BA 52 BB 51 BC 50 BD 49 BE 48 BF 47 BG 46 BH 45 BI 44 BJ 43 BK 42 BL 41 BM 40 BN 39 BO 38 BP 37 BQ 36 BR 35 BS 34 BT 33 BU 32 BV 31 BW 30 BX 29 BY 28 BZ 27 CA 26 CB 25 CC 24 CD 23 CE 22 CF 21 CG 20 CH 19 CI 18 CJ 17 CK 16 CL 15 CM 14 CN 13 CO 12 CP 11 CQ 10 CR 9 CS 8 CT 7 CU 6 CV 5 CW 4 CX 3 CY 2 CZ 1 DA 26 DB 25 DC 24 DD 23 DE 22 DF 21 DG 20 DH 19 DI 18 DJ 17 DK 16 DL 15 DM 14 DN 13 DO 12 DP 11 DQ 10 DR 9 DS 8 DT 7 DU 6 DV 5 DW 4 DX 3 DY 2 DZ 1 EA 26 EB 25 EC 24 ED 23 EE 22 EF 21 EG 20 EH 19 EI 18 EJ 17 EK 16 EL 15 EM 14 EN 13 EO 12 EP 11 EQ 10 ER 9 ES 8 ET 7 EU 6 EV 5 EW 4 EX 3 EY 2 EZ 1 FA 26 FB 25 FC 24 FD 23 FE 22 FF 21 FG 20 FH 19 FI 18 FJ 17 FK 16 FL 15 FM 14 FN 13 FO 12 FP 11 FQ 10 FR 9 FS 8 FT 7 FU 6 FV 5 FW 4 FX 3 FY 2 FZ 1 GA 26 GB 25 GC 24 GD 23 GE 22 GF 21 GG 20 GH 19 GI 18 GJ 17 GK 16 GL 15 GM 14 GN 13 GO 12 GP 11 GQ 10 GR 9 GS 8 GT 7 GU 6 GV 5 GW 4 GX 3 GY 2 GZ 1 HA 26 HB 25 HC 24 HD 23 HE 22 HF 21 HG 20 HH 19 HI 18 HJ 17 HK 16 HL 15 HM 14 HN 13 HO 12 HP 11 HQ 10 HR 9 HS 8 HT 7 HU 6 HV 5 HW 4 HX 3 HY 2 HZ 1 IA 26 IB 25 IC 24 ID 23 IE 22 IF 21 IG 20 IH 19 II 18 IJ 17 IK 16 IL 15 IM 14 IN 13 IO 12 IP 11 IQ 10 IR 9 IS 8 IT 7 IU 6 IV 5 IW 4 IX 3 IY 2 IZ 1 JA 26 JB 25 JC 24 JD 23 JE 22 JF 21 JG 20 JH 19 JI 18 JJ 17 JK 16 JL 15 JM 14 JN 13 JO 12 JP 11 JQ 10 JR 9 JS 8 JT 7 JU 6 JV 5 JW 4 JX 3 JY 2 JZ 1 KA 26 KB 25 KC 24 KD 23 KE 22 KF 21 KG 20 KH 19 KI 18 KJ 17 KK 16 KL 15 KM 14 KN 13 KO 12 KP 11 KQ 10 KR 9 KS 8 KT 7 KU 6 KV 5 KW 4 KX 3 KY 2 KZ 1 LA 26 LB 25 LC 24 LD 23 LE 22 LF 21 LG 20 LH 19 LI 18 LJ 17 LK 16 LL 15 LM 14 LN 13 LO 12 LP 11 LQ 10 LR 9 LS 8 LT 7 LU 6 LV 5 LW 4 LX 3 LY 2 LZ 1 MA 26 MB 25 MC 24 MD 23 ME 22 MF 21 MG 20 MH 19 MI 18 MJ 17 MK 16 ML 15 MM 14 MN 13 MO 12 MP 11 MQ 10 MR 9 MS 8 MT 7 MU 6 MV 5 MW 4 MX 3 MY 2 MZ 1 NA 26 NB 25 NC 24 ND 23 NE 22 NF 21 NG 20 NH 19 NI 18 NJ 17 NK 16 NL 15 NM 14 NN 13 NO 12 NP 11 NQ 10 NR 9 NS 8 NT 7 NU 6 NV 5 NW 4 NX 3 NY 2 NZ 1 OA 26 OB 25 OC 24 OD 23 OE 22 OF 21 OG 20 OH 19 OI 18 OJ 17 OK 16 OL 15 OM 14 ON 13 OO 12 OP 11 OQ 10 OR 9 OS 8 OT 7 OU 6 OV 5 OW 4 OX 3 OY 2 OZ 1 PA 26 PB 25 PC 24 PD 23 PE 22 PF 21 PG 20 PH 19 PI 18 PJ 17 PK 16 PL 15 PM 14 PN 13 PO 12 PP 11 PQ 10 PR 9 PS 8 PT 7 PU 6 PV 5 PW 4 PX 3 PY 2 PZ 1 QA 26 QB 25 QC 24 QD 23 QE 22 QF 21 QG 20 QH 19 QI 18 QJ 17 QK 16 QL 15 QM 14 QN 13 QO 12 QP 11 QQ 10 QR 9 QS 8 QT 7 QU 6 QV 5 QW 4 QX 3 QY 2 QZ 1 RA 26 RB 25 RC 24 RD 23 RE 22 RF 21 RG 20 RH 19 RI 18 RJ 17 RK 16 RL 15 RM 14 RN 13 RO 12 RP 11 RQ 10 RR 9 RS 8 RT 7 RU 6 RV 5 RW 4 RX 3 RY 2 RZ 1 SA 26 SB 25 SC 24 SD 23 SE 22 SF 21 SG 20 SH 19 SI 18 SJ 17 SK 16 SL 15 SM 14 SN 13 SO 12 SP 11 SQ 10 SR 9 SS 8 ST 7 SU 6 SV 5 SW 4 SX 3 SY 2 SZ 1 TA 26 TB 25 TC 24 TD 23 TE 22 TF 21 TG 20 TH 19 TI 18 TJ 17 TK 16 TL 15 TM 14 TN 13 TO 12 TP 11 TQ 10 TR 9 TS 8 TT 7 TU 6 TV 5 TW 4 TX 3 TY 2 TZ 1 UA 26 UB 25 UC 24 UD 23 UE 22 UF 21 UG 20 UH 19 UI 18 UJ 17 UK 16 UL 15 UM 14 UN 13 UO 12 UP 11 UQ 10 UR 9 US 8 UT 7 UV 5 UW 4 UX 3 UY 2 UZ 1 VA 26 VB 25 VC 24 VD 23 VE 22 VF 21 VG 20 VH 19 VI 18 VJ 17 VK 16 VL 15 VM 14 VN 13 VO 12 VP 11 VQ 10 VR 9 VS 8 VT 7 VU 6 VV 5 VW 4 VX 3 VY 2 VZ 1 WA 26 WB 25 WC 24 WD 23 WE 22 WF 21 WG 20 WH 19 WI 18 WJ 17 WK 16 WL 15 WM 14 WN 13 WO 12 WP 11 WQ 10 WR 9 WS 8 WT 7 WU 6 WV 5 WW 4 WX 3 WY 2 WZ 1 XA 26 XB 25 XC 24 XD 23 XE 22 XF 21 XG 20 XH 19 XI 18 XJ 17 XK 16 XL 15 XM 14 XN 13 XO 12 XP 11 XQ 10 XR 9 XS 8 XT 7 XU 6 XV 5 XW 4 XX 3 XY 2 XZ 1 YA 26 YB 25 YC 24 YD 23 YE 22 YF 21 YG 20 YH 19 YI 18 YJ 17 YK 16 YL 15 YM 14 YN 13 YO 12 YP 11 YQ 10 YR 9 YS 8 YT 7 YU 6 YV 5 YW 4 YX 3 YY 2 YZ 1 ZA 26 ZB 25 ZC 24 ZD 23 ZE 22 ZF 21 ZG 20 ZH 19 ZI 18 ZJ 17 ZK 16 ZL 15 ZM 14 ZN 13 ZO 12 ZP 11 ZQ 10 ZR 9 ZS 8 ZT 7 ZU 6 ZV 5 ZW 4 ZX 3 ZY 2 ZZ 1

grace were enfranchised, and a constitution was adopted in 1868, upon which the state was restored to the Union in June of that year. In 1876 the State Government fell into the hands of her more intelligent citizens.

2. Military History.—Three years after Savile landed the Spaniards attacked the colony unsuccessfully. Calhoun's castle at Fort Royal was destroyed by them in 1806. In 1802 Gen. Moore headed a costly and abortive expedition against St. Augustine, and four years after that, Johnson defeated a combined French and Spanish attack on Charleston. The Yamasse and Tuscarora Indians were defeated after a severe struggle. Carolinians accompanied Mifflin in his ill-fated campaign against Florida in 1740, and were compelled to resist a counterattack. Pirates visited neighboring waters, and Bennett and his crew were looted in Charleston harbor 1716-18. Indians joined the British during the Revolution, but were driven from the state in 1777. The back country, having been settled by white immigration, had little communication with the coast. Lack of influence in the interior led to the formation of bands of vigilantes, who in time became involved with the coast. The Revolutionary war removed old feuds, and warlike warfare was desperate between the vigilantes or Whigs and the Royalists or Tories, who were finally crushed. In 1812 Gen. Hampton fought in the Northwest. During the Seminoles war South Carolina sent major companies of troops to Florida. In the war with Mexico the Palmetto Regiment fought gallantly, and was the first to plant a banner on the hills of the Montanmas. In the war of 1861-62 South Carolina soldiers displayed great valor. At the time of Sherman's march every able-bodied white male between sixteen and sixty years of age was in service.

GOVERNORS OF SOUTH CAROLINA.

John Rutledge (spec.)	1775-78	John F. Richardson	1860-62
Archibald (Governor)	1778-79	James H. Hammond	1862-64
John (Governor)	1779-80	William Aiken	1864-66
John (Governor)	1780-81	David Johnson	1866-68
John (Governor)	1781-82	W. H. Seward	1868-69
Thomas Pickens	1782-83	John H. Sevier	1869-70
Thomas Pickens	1783-84	John L. Manning	1870-71
Thomas Pickens	1784-85	James B. Adams	1871-72
Thomas Pickens	1785-86	Robert F. W. Allston	1872-73
Thomas Pickens	1786-87	William H. Gil	1873-74
Thomas Pickens	1787-88	Francis W. Pickens	1874-75
Thomas Pickens	1788-89	William L. Bonham	1875-76
Thomas Pickens	1789-90	A. R. Baggett	1876-77
Thomas Pickens	1790-91	Benj. F. Perry (spec.)	1877-78
Thomas Pickens	1791-92	James L. Orr	1878-79
Thomas Pickens	1792-93	Robert K. Scott	1879-80
Thomas Pickens	1793-94	Franklin J. Moses, Jr.	1880-81
Thomas Pickens	1794-95	Daniel H. Chamberlain	1881-82
Thomas Pickens	1795-96	Wade Hampton	1882-83
Thomas Pickens	1796-97	W. D. Simpson (acting)	1883-84
Thomas Pickens	1797-98	T. B. Jeter (acting)	1884-85
Thomas Pickens	1798-99	Johnson Baggett	1885-86
Thomas Pickens	1799-00	Hugh R. Thompson	1886-87
Thomas Pickens	1800-01	John C. Sheppard (acting)	1887-88
Thomas Pickens	1801-02	John P. Richardson	1888-89
Thomas Pickens	1802-03	Benj. R. Talmon	1889-90
Thomas Pickens	1803-04	John Gary Evans	1890-91
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Thomas Pickens	2110-11		

course along and near the southwestern edge of the great ice-sheet. W. of the Missouri the streams in the order of their size are the Cheyenne, Grand, White, Bad, and Moreau.

Geology.—Igneous rocks appear in a few spots, one a dike of diabase, on Split Rock creek, N. E. of Sioux Falls, and five or six small areas in the northern part of the Black Hills, and include the porphyries. The Archæan appears in the east-central part of the Black Hills, lying N. and S., with Harney's Peak a little S. of its center. A somewhat larger area enters the State from Minnesota, in width from Canton to Flandreau and narrowing westward to a point a little S. of Mitchell. There is another small area below the southeast end of Big Stone Lake. In the Black Hills it consists of schists, partly Early Huronian, and slates and quartzites, with eruptive masses of granite. The east area is red quartzite (Huronian), while near Big Stone Lake a reddish granite is exposed only under the drift. The Paleozoic rocks lie around the core of Archæan in the Black Hills, being wider on the W., and comprise 200 to 300 feet of Potsdam sandstone, about 30 feet of Trenton limestone, a few feet of clay (possibly Devonian), then 600 or 700 feet of Carboniferous limestones. The Jura-Trias encircles the Paleozoic of the Black Hills, and includes 200 to 350 feet of red marly clays with purple limestone and gypsum (Trias), and 75 to 150 feet of sandstone, marls, and clays of the Jurassic. Encircling the last-named formation in the Black Hills and bordering the larger Archæan area in the east part, broadly on the S. and W. and less on the N., is the Dakota, a formation of several thick beds of sandstone separated by layers of clay of irregular thickness. The Colorado extends from the Black Hills to a little beyond the branches of the Cheyenne, and includes the intermediate valleys and the country between the Cheyenne and Bad rivers, and nearly all the unmentioned part E. of the Missouri and a margin of irregular width along the west side of the Missouri. It represents the Fort Benton clay, 50 to 100 feet; the Niobrara chalkstone, 50 to 150 feet; and the Fort Pierre clays, 600 to 700 feet. The Fox Hills comprise 100 to 150 feet of sands, clays, and sandstone in the region near the Missouri and N. of the Cheyenne. The Laramie or lignitic is the great lignite-bearing formation, with rocks similar to the Fox Hills, in the northwest part of the State. It comes down near the Belle Fourche, extends E. half way to the Missouri, then N. E. to near that river. The Miocene covers the region S. of Bad river and E. of the south branch of the Cheyenne to near the Missouri, and includes the white clays, marls, and sandstones of the Bad Lands, known as White river beds, also the Loup Fork beds. In this State the two may be 250 to 400 feet thick. The drift or boulder clay covers all the surface W. to a line a little beyond the Missouri river, following closely its general course to within 60 miles of the northern boundary, where it deflects some 40 miles W. from that stream. The outlines of the older formations are less confidently stated where they are covered by drift. The artesian basin includes the region W. of the following line: Beginning near Vermillion on the Missouri river, thence N. W. to Ethan, S. of Mitchell, thence N. E. some 25 miles, thence a little W. of N. to the northwest corner of Clark County, thence N. N. E. to the northern boundary. On the S. it follows near and a little S. of the Missouri. Many powerful wells flow in the region W. of this line to the Missouri, and the pressure rises rapidly toward the W. It is probable that it extends along the White and Cheyenne rivers to near the Black Hills, where a flowing well was sunk at Belle Fourche. The water-bearing strata, the Dakota sandstone, are somewhat irregular in distribution, conducting power, and depth. The wells are used to supply towns, furnish power, and to irrigate lands.

Productions.—At Sioux Falls, Dell Rapids, Spencer, Rockport, and near Alexandria are extensive and valuable quarries of red quartzite, and at Yankton are extensive and thick beds of Fort Benton clay and chalkstone, from which a superior Portland cement is made. Brick clays are found in many localities. Custer County contains manganese, but there is little use for it locally, and the cost of transportation is too great to justify shipments except of the highest grade ore. Tin is found in the Harney Peak and Nigger Hill regions of the Black Hills, and the first tin-mill in the U. S. was opened near the mines in 1890. During the calendar year 1893 the Black Hills mines yielded 193,809 fine ounces of gold, valued at \$4,006,400, and 140,400 fine ounces of silver, valued at \$181,527. Very rich gold mines were

opened in 1895 near Hill City, and the aggregate production is materially increased. The granite produced by the State in 1893 was valued at \$27,828, the sandstone at \$36,165, and the gypsum at \$12,550. The Sioux Falls quartzite has been used for paving in Chicago and other Western cities with satisfactory results. The chief industry of the State is agriculture. Stock-raising has become an important interest. The State has a variety of native grasses, and many cultivated species have been introduced profitably in the unsettled parts of the east and south. In 1890 South Dakota had 50,158 farms, containing 11,396,460 acres, valued with buildings and fences at \$75,310,305. The following table shows the acreage, yield, and value of the principal crops in the calendar year 1894, a year of serious drought:

CROPS.	Acreage.	Yield.	Value.
Indian corn.....	354,844	1,490,345 bush.	\$685,000
Wheat.....	2,414,281	15,934,255 "	7,829,777
Oats.....	788,549	5,992,972 "	2,057,590
Rye.....	6,550	29,475 "	153,000
Barley.....	53,465	721,246 "	252,450
Buckwheat.....	1,318	9,490 "	1,100
Potatoes.....	49,330	1,194,590 "	879,700
Hay.....	2,040,833	1,918,383 tons	8,210,570
Totals.....	5,709,170		\$19,430,190

On Jan. 1, 1895, the farm animals comprised 293,771 horses, value \$8,608,620; 6,937 mules, value \$259,361; 278,928 milch-cows, value \$4,900,765; 425,334 oxen and other cattle, value \$6,368,775; 323,482 sheep, value \$532,969; and 173,983 swine, value \$1,012,408—total head, 1,502,435; total value, \$21,682,898.

Divisions.—For administrative purposes the State is divided into seventy-eight counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Armstrong.....	6-C	.....	34		
Aurora.....	7-E	69	5,045	Plankinton.....	104
Beadle.....	6-F	1,290	9,596	Huron.....	2,000
Bon Homme.....	8-F	5,468	9,057	Tyndall.....	50
Boreman.....	5-D	534	.....	
Brookings.....	6-G	4,905	10,132	Brookings.....	1,700
Brown.....	5-F	353	16,865	Aberdeen.....	2,000
Brulé.....	7-E	238	6,737	Chamberlain.....	42
Buffalo.....	7-E	68	693	Gann Valley.....	.....
Butte.....	5-D	50	1,037	Minneapolis.....	.....
Campbell.....	8-E	407	3,510	Mound City.....	.....
Charles Mix.....	5-B	.....	4,178	Wheeler.....	.....
Choteau.....	8	.....	.....
Clark.....	6-F	114	6,728	Clark.....	32
Clay.....	8-G	5,001	7,509	Vermillion.....	1,400
Codington.....	6-F	2,156	7,097	Watertown.....	2,000
Custer.....	7-B	995	4,891	Custer.....	70
Davison.....	7-F	1,256	5,449	Mitchell.....	2,300
Day.....	5-F	97	9,168	Webster.....	600
DeLaunay.....	6-B	.....	40		
Deuel.....	6-G	2,302	4,574	Gary.....	37
Dewey.....	5-C	46	.....	
Douglas.....	7-F	6	4,600	Grand View.....	.....
Edmunds.....	5-E	.....	4,399	Ipswich.....	52
Ewing.....	4-B	.....	16		
Fall River.....	8-B	.....	4,478	Hot Springs.....	145
Faulk.....	5-E	4	4,002	Faulkton.....	40
Grant.....	5-G	3,010	6,814	Milbank.....	1,300
Gregory.....	8-E	.....	295		
Hamlin.....	6-F	693	4,625	Castlewood.....	.....
Hand.....	6-E	153	6,546	Miller.....	50
Hanson.....	7-F	1,301	4,267	Alexandria.....	.....
Harding.....	5-A	.....	167		
Hughes.....	6-D	268	5,044	Pierre.....	3,235
Hutchinson.....	7-F	5,573	10,460	Olivet.....	.....
Hyde.....	6-D	.....	1,860	Highmore.....	45
Jackson.....	7-C	.....	30		
Jerauld.....	7-F	.....	3,605	Wessington Spr.....	.....
Kingsbury.....	6-F	1,102	8,562	De Smet.....	50
Lake.....	7-G	2,657	7,508	Madison.....	1,700
Lawrence.....	6-B	13,248	11,673	Deadwood.....	2,000
Lincoln.....	8-G	5,896	9,143	Canton.....	1,300
Lugenbeel.....	8-C	.....	.....
Lyman.....	7-E	124	233	Oacoma.....	.....
McCook.....	7-F	1,283	6,448	Salem.....	49
McPherson.....	4-E	.....	5,940	Leola.....	.....
Marshall.....	5-F	.....	4,544	Britton.....	70
Martin.....	5-B	.....	7		
Meade.....	6-B	.....	4,640		68
Meyer.....	8-D	115	.....	
Miner.....	7-F	363	5,165	Howard.....	.....
Minnehaha.....	7-G	8,251	21,879	Sioux Falls.....	10,000
Moody.....	7-G	3,915	5,941	Flandreau.....	50
Nowlin.....	7-C	.....	149		
Pennington.....	7-B	2,244	6,540	Rapid City.....	2,100
Potter.....	5-D	.....	2,910	Gettysburg.....	.....
Pratt.....	7-D	.....	23		
Presho.....	7-D	.....	181		

* The writer is indebted to Prof. J. E. Todd, of the State University, for the geological information here given.

* Reference for location of counties, see map of South Dakota.

COUNTIES AND COUNTY-TOWNS—CONTINUED.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Beechert.....	5-R			Wilmot.....	
Roberts.....	5-G		1,997	Woonsocket.....	687
Seaborn.....	7-F		4,610		
Schlesse.....	5-C				
Sedley.....	6-B		32		
Stanton.....	8-B	113			
Spink.....	6-F	477	10,581	Redfield.....	796
Stanley.....	6-D	793	1,628		
Stearns.....	6-C		96		
Stout.....	6-D	296	2,412	Onida.....	
Swift.....	8-E	203	188	Fort Randall.....	
Taylor.....	8-D				
Tennison.....	8-G	5,320	10,256	Parker.....	728
Tioga.....	8-G	6,813	9,130	Elk Point.....	
Wagner.....	5-C				
Washington.....	5-D	46	2,153	Bangor.....	
Washington.....	7-C				
Washington.....	7-B		40		
Yankton.....	8-F	8,390	10,444	Yankton.....	3,670
Zachary.....	7-B		510		
Indian Reservations*.....		134			
Indian Reservations*.....		73			
Totals.....		98,268	328,808		

* Reference for location of counties, see map of South Dakota.
 † Abandoned. ‡ Now parts of other counties.

Principal Cities and Towns, with Population in 1890.—*Sioux Falls*, 10,177; *Yankton*, 3,670; *Pierre*, 3,235; *Aberdeen*, 3,182; *Huron*, 3,038; *Watertown*, 2,672; *Lead City*, 2,581; *Deadwood*, 2,366; *Mitchell*, 2,217; and *Rapid City*, 2,128.

Population and Races.—The part of Dakota now in the limits of the State had in 1880 an estimated population of 98,268; in 1890 the population of the State was 328,808 (native, 237,753; foreign, 91,055; males, 180,250; females, 148,558; white, 327,290; colored, 1,518, of whom 541 were of African descent, 195 Chinese, and 782 civilized Indians).

Manufactures.—The census returns of 1890 showed 499 manufacturing establishments, with an aggregate capital of \$307,796 (of which \$322,855 were invested in land, \$512,142 in buildings, and \$1,329,023 in tools, machinery, and implements), employing 2,422 persons, paying \$1,098,418 for wages, \$268,214 for miscellaneous expenses, and \$3,523,840 for materials, and turning out products valued at \$5,682,748.

Finance.—The assessed valuations in 1893 aggregated \$36,032,840, and the total funded debt on Jan. 1, 1894, was \$1,040,200.

Banking.—In 1893 there were 39 national banks, with combined capital of \$2,510,000, individual deposits of \$3,354,464, and surplus and profits of \$708,838; and 135 State banks, with capital of \$1,987,053, deposits of \$3,480,688, and surplus of \$437,477. There were also over 50 private banks, which were not required to report their condition. The State banks were organized under two laws, the old ones under the general corporation law, and later ones under a new banking law, with more restrictions and safeguards.

Means of Communication.—Transportation to and within the State is provided by four great railway lines, the Chicago, Milwaukee and St. Paul, the Chicago and Northwestern, the Fremont, Elkhorn and Missouri Valley, and the Burlington and Missouri River, and by thirteen local and minor ones. The total mileage within the State in 1892 was 2,798, of which the greater part was operated by the four great lines in the order given. The State receives about \$500,000 annually from taxes on railway property.

Churches.—The census of 1890 gave the following statistics of the religious bodies having a membership of 1,000 or more each in the State:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic.....	177	169	25,720	\$246,020
Methodist Episcopal.....	254	248	11,371	375,290
Lutheran, United Norwegian.....	148	138	7,922	54,655
Presbyterian.....	138	142	5,164	200,665
German, General Council.....	100	97	4,770	40,125
Evangelical in the U. S. of America.....	124	125	4,413	156,940
Episcopal, Regular.....	83	85	3,856	227,175
Episcopal, Synodical Conference.....	71	35	3,097	20,770
Lutheran, Norwegian Evang.....	46	43	3,030	25,700
Methodist Episcopal.....	83	74	2,649	234,532
Lutheran, Hauge's Synod.....	36	36	2,239	11,700
Evangelical Association.....	74	74	1,628	20,450
Evangelical, in the U. S.....	16	14	1,000	11,750

Schools.—The act of Congress creating the State set apart 2,823,320 acres of land for the support of public schools, and both the act and the State constitution fixed the minimum price at which this land should be sold at \$10 per acre. More than 100,000 acres have been sold at an advance on the minimum price, and should the remainder fetch only \$10 per acre, the permanent school fund would amount to more than \$28,000,000. In 1892 there were in the State 87,317 children of school age, of whom 73,962 were enrolled in the public schools. There were 4,298 teachers, 3,253 public school buildings, 10 public high schools, 2 normal schools (at Madison and Spearfish), and public-school property valued at \$2,704,933. The institutions for advanced instruction include the University of South Dakota at Vermillion (opened in 1883); Dakota University at Mitchell (Methodist Episcopal, 1885); Pierre University at East Pierre (Presbyterian, 1883); Sioux Falls University at Sioux Falls (Baptist, 1883); Scotland Academy at Scotland (Presbyterian, 1876); Augustana College at Canton (Lutheran, 1884); Redfield College at Redfield (Congregational, 1887); All Saints' School at Sioux Falls (Protestant Episcopal, 1886); Black Hills College at Hot Springs; Academy of the Sacred Heart at Yankton (Roman Catholic); Yankton College at Yankton (Congregational, 1882); Ward Academy at La Roche (Congregational); and the Wessington Springs Seminary (Free Methodist). There are also a State Agricultural College with an experiment station near Brookings and a State School of Mines at Rapid City.

Libraries.—According to a U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, South Dakota had 11 libraries, containing 23,366 bound volumes and 8,230 pamphlets. The libraries were classified as follows: General, 3; college, 5; scientific, 1; garrison, 1; and society, 1.

Post-offices and Periodicals.—In Jan., 1895, there were 667 post-offices, of which 41 were presidential (8 second-class, 33 third-class) and 626 fourth-class. There were 211 money-order offices and 21 limited money-order offices. The newspapers and periodicals in 1894 comprised 16 daily, 1 semi-weekly, 224 weekly, 1 semi-monthly, 18 monthly, and 1 bi-monthly publications—total, 261.

Charitable, Reformatory, and Penal Institutions.—These include a State School for Deaf Mutes at Sioux Falls; a Hospital for the Insane at Yankton; a Soldiers' Home at Hot Springs; a Reform School at Plankinton; and a State Penitentiary at South Falls; and the Legislature has authorized an additional hospital for the insane at Redfield and a school for the blind at Gary.

Political Organization.—The constitution vests the legislative authority in a Legislature consisting of a Senate and House of Representatives, which in 1895 had 43 and 83 members respectively. The Legislature meets biennially and sessions are limited to sixty days. It is prohibited from enacting private or special laws for granting divorces; changing the names of persons or places; constituting one person the heir-at-law of another; locating or changing county-seats; regulating county and township affairs; granting to an individual, association, or corporation any special or exclusive privilege; or authorizing any game of chance, lottery, or gift enterprise. The executive authority is vested in a Governor elected for two years. There is also a Lieutenant-Governor chosen in the same way and for the same term as the Governor. The Governor may disapprove of any separate item or items in a bill. Bills may be passed over his veto by a two-thirds vote of both houses, and those not returned by him within three days of reception become laws. The Governor is assisted in the discharge of his duties by a secretary of State, auditor, treasurer, superintendent of public instruction, commissioner of school and public lands, and an attorney-general, all elected for terms of two years. The judicial authority is vested in a Supreme Court, circuit courts, county courts, and justices of the peace, and such other courts as may be created for cities and incorporated towns. The constitution contains a "bill of rights," guaranteeing that the right to worship God according to the dictates of conscience shall never be infringed; that no person shall be denied any civil or political right on account of his religious opinions; that no person shall be compelled to attend or support any ministry or place of worship against his consent; and that no money or other property of the State shall be given for any religious or sectarian purpose. The voting privilege is extended to every male person who is a citizen of the U. S. or an alien who has declared his intention of becoming a citizen, who has resided in the U. S. one

year, in the State six months, in the county thirty days, and in the precinct ten days, next preceding any election, provided he is not under guardianship, insane, an idiot, or an unpardoned person convicted of treason or felony. Women with the foregoing qualifications may vote at any election held solely for school purposes. A modification of the Australian ballot law is in force. The constitution authorized the enactment of a State prohibition law. The Legislature passed one in 1891. It was immediately contested, and a county court declared it unconstitutional, but on an appeal in 1893 the Supreme Court affirmed its validity.

History.—The early history of the State is identical with that of NORTH DAKOTA (*q. v.*). In 1890–91 the Indian Messiah craze among the Sioux led to grave apprehensions, the intervention of U. S. troops, and the death of Sitting Bull, a great Sioux chief; in 1893 the Yankton Sioux Indians signed an agreement with U. S. commissioners to cede to the U. S. a large part of their reservation between the Choteau and Missouri rivers; and in 1893 the Legislature passed acts to promote irrigation, to prohibit the introduction into the State of armed bodies of police or detectives, and to create a number of State commissioners.

GOVERNORS OF SOUTH DAKOTA.

Arthur C. Mellette 1889–93
Charles H. Sheldon 1893–

AUTHORITIES.—Child, *South Dakota: Resources, People, Statehood* (1888); Beadle, *Dakota* (1889); Hagerty, *The State of South Dakota: Statistical, Historical, and Political Abstract* (Aberdeen, 1889). WILLIAM H. H. BEADLE.

South Dakota, University of: an institution located at Vermillion by the first territorial legislature (1862), and first known as University of Dakota, but not opened by the Territory until 1883. The city and county opened an independent school in the court-house in 1882, to which they applied the original name, University of Dakota, and erected one building, which was, with the school, accepted as the territorial university by the Legislature in 1883, when the first appropriation was made. The name was changed to University of South Dakota in 1891. It has one brick and two large stone buildings, a 20-acre campus, and 86,000 acres of land. There is a College of Arts and Sciences, with four bachelor and four master courses; colleges of music and business; military and preparatory departments. It has three laboratories and a museum on the "typical" plan. The faculty consists of the president, twelve professors, and three assistants. The students number 275. J. W. MAUCK.

South Deerfield, Mass.: See DEERFIELD.

Southern Confederacy: See CONFEDERATE STATES.

Southern Crown: See CORONA AUSTRALIS.

Southern-wood: a plant. See ARTEMISIA.

Southey, CAROLINE ANNE (Bowles): poet; b. at Lymington, Hants, England, Dec. 6, 1787. At an early age she wrote for *Blackwood's Magazine* and other periodicals. In 1820 a collection of her pieces was made, which speedily won for her a place in the world of letters. In 1839 she became the second wife of Robert Southey. *The Pauper's Deathbed* is, perhaps, the best known of her poems, which were prevailingly of a moral, religious, and domestic character. Her published works are *Ellen Fitz-Arthur*, a poem (1820); *The Widow's Tale, and other Poems* (1822); *Solitary Hours*, prose and verse (1826); *Chapters on Churchyards* (1829); *The Birthday*, a poem (1836); *Tales of the Factories*, in verse; and *Robin Hood*, a fragment of a poem begun jointly by herself and her husband, to which were added other fragments by both (1847). D. at Lymington, July 20, 1854. See *Southey's Correspondence with Caroline Bowles*, by Dowden (1881). Revised by H. A. BEERS.

Southey, ROBERT: author; b. at Bristol, England, Aug. 12, 1774, the son of a linen-draper. Early left an orphan, he was cared for by an uncle; received his early education at Westminster School; in 1793 entered Baliol College, Oxford, with the design of taking holy orders, but, becoming unsettled in his religious and political views, left Oxford after two years, and entered upon a career of authorship in verse and prose, his first published work being a small volume of poems (1794). In 1795 he married Edith Fricker, whose sister soon after became the wife of Coleridge; set out with his uncle for Portugal; published an account of his six months' residence (1797); was made secretary to the Chancellor of the Exchequer for Ireland, a sinecure with a

salary of £350; resigned the position, and in 1804 settled for life at Keswick in the lake country. From this time his life is mainly the history of his numerous writings in almost every department of literature. In early manhood he had imbibed strong radical ideas; proposed, in conjunction with Coleridge and Lovel, to set up a socialist community or "pantisocracy" on the banks of the Susquehanna; and wrote a drama, *Wat Tyler* (printed in 1793, but first published in 1817, without his consent), which was denounced in the House of Commons as seditious. In the course of years he went over to the opposite extreme of conservatism in Church and state, and became considered the exponent of high Tory opinions. He was named poet-laureate in 1813. In 1807 he received a Government pension of £160 a year, increased to £460 in 1835. His wife, who had for several years been hopelessly insane, died in 1837, and two years afterward he married Caroline Bowles. (See SOUTHEY, CAROLINE ANNE.) But Southey's own faculties had begun to give way, and on the day when he brought his wife to their home he fell into a state of mental prostration which soon grew into complete imbecility, that continued to his death, on Mar. 21, 1843. Southey's principal poems are *Joan of Arc* (1795); *Thalaba the Destroyer*, an Arabian tale (1801); *Madoc*, founded on legends of early Welsh voyages to America (1805); *The Curse of Kehama*, based upon Hindu mythology (1810); *Roderick, the Last of the Goths*, founded on Spanish history (1814); *A Vision of Judgment*, an apotheosis of George III. (1821); and *A Tale of Paraguay* (1825). Among his numerous prose works are *History of Brazil* (1810–19); *Life of Nelson* (1813); *Life of John Wesley* (1820); *History of the Peninsular War* (1820–32); *Book of the Church* (1824); *Sir Thomas More, or Colloquies on Society* (1829); *Life of John Bunyan* (1830); and *The Doctor* (1834–37). He also contributed largely to *The Quarterly Review* for many years. His poetical works were collected by himself (10 vols., 1837), and have been several times republished in different forms. His *Life and Correspondence*, edited by his son, Rev. C. C. Southey, appeared in 1849, and a selection from his *Commonplace Book*, by his son-in-law, Rev. J. W. Warter, in 1856. Southey was one of the most indefatigable and voluminous of English authors, his published works in verse and prose numbering over 100 titles. His reputation as a poet, imposing in his own lifetime, has steadily declined. His poetry is commonplace, without inspiration, spontaneity, or charm of style. A few of his less ambitious pieces, such as *My Library*, *The Holly Tree*, and *The Battle of Blenheim*, keep a place in popular remembrance. Of his prose writings the lives of Nelson and Wesley are among the best, and indeed are among the best standard biographies in the language. His whimsical and mystifying book *The Doctor* is a favorite with many readers. The worth of Southey's character, his wide learning and incessant productivity, his dignified social standing, and his intimate association with Wordsworth and Coleridge, men of a higher genius than his own, still make him an important figure in English literary history. Revised by H. A. BEERS.

South Framingham: village; Framingham town, Middlesex co., Mass.; on the Boston and Albany and the N. Y., N. H. and Hart. railways; 21 miles W. by S. of Boston, and 23 miles E. of Worcester (for location, see map of Massachusetts, ref. 2–G). It contains 8 churches, a national bank with capital of \$100,000, 2 saving-banks, and 3 weekly newspapers, and is principally engaged in the manufacture of straw goods, woolens, shoes, paper, and rubber goods. Pop. (1890) not separately reported.

Southgate, HORATIO, D. D.: clergyman and author; b. at Portland, Me., July 5, 1812; graduated at Bowdoin College 1832, and at Andover Theological Seminary 1835; took orders in the Protestant Episcopal Church 1836; traveled as a missionary in the East; was chosen missionary bishop of Constantinople 1844; resigned his charge in 1850 and returned to the U. S. the following year, in which he became rector of St. Mark's, Portland, of the Church of the Advent, Boston, 1852, of Zion church, New York, 1850–72, and of St. Thomas church, Ravenswood, L. I., 1882. The episcopate of California was tendered to him by a convention of clergy and laity, but the plan miscarried. D. Apr. 11, 1894. He was the author of *A Tour through Armenia, Kurdistan, Persia, and Mesopotamia* (New York, 2 vols., 1840); *A Visit to the Syrian Church of Mesopotamia* (New York, 1844); *The War in the East* (1855); and *Parochial Sermons* (1859). Revised by W. S. PERRY.

South Georgia: a group of uninhabited islands, generally considered, to lat. 54° 30' S., lon. 30°-32° W., nearly 900 miles E. by S. of the Falkland islands, of which they are a dependency. Area about 1,000 sq. miles. They were first discovered in 1833.

South Hadley: town (incorporated in 1733); Hampshire co., Mass.; on the Connecticut river, which here has a fall of 30 feet, and near the Boston and Me. and the N. Y., N. H. and Hary. railways; 4 miles S. E. of Northampton and 14 miles N. of Springfield (for location, see map of Massachusetts, ref. 8-15). It is the seat of Mount Holyoke College, one of the oldest collegiate institutions for women in the U. S., and contains the villages of South Hadley and South Hadley Falls; a high school, 21 public schools, 5 churches, and saw-mill, and saw mills. In 1894 it had an assessed valuation of nearly \$2,000,000. Pop. (1890) 2,529; (1896) 3,261. HARRISON R. HANSEN.

Southington: town (incorporated in 1779); Hartford co., Conn.; on the N. Y., S. H. and Hary. Railroad; 24 miles N. of New Haven (for location, see map of Connecticut, ref. 9-11). It has manufactories of gunnery and carriage hardware, harness supplies, pocket cutlery, wood screws, and casing and floor plates, and contains the Lewis High School, a national bank with capital of \$100,000, a savings-bank, and a weekly newspaper. In 1894 it had an assessed valuation of over \$2,000,000. Pop. (1890) 5,411; (1896) 5,501. WILLIAM J. HOLLIES, editor of "Pulsis."

South McAlester: town; Choctaw Nation, Ind. Terr.; on the Choctaw, Okl. and Gulf Railroad; 64 miles W. of Winter Junction (for location, see map of Indian Territory, ref. 4-7). It is in a rich coal-mining region, and contains a private bank and three weekly newspapers; and in 1895 was made the headquarters of the part of the U. S. Geological Survey detailed under act of Congress to make a survey of the territory preparatory to its being opened to general settlement. Pop. (1894) estimated, 2,500.

South Manchester: village; Manchester town, Hartford co., Conn.; on the N. Y. and New England Railroad; 9 miles E. of Hartford (for location, see map of Connecticut, ref. 8-1). It is noted for its extensive manufactories of silk and paper, and contains a public library (founded in 1879) and a weekly and a monthly periodical. Pop. (1890) not separately reported.

South Norwalk: city; Fairfield co., Conn.; on Long Island Sound, the Norwalk river, and the N. Y., N. H. and Hary., and the Shesung, Litch and N. railways; 33 miles E. W. of New Haven, and 42 miles N. E. of New York (for location, see map of Connecticut, ref. 13-D). The city has a fine harbor and an excellent harbor. The surface begins to rise within the city limits and in the western suburbs reaches an altitude of 160 feet above sea-level, affording choice locations for residences, with extensive views of the Sound and harbor. Steam freight-boats ply between the city and New York all the year and passenger boats during the summer season. The city contains a public high school, 2 opera-houses, 2 electric railways, a public library (founded in 1877), 7 national banks with combined capital of \$200,000, a savings-bank, and a daily newspaper. The chief industries are the manufacture of hats, vests, shoes, hosiery, bronze goods, fire-pumps, steam-engines, machinery, air-compressors, stone and earthenware, and paper boxes; ship and boat building; and the cultivation of oysters. Pop. (1880) 8,736; (1890) not separately reported; (1895) 6,152.

EDITOR OF "EVENING SENTINEL."

South Omaha, Neb.: see OMAHA.

South Orange: village and township; Essex co., N. J.; on the Rahway river, and the Del., Lack. and West, and the Newark and S. Orange electric railways; 15 miles W. of New York and 5 miles N. W. of Newark, the county-seat (for location, see map of New Jersey, ref. 2-D). It is pleasantly located on the Orange Mountains, has many fine residences, particularly of New York business men, and contains a new town hall (completed in 1895), Seton Hall College (Roman Catholic, opened in 1856), a Roman Catholic parochial school, 3 public and 3 private schools, a public library, and a weekly newspaper. Valhalla, formerly a part of South Orange township, between South Orange and Newark, was incorporated as a borough in 1894. Pop. of South Orange (1890) 2,178; (1896) 3,106; (1895) estimated, 5,000. EDITOR OF "BULLETIN."

Southport: town; in Lancashire, England; at the mouth of the Ribblesdale estuary; 18 miles E. of Liverpool (see map of

England, ref. 7-K). Southport from being a sandy waste has rapidly developed into a popular watering-place. It has an esplanade 2 miles long, a pier (1,465 yards), a pavilion and winter gardens, a public library and art gallery, a market-hall (1891), schools of science and art (1897), besides large baths, hotels, etc. Pop. (1891) 43,000.

South Sea Bubble: a financial speculation which arose in England about the same time as Law's Mississippi Scheme in France. The South Sea Company was established by Lord Treasurer Harley in 1711 with the design of providing for the extinction of the public debt, then amounting to about £10,000,000. The debt was assumed by a number of merchants, under an engagement of the Government to pay 6 per cent. interest for a certain period, covering this sum by holding permanent certain import duties. The Government further granted the purchasers of the fund a monopoly of the trade to the South Sea or the coast of Spanish America, and the company was organized under the name of the South Sea Company. Though the South Sea trade yielded no great profit, the company flourished from the prevailing delusion with regard to the riches of Spanish America, and business as well established as to tie with the Bank of England in controlling the finances of the country. In 1720 the company assumed the entire debt of over £20,000,000, bearing interest of 5 per cent. The ministers intended to give the South Sea Company a good bargain, but when the plan was proposed in the House of Commons that body voted to open the scheme for competition to the Bank of England also. The company was thus compelled to offer £7,500,000 for its privilege. Notwithstanding this drawback the stock of the company was in great demand, making the extravagant expectation of profits from the American trade and the prevalent rage for speculation. It was increased by successive subscriptions, the price of shares rapidly rising till £1,000 was paid for a single share of £100. Other bubbles were started, such as schemes for a fishery of rocks, to make salt water fresh, to make oil from sun-flowers, to extract silver from lead, all with promises of enormous profits. For lack of other room the streets near Change Alley were filled with desks. The action of the South Sea Company itself in proceeding against some of these bubbles turned attention to its own affairs, and distrust arose, under which the stock rapidly declined. Confidence was further weakened when it became known that some of the directors had sold out. The news of the failure of Law's scheme and its consequences in Paris opened all eyes to the delusion, and as the year 1720 closed the bubble burst, bringing ruin to the company and to thousands of families.

Revised by P. M. CONAY.

South Shetland or New South Shetland Islands: an Antarctic Archipelago, directly S. of South America; between 61° and 63° 30' S. lat., consisting of Clarence, George First, Livingston, and Smith islands. Area about 850 sq. miles. The islands are mountainous, destitute of vegetation, in the interior covered with perpetual snow and ice, and rise out of very deep water. They were discovered in 1819, and are visited by whalers, but navigation is dangerous on account of the ice.

Revised by M. W. HARRISOTON.

Southwell: Rector: ecclesiastic and author; b. at Barcham St. Faith's, Norfolk, England, in 1599; educated in Paris and, it is said, also in the Roman Catholic seminary at Douay, France; became a Jesuit at Rome 1578; prefect or rector of the English Jesuits' college at Rome 1583; went as a missionary to England 1586; chaplain to Anne, Countess of Arundel, and secretly administered the rites of his Church to the English Roman Catholics; was thrown into the Tower July, 1592, on an accusation of complicity in a plot against Queen Elizabeth; was ten times subjected to torture, but made no confession beyond that of being a Jesuit and having exercised his priest's office; was condemned to death for constructive treason in refusing to take the oath of supremacy Feb. 22, 1595, and on the following day was hanged, drawn, and quartered at Tyburn, meeting his fate with firmness and composure. He was the author of several pieces of prose and verse published in London immediately after his death, among which were *The Triumph over Death* and *Epistles of Comfort to those Catholics who Lie under Persecution*. A complete edition of his *Poems* appeared in 1856 (London).

Revised by S. M. JACKSON.

Southwest Pass: See LAURENSBURG.

Southworth: COOPERAGE: colonist; b. at Leyden, Holland, in 1614, son of Edward Southworth, a merchant and

[Russian] does when they come into conflict with those passed by another? What shows conclusively that the States can not be said to have received an undivided sovereignty is that they expressly vested the right to punish treason—and reason against their separate power, lest treason against the U. S. Treason is an offense against sovereignty, and sovereignty must reside with the power [able] to punish it." See also article (Hauptmann, Hermann), LAW, MOVEMENT, NATION-STATE, HERRMANN, and TREASON.

Revised by T. S. WOODRUFF.

Sowerby, James, paleontologist and botanist; b. at Lambeth, London, May 31, 1737. Among his works are *English Botany*, containing colored figures of all the native plants of Great Britain, 388 vols., with descriptions by Sir James E. Sowerby, 1793-1807; supplement by his son, James De C. Sowerby, 4 vols., 1813-49; new ed. by J. T. R. Sowerby, 11 vols., 1903-15; *English Fungi or Mycetozoa*, with 440 colored figures of vols., 1797-1803; *British Mineralogy*, with 500 colored plates (6 vols., 1804-17); *Earth. Mineralogy*, with 329 colored plates (2 vols., 1811-17); and *Mineral Conchology of Great Britain*, with 993 plates (6 vols.; the last two by his son, J. De C. Sowerby, 1812-35). D. Oct. 25, 1822.

Sowing and sowing machines: the act or process of depositing seed in the ground, and the machines used for the purpose. When seeds are deposited singly or with only a few in a definite spot, the act is usually called *planting*, the sowing being restricted to cases where the seed is thrown broadcast or deposited in rows or drills. Sowing or planting is usually performed in the spring, but sometimes, and with some kinds of crops, in the autumn, so that the plants may have a fair start when the spring opens. The seeds are usually covered over by harrowing, brushing, or rolling the soil after they have been deposited. As a rule, it may be laid down that when the soil is rather firm and the climate moist, little depth of covering is required; but when the soil is loose and the climate dry, the seeds should be covered to a depth of twice or more than this thickness. Machines, more or less complex, have been found from time immemorial for performing the operation of sowing or planting in all its forms. Some scatter the seed broadcast, others diffuse it into the ground in rows or drills, and some cover it, the general principle being that the drills should be at such a distance apart that a furrow, drawing a light plow may pass between the drills without injuring the plants. In the larger machines, often drawn by horse-power, the seed is often placed in small cups, from which it issues through tubes so arranged as to allow them to drop regularly into shallow furrows cut by coulters just in front of the sowing-machine of the tubes, the furrows being closed up by a kind of rake or harrow following immediately after and forming a part of the machine. There are many kinds of sowing-machines and planters in use.

Revised by L. H. HANLEY.

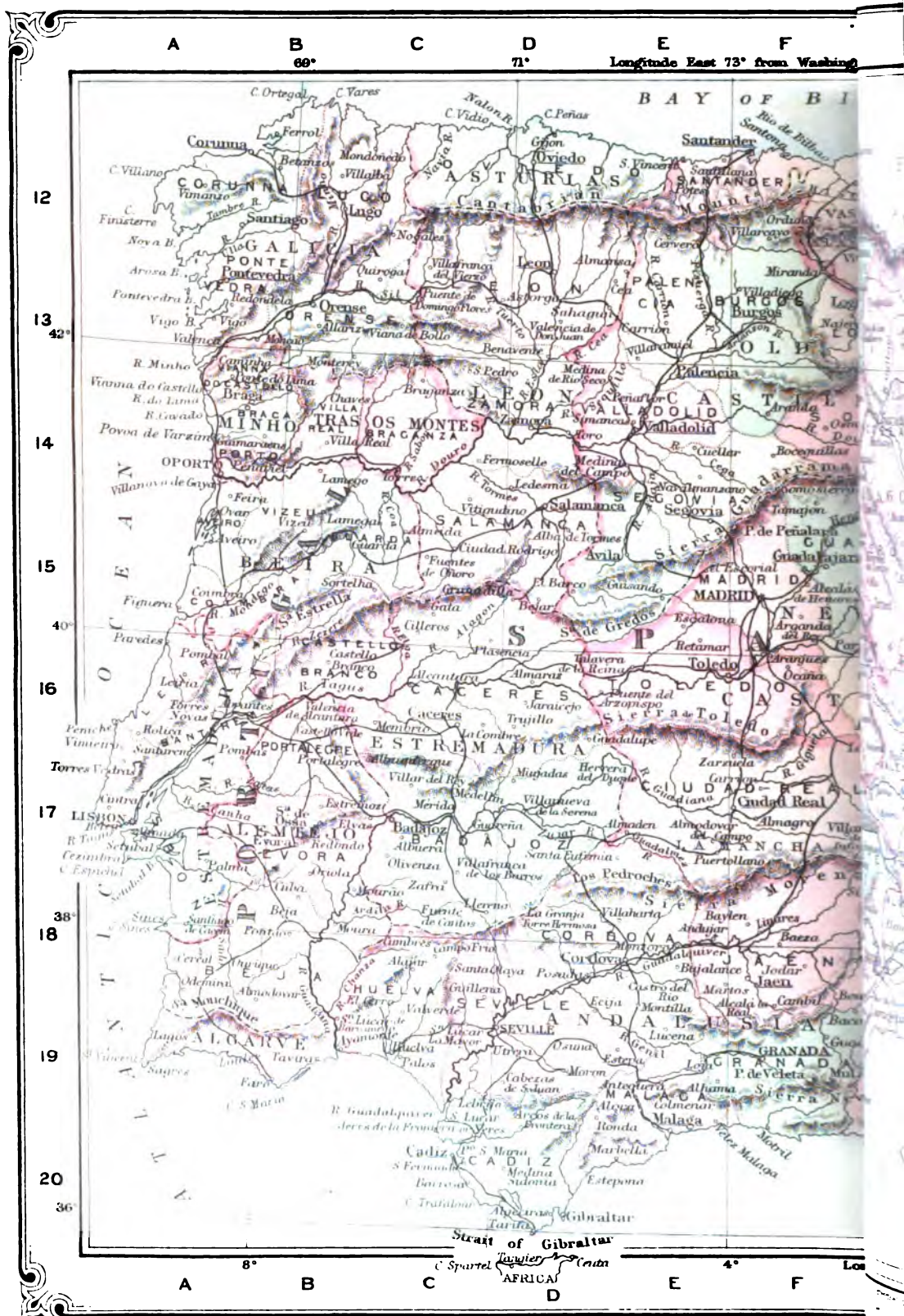
Soy bean, the *Melilot* (or *Soybean*), a bean extremely grown in Japan, China, India, and the Spice Islands, where it is much used as food. The same culture is in, some regions, made of boiled soy-beans, mixed with wheat, and fermented. It is then called and mixed with water, and after daily stirring for a long time the supernatant liquid is poured off and preserved for use. Good soy is a greenish and excellent sauce, and is believed to improve the soil. The plant is coming into notice in the southern parts of the U. S. for forage. Revised by L. H. HANLEY.

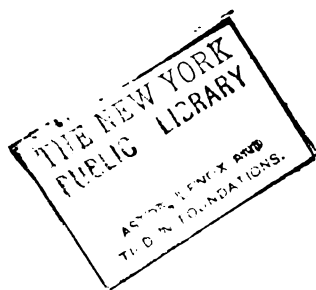
Soyer, Jean-Louis, Atlix: cook and author of books on cookery; b. at Marseilles, France, 1800; served as cook in several restaurants in Paris; went to London in 1820; was cook in the Reform Club in that city 1827-39; during the war in the Crimea voluntarily visited the British camps and suggested to introduce a better system of cookery for the soldiers. He published *Culinary Requisites* (1843); *Culinary Requisites* (1847); 2d ed., 1861; *Modern Cookery* (1867); new ed., 1877; *Modern Cookery* (1887); *Culinary Campaign* (1887); and other works. D. Aug. 1, 1890.

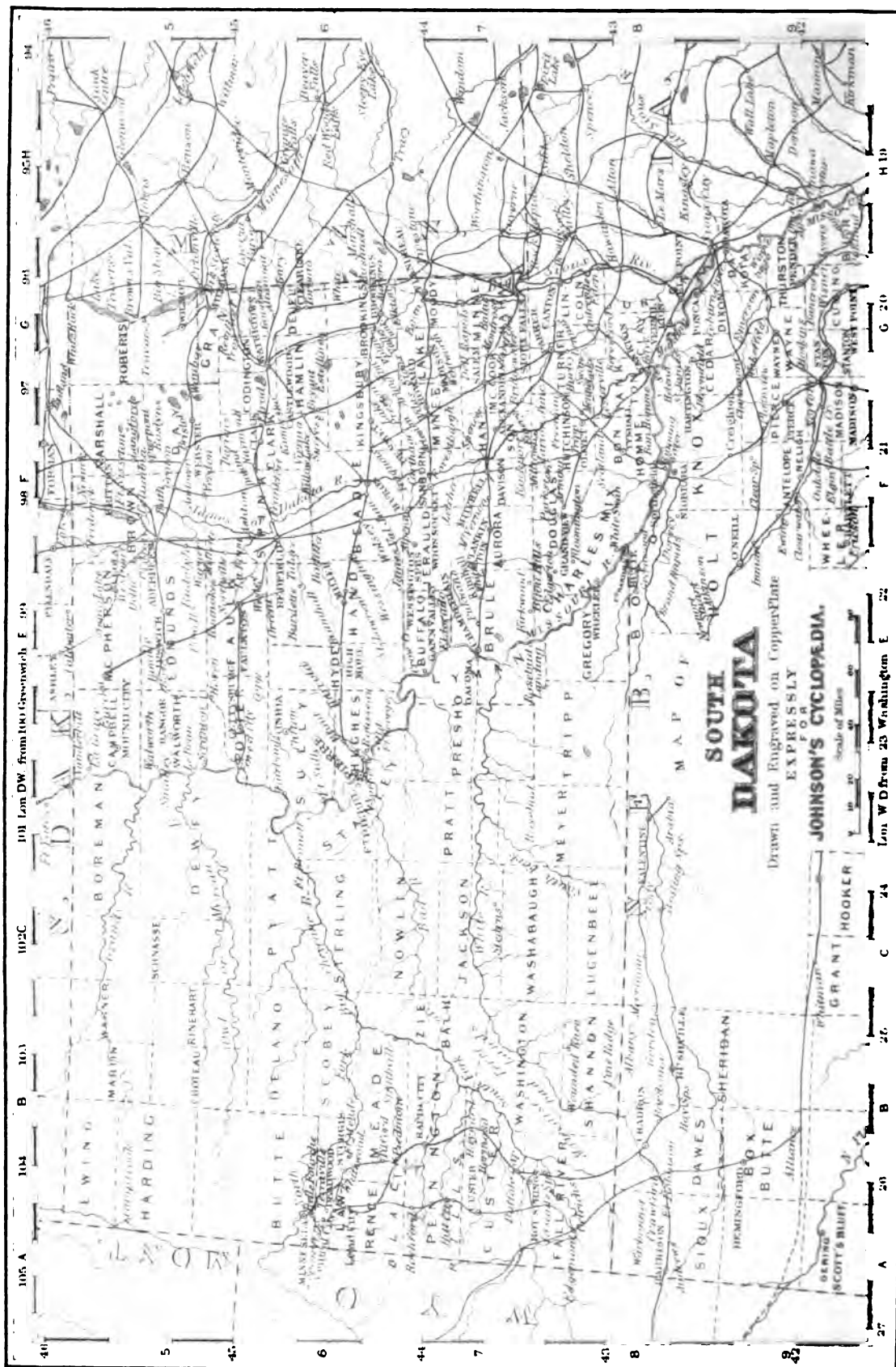
Space, 181 D. Pn from Lat. *spatium*, room, space; interv. in *spatium* (interv. as defined by Aristotle (*Phys.* iv, 1-3), "the first and unmeasured limit which bounds body" when the body is in motion or place; taken as space in general, it is the unmeasured limit of whatever is moved"—i. e. of all things. Time, on the other hand, should be, according to Aristotle, the measure and measure of movement. The existence of continuous is evident, he says, from the fact that things

change place; yet in spite of its three dimensions it is not to be confounded with body, for in that case two bodies would coincide; it is not vague; there is no place in which space itself exists; nor does space grow with what grows. Matter and form are inseparable, but extension and limiting surface are separable; hence matter and form do not explain them, as was thought by Plato in the *Timæus*, where he makes space to be the primitive matter of the universe; it is not form, for space remains when the form is removed. In those distinctions Aristotle lays especial stress on the idea of unity, negation, difference in relation to body as essential to the definition of space. In philosophy there is scarcely any subject upon which there is more important diversity of opinion or more fruitless attempts at definition. The difference, however, is not really so great as it seems. Space has been made identical with pure extension, but this leaves no definition for time, which likewise involves extension. Leibniz made it "the order of things existing, as time is the order of things successive," so that if the totality of things could be moved, space, being their arrangement, would likewise be moved. It has been defined to be pure nothing, thus omitting its specialising attribute, but while "nothing" may be regarded as the potentiality of all of events and ideas as well as of bodies, space can be regarded only as the potentiality of bodies. It has been made an accident or attribute or relation inhering in bodies; but this would involve the absurdity that annihilation of bodies destroyed space. As the ultimate logical condition for the coexistence of bodies space is itself a correlate of time as regards motion and actually existing matters; time by itself being the ultimate logical condition of all extension. As ultimate logical condition it has quite frequently been identified with the infinite, or made to be a divine attribute. Sir Isaac Newton suggested that God for existing constitutes time and space. Samuel Clarke expanded this suggestion into a system of theology, and held a long discussion with Leibniz on the subject. Again to this view is that which makes space and time to be forms of mind when it thinks nature. Kant laid great stress on this, making space and time subjective forms of intuition and devoid of objective validity as regards "things in themselves." By this, however, he must not be understood to mean that they are subjective to the more individual mind, and to be removed validity as regards objects in nature and history; for Kant regards all nature and all history as necessarily conditioned in and through space and time. His doctrine, therefore, does not narrow or belittle space and time, but only magnifies and glorifies mind, which is thus shown to transcend the world and to be of an eternal nature.

Much later has been expended by sensualists on the problem of accounting for the origin of the idea of space. Locke thought that he could trace it to the series of touch and sight; most of his followers have adopted the same doctrine, making it a generalization from experience gained in the perception of bodies. Accordingly, they ignore in different ways the attributes of universality and necessity which are the distinctive characteristics of a *a priori* idea, and make unbroken custom or habit to be the explanation of the inability or impotence of the mind which we call its immutability. That geometry rests upon the *a priori* organization of space, as arithmetic and algebra rests upon a similar cognition of time, is not denied by them. But Kant saw and stated with great clearness the grounds for all transcendental or spiritual philosophy as involved in the question, "Are *a priori* synthetical judgments possible?" i. e. Can we construct the universal and necessary conditions of experience? The answer being affirmative, instancing mathematics, the next question is, "How are they possible?"—that is, What does this presuppose in regard to mind? Instead of deriving the idea of space from experience in regard to bodies, he saw that by no possibility could the mind conceive a body in the first instance without already having the idea of space. The mind uses the idea of space as an indispensable instrument in thinking the idea of a body. Moreover, space is not a generalized idea (discursive), inasmuch as it is not abstracted from spaces, but is thought as the logical condition of all possible spaces or bodies, and therefore as infinite from the first. (See refutation of Hamilton's doctrine of the inconceivability of infinite space in article on INFINITE.) Hegel enters in his view of space the doctrine of the Christian Mystics with that held by such thinkers as Newton and Clarke; making God's thinking and willing to be identical, he holds this self-knowledge to be a creation of the world—the making







were enfranchised, and a constitution was adopted in 1868, upon which the State was restored to the Union in June of that year. In 1870 the State Government fell into the hands of less more intelligent citizens.

Military History.—Three years after Bayle landed the Spaniards attacked the colony unsuccessfully. Cardenas's colony at Fort Royal was destroyed by them in 1696. In 1702 Don. Moore headed a costly and abortive expedition against St. Augustine, and four years after Gov. Johnson defeated a combined French and Spanish attack on Charleston. The Yamasee and Tuscarora Indians were defeated after a severe struggle. Carolinians accompanied Oglethorpe on his ill-starred campaign against Florida in 1733, and were compelled to repel a similar attack. Pirates infested neighboring waters, and Bennett and his crew were hanged in Charleston harbor 1718-19. Indians joined the British during the Revolution, but were driven from the State in 1777. The back country, having been settled by inland migration, had little communication with the coast. Lack of tribulation in the interior led to the formation of bands of regulators, who in time became involved with the court. The Revolutionary war renewed old feuds, and partisan warfare was desperate between the regulators or Whigs and the Sevilleites or Tories, who were finally crushed. In 1812 Gen. Hampton fought in the Northwest. During the Seminole war South Carolina sent many companies of troops to Florida. In the war with Mexico the Palmetto Regiment fought gallantly, and was the first to plant a banner on the walls of the Montezuma. In the war of 1861-65 South Carolina soldiers displayed great valor. At the time of Sherman's march every able-bodied white male between sixteen and sixty years of age was in service.

GOVERNORS OF SOUTH CAROLINA.

John Rutledge (term)	1775-78	John P. Richardson	1845-47
Thomas B. Yeamans (term)	1778-79	James H. Hammond	1847-48
John Pickens (governor)	1779-82	William Aiken	1848-50
John Mathews	1782-85	David Johnson	1848-50
Benjamin Pickens	1785-86	W. R. Leake	1848-50
William Moultrie	1786-87	John H. Moultrie	1848-50
Thomas Pickens	1787-88	John L. Manning	1848-50
Charles Pickens	1788-90	James H. Adams	1848-50
Andrew Chamberlain	1792-94	Robert F. W. Aiken	1848-50
William Moultrie	1794-95	William H. Gil	1848-50
Charles Pickens	1795-96	Francis W. Pickens	1848-50
Edward Rutledge	1796-1800	Millidge L. Bonham	1848-50
John Telford	1800-02	A. G. Magrath	1848-50
James H. Richardson	1802-04	Ben. F. Perry (acting)	1848
Paul Hamilton	1804-06	James L. Orr	1848-50
Charles Pickens	1806-08	Robert K. Scott	1848-50
John Drayton	1808-10	Franklin J. Moses, Jr.	1848-50
Henry Middleton	1810-12	David H. Chamberlain	1848-50
Joseph Aiken	1812-14	Wm. Hamilton	1848-50
David H. Williams	1814-16	W. D. Simpson (acting)	1848-50
Andrew Pickens	1816-18	T. B. Jeter (acting)	1848
John Goodrich	1818-20	Johnson Haynes	1848-50
Thomas Bennett	1820-22	Hugh S. Thompson	1848-50
John L. Wilson	1822-24	John C. Sheppard (acting)	1848
Richard I. Manning	1824-26	John P. Richardson	1848-50
John Taylor	1826-28	Benj. R. Tilman	1848-50
Stephen H. Miller	1828-30	John Gary Evans	1848
Andrew Hamilton	1830-32		
Robert Y. Haynes	1832-34		
George McCall	1834-36		
Thomas M. Butler	1836-38		
Patrick Noble	1838-40		
D. C. Montgomery (acting)	1840		

AUTHORITIES.—Hammond, *Handbook of South Carolina* (Department of Agriculture, 1884); Rivers, *Historical Sketches* (in 1710); Ramsey, *History* (in 1808); Simms, *History*; Davidson, Weber, and Chapman, *School Histories*; Logan, *Upper South Carolina*; Gregg, *History of the Cherokee*; Carroll, *Calladonia*; Gibbs, *Documentary History*; Woods, *Warren*; Moultrie, *Memoirs*; Telford's *Campaigns and Memoirs*; Johnson, *Traditions of the Revolution*; and Mills, *Statistics*. The State has preserved a complete set of copies of all colonial records relating to the province, and has in the Secretary of State's office a complete MS. journal of the provincial parliament to 1776, besides other records of more recent date.

ROBERT MEANS DAVIS.

Southwell. JESSICA: religious enthusiast; b. at Abington, Devonshire, England, Apr. 1750; was a domestic servant at Emsay; joined the Methodist Church about 1769, and in 1782 announced herself as a prophetess, giving forth extraordinary series of revelations in ungrammatical prose and disjointed verse, e. g., *Effects of Faith* (1801), *True Exposition of the Bible* (1804), *The Book of Wisdom* (1810-14), *Prophecies announcing the Birth of the Prince of Peace* (1814), and many others, and obtained such success that in a few years her followers were numbered by thousands. She established herself at London; announced herself as the

woman spoken of in Rev. xii. as being driven into the wilderness, and 6,100 sealed packets in her followers, which were warranted to secure the salvation of the purchaser; and at last declared herself pregnant, and that she should give birth to "Shiloh" or "the Prince of Peace" at midnight on Oct. 10, 1814, but the occasion was marked only by the prophetess falling into a trance. She died in London, Dec. 21, 1814. A post-mortem examination showed that she had been suffering from dropsy. Four congregations of believers, comprising 188 persons, were reported in England by the census of 1851, a community was founded at Walslop in 1807, and they were not extinct in 1867. See Roberts, *Observations on the Divine Mission of Joanna Southwell* (1807); Richard Ross, *A Correct Statement of the Circumstances that attended the Last Illness and Death of Mrs. Southwell* (3 vols. 1815); D. Mathias, *The Case of Joanna Southwell* (1815), and *Joanna Southwell's Prophecies and Case stated* (1853). Revised by R. M. JAMES.

South Dakota: one of the U. S. of North America (North Central group). The twenty-seventh State admitted into the Union.

Location and Area.—The State lies a little N. of the center of the continent, on the middle section of the Missouri river, between lat. 43° 37' N., and 49° 29' N. (extreme south-east point); W. of the Missouri the boundary is 40° N., and between lat. 90° 20' (extreme west point) and about 104° 03' W. of Greenwich—the west boundary is 27° W. of Washington. It is bounded on the N. by North Dakota, E. by Minnesota and Iowa, S. by Nebraska, and W. by Wyoming and Montana; extreme length from E. to W., 696 miles; extreme breadth N. to S., 240 miles; area, 76,700 sq. miles, excluding the rivers (Missouri and Big Sioux) and lakes (Big Stone and Traverse) which form part of the boundary of the State; those portions of these properly belonging to South Dakota have an area of about 115 sq. miles.

Physical Features.—The Missouri river divides the State into two nearly equal portions. Except a very limited area at the northeast corner, the southeast part is lowest, and all the State slopes and all the streams flow in that direction. That part E. of the Missouri river is generally smooth and gently rolling in surface, rising into hills in a small area in the northeast part and in the central part near the Missouri where are the Westington Hills and Rose Heights. W. of the Missouri the country rises more rapidly and culminates in the Black Hills, an elevation in elliptical form about 100 by 60 miles in extent, the central point of which is Harney's Peak, with an elevation of 9,790 feet. The western half is more rolling and broken, but has a large part of smooth lands. The Bad Lands (French, *Nascentes Terres*), near the head of White river and extending into Nebraska, are a striking feature, with cañons, depressions, walls, and masses of white earth, a desert region rich in soil-making elements and abounding in highly interesting fossils. The gently sloping lands of the eastern portion, and the intervals and parks of the Black Hills and the valleys near them, are the most fertile soils. The river-bottoms are very rich and fertile, while the more rolling or hilly lands are dry and less productive. The Big Sioux river flows S. near the east border, and forms the boundary for 75 miles. Its current is somewhat swift, and there are rapids falling 110 feet at Sioux Falls. The Dakota (or James) river, 90 miles W., is a sluggish stream 200 to 400 feet lower than the Big Sioux. The surface rises westward from this stream, which is thus at the bottom of a wide trough or valley, and follows what was the preglacial course of the Missouri, the latter stream forming its new



Great Seal of South Dakota.

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limestone, in Andalusia, are very important; copper is worked in many places, principally in the N. of Huéscar; alumina has been taken out at Almadén from the time of the Romans; and rock-salt, marble, plaster, mineral fertilizers, and coal offer large resources. In 1898 the production of copper was 4,994,416 tons, valued at nearly \$4,000,000; the value of the coal was about twice as much, and of argentiferous lead about \$3,200,000. Of the copper ore, over 90 per cent. was exported, chiefly to Great Britain. In 1894 over 15,000 mines were registered, of which about 2,000 were worked.

The wealth of Spain in mineral and thermal springs is even more unique than her wealth in minerals. In 1765 Bedoya enumerated 2,000 such springs; in 1844 the number of such springs actually used by the sick surpassed 1,200, while in France the number was 804. These springs are generally at the foot of the Pyrenees and of the Sierra Nevada. Guipúzcoa, the smallest of the provinces, has the largest number, 84 springs, of which 35 have accommodations for bathing; next is Granada, with 63 springs and 25 baths; then Malaga, with 36 springs and 63 baths.

Of the lands, 50 per cent. is classed as productive, and of this 84 per cent. is devoted to agriculture, 21 to fruits, 30 to meadows, 4 to vineyards, and 2 to olives. The great variations in altitudes permit the productions to range through those of the sub-tropical and temperate zones. The cereals are abundant and of excellent quality. The leading crops are wheat, rye, barley, maize, rice, esparto, flax, hemp, and pulses. The product of wine is very large and highly valued; it is the chief item of export; value in 1895, 110,119,728 pesetas (\$69,033,045). Raisins, almonds, oranges, olive oil, and conserves are also exported in great quantities. Cork is chiefly furnished by Spain, though the cork-tree grows in Southwestern Europe and Northern Africa. The exported Spanish product in 1899 was valued at over \$5,000,000. Pastoral pursuits occupy the peasantry of the interior, and the Spanish flocks of sheep, cattle, and horses are all celebrated for excellence. The wool export in 1892 was valued at \$1,000,000, and that of hides and skins at \$5,000,000.

Commerce.—The imports of merchandise in 1894 were valued at 644,564,970 pesetas (\$166,964,966) and the exports at 630,631,332 pesetas (\$155,356,306), and the imports of the previous metals at 26,042,000 pesetas (\$5,208,409) and exports at 270,000 pesetas (\$2,653,900). The imports are chiefly wheat, cotton, raw or manufactured, coal and coke, drugs and chemicals, sugar, machinery, tobacco, and woolen goods. The chief exports were wine, minerals and ores, cork, hides and skins, cotton, textiles, fruits, oil, and wool. The trade is chiefly with France, Great Britain, the U. S., and the colonies. The merchant navy consisted in 1894 of 302 steamers and 368 sailing vessels of over 100 tons. In 1893 14,159 vessels entered and 16,059 cleared from the Spanish ports, and about half carried the Spanish flag.

In 1894 there were 6,703 miles of railway open, all of private ownership. In the same year there were 15,248 miles of telegraph line, with 41,141 miles of wire.

The unit of money is the *peseta*, of the value of a franc, or about 30 cents. The gold coins in common use are worth 5, 10, and 20 pesetas, and the silver coins 1 and 5 pesetas. Weight and measure are those of the corresponding French coins. The ratio of gold to silver is 15½ to 1, and the 5-peseta silver piece is legal tender. The metric system was introduced in 1839, but the old weights and measures are still largely used. The *libro* is 1,014 li. avoirdupois, and the *quintal* = 100 libras. The *arroba* = 3½ imperial gal. for wine or 2½ gal. for oil, and the *fanega* = 1½ imperial bush.

Administration.—Spain is a monarchy, under the constitution of 1876. The legislative power is vested in a parliamentary body called the Cortes, consisting of a Senate and a Congress. The senators in part hold life positions by inheritance or *ex officio*, in part are nominated by the crown, and in part elected, and together number not more than 360. The Congress has 401 elected deputies. All are elected for five years, or until the Cortes are dissolved by the crown. The ministry is responsible, and consists of nine members. The local governments are generally representative.

For the fiscal year 1899-00 the total revenue was 507,338,172 pesetas (\$114,470,634) and expenditures 754,444,090 pesetas (\$150,898,936). The revenue is derived from direct and indirect taxation, stamp-duties, monopolies, and income of public property. The monopolies are the tobacco-trade, the lottery, the mint, and others. The public debt of all kinds on Jan. 1, 1899, exceeded 7,129,000,000 pesetas (\$1,425,800,000), and the principal item in the public expenditure is the payment of the interest charges.

Spain possesses about fifty fortified places, mostly ports, but Gibraltar, which controls the Straits, is in the hands of the British. The permanent army consists of 115,733 men, and this force can be increased to 1,000,000 in case of war. In the Philippines there are 6,870 troops: in Cuba, 21,000; in Porto Rico, 3,400. There are 13 military schools and colleges. Spain has 1 battleship of the first class, 2 port-defense ships, 9 first-class cruisers, 6 second class, 46 third class, and 60 torpedo-boats, making 97 in all. The navy is manned by 14,000 seamen, 9,000 marines, and 1,000 officers, including engineer officers. The army and navy are recruited by conscription. See ARMY and NAVY OF WAR.

For administrative purposes the Canary islands are considered a part of Spain, and Rio de Oro and Azores are governed by the province of Canarias. Cuba sends deputies to the Cortes. Porto Rico was declared a province of Spain in 1870. The Philippine islands are controlled by a governor-general.

Demographics.—The forty-nine provinces of Spain, including the Canary islands, with population of each, according to a revision of the census of 1857, are as follows:

Province.	Pop.	Province.	Pop.
Alava.....	46,917	León.....	19,460
Alicante.....	246,100	Lugo.....	48,100
Albacete.....	232,500	Madrid.....	1,028,844
Almería.....	279,482	Malaga.....	378,677
Ávila.....	163,400	Murcia.....	491,030
Balearas.....	491,506	Navarra.....	769,152
Barcelona.....	612,000	Orense.....	406,127
Burgos.....	945,000	Oviedo.....	555,439
Caceres.....	234,551	Palencia.....	198,040
Cadix.....	239,730	Pontevedra.....	440,585
Cantabria.....	168,872	Salamanca.....	314,473
Castile de la Mancha.....	592,437	San Sebastian.....	344,274
Castile de Leon.....	592,437	Segovia.....	154,143
Cataluña.....	592,437	Sevilla.....	344,873
Córdoba.....	437,728	Soria.....	171,539
Cuenca.....	612,401	Tarazona.....	246,279
Ciudad Real.....	242,430	Terracina.....	241,805
Granada.....	370,750	Torrelavega.....	250,000
Huesca.....	444,000	Valencia.....	738,979
Guadalajara.....	301,574	Valladolid.....	367,745
Guipúzcoa.....	187,830	Vizcaya.....	250,600
Illes Balears.....	254,877	Zamora.....	270,077
Jaca.....	270,157	Zaragoza.....	416,195
Jenova.....	407,842	N. and W. coast of Africa.....	5,389
León.....	381,000		
Lerida.....	260,417	Total.....	17,508,022

Population.—The native tribes of the Peninsula known to the Romans may be called Iberian. The present population consists of Iberians, modified successively by intermixture with Celts, Carthaginians, Romans, Goths, Jews, and Moors. With the last came some Negro blood, and to the slight intermixture of this blood is probably due the well-known Spanish and Portuguese capacity for tropical colonization. At the same time from Spain has poured out an enormous wave of migration, which has left its mark on the most of America and several oceanic archipelagoes, and this has had its reaction on purity of Spanish blood. Yet notwithstanding these numerous intermixtures, each lasting through centuries, the people are among the most characteristic, self-contained, and sharply defined of Europe. The linguistic type evolved is essentially Roman, but the ethnic includes the Portuguese, and is clearly distinct from the rest of Europe. The Spaniard, somewhat swarthy, is well-balanced as to virtues and vices, rigorous, original, serious, proud, dignified, courteous, tenacious, patriotic, thrifty, sometimes vain, bigoted, intolerant, and vindictive. In the Roman conquest Spaniards were found gallant and warlike, and when overcome they made the most faithful and conservative of the Roman provinces. They formed a fertile and easy field for early Christian missionary effort, and having accepted the Roman supremacy and Christianity they were tenacious of them, and for the next 1,000 years were chiefly occupied in defending themselves and their religion. With the discovery of America this race displayed to the world its amazing supply of courage, enterprise, and endurance, as well as its indifference to the sufferings of inferior races.

The growth of the population has been slow. Philip II. took a census (imperfect as compared with modern ones) in 1594, giving 8,206,701 inhabitants; in 1797 another census gave 10,268,160—a very small increase in two centuries, due to enormous emigration. The increase during 1877-87 was at the rate of .47 per cent. per annum. The density of population is over 88 per square mile, and decreases from east to center. The females are in surplus of 104 to 100. The principal cities are Madrid (pop. 470,288), Barcelona (272,481), Valencia (170,765), Seville (143,182), and Malaga (104,016), and there are no other cities with a population over 100,000.

In 1889 4,854,742 persons were following agricultural pursuits, 823,310 the arts and trades, 409,549 domestic service, 243,867 industrial (textile and mineral), 194,755 commercial, 115,764 merchant marine, 97,257 public employees, 91,226 were inmates of asylums, etc., 84,510 professional, 72,077 religious, and 1,719,955 were school and college pupils. In 1892 the surplus of emigration over immigration was 8,258. Emigration is chiefly to Brazil, Uruguay, and Argentina.

The national church is the Roman Catholic, and the only professed dissenters in 1887 were 9,645 rationalists, 6,654 Protestants, 402 Jews, and 510 of other religions. In 1884 there were 32,435 priests, 1,684 monks resident in 161 monastic houses, and 14,592 nuns in 1,027 convents. There were 65 cathedrals, 18,564 churches, 30 religious colleges, and 11,202 other buildings used for religious purposes. Since 1876 private Protestant worship has been permitted.

In 1860 only 20 per cent. of the population could read and write; in 1889 this percentage had grown to 28.5. Compulsory primary education is statutory, but is not enforced. In 1885 there were 24,529 public free primary schools and 5,576 private ones, with a total enrollment of 1,843,183 pupils. The secondary schools are less efficient. There are 10 universities with 16,000 students in all; also various special schools supported by the Government.

History.—The colonization of the coasts of the Peninsula by the Phœnicians (Cadiz), Greeks (Saguntum), and Carthaginians (Cartagena) began about 1100 B.C. The Carthaginians extended their conquest over about a half of the Peninsula in the third century B.C. This was inherited by the Romans as the result of the Punic wars, and the conquest was completed 19 B.C. The Spanish provinces were very thoroughly Romanized. The Gothic invasion was begun in the fifth century of our era, but the Gothic kingdom was overthrown by the Arabs in 711, who remained in control of most of the Peninsula for three centuries. Christian kingdoms were gradually established from the eleventh century until the marriage of Ferdinand V. of Aragon and Isabella of Castile united these kingdoms in 1479, and began a career of prosperity, which resulted in the conquest of the Moors and the discovery of America, and gave Spain the form and character which it yet bears. The marriage of Isabella's daughter Johanna with Philip I., son of the Emperor Maximilian, made Spain a part of the Hapsburg empire, with Germany, the Netherlands, Milan, Naples and Sicily, Sardinia, Burgundy, and the colonies, under Charles I. of Spain, V. of Germany (1516). The despotism of Charles was followed by the tyranny of the bigoted Philip II. (1556-98), who, with the aid of the Inquisition, undertook to root out Protestantism, and he with his no less despotic and intolerant successors succeeded in bringing to a close before the eighteenth century the brilliant period of Spanish history, which began with Ferdinand and Isabella. The line of Hapsburg princes closed with Charles II. (1665-1700). On his death followed the war of the Spanish succession (see Succession Wars), which resulted in placing a Bourbon prince on the throne, and with two brief interruptions this dynasty has since remained in power. The first interruption was in 1808-14, during which time Joseph was kept in power by his brother Napoleon. This was the period of the Peninsular war, in which successful resistance to the self-aggrandizing schemes of Napoleon was for the first time offered. Upon the dethronement of their king and the occupation of his throne by Joseph Bonaparte the entire Spanish people rose in arms, and, though ill disciplined and unorganized, showed such vigor and courage as to require the personal presence of Napoleon in Spain in order to restore the French authority. Subsequently, however, he left to his marshals the difficult task of subduing the Spaniards, whose persistent efforts, aided and directed by the military genius of Wellington, resulted in driving out the intruders and contributed to the final overthrow of Napoleon. (For an account of the causes of the Peninsular war, see NAPOLEON I. (*Spanish Campaign*), and for further details WELLINGTON, ARTHUR WELLESLEY, DUKE OF.) The second interruption of the Bourbon rule was from 1868 to 1874, during which years a regency, a short-lived monarchy under Amadeus, and a republic were successively established. The Bourbons were restored Dec. 30, 1874, in the person of Alfonso XII., eldest son of Isabella. He died in 1885, and was succeeded by his posthumous son, Alfonso XIII., with Maria Christina, his mother, as regent. The Government has since passed alternately from a conservative to a progressive ministry, and back, with gradual progress toward greater freedom and more elaborate constitutional rights.

REFERENCES.—Murray's *Handbook of Spain* (1888); Willkomm, *Die Pyrenäische Halbinsel* (1885); Gallenga, *Iberian Reminiscences* (1883); Riera y Sans, *España y sus Colonias* (1891).

MARK W. HARRINGTON.

Spal'ato, or Spalatro: town and railway station; in the province of Dalmatia, Austria; on a peninsula jutting out into the Adriatic (see map of Austria-Hungary, ref. 10-F). It has a good harbor, is defended by a citadel, and carries on an active trade in grain, cattle, horses, swine, fruits, wine, and rosoglio, besides an extensive transit trade between Italy and Turkey. It is situated near the ancient *Salona*, on the site of the famous palace of Diocletian, called *Salonæ Palatium*, or, in an abbreviated form, *S. Palatium*; hence the name of the modern town. Of the magnificent palace, which covered 8 acres of ground and which it took twelve years to build, many remains are extant. Pop. (1890) 15,697.

Revised by M. W. HARRINGTON.

Spalax: a small rodent (*Spalax typhlus*) having the habits and very much the appearance of a mole. The incisors are large, the molars, three on each side of either jaw, have roots. The external ears are rudimentary, as are also the eyes, which are covered by the skin; the tail is rudimentary; the fore feet modified for digging. The silky fur is of a general yellowish brown; the length is 5 or 6 inches. The animal is also known as the mole-rat. It ranges from Southeastern Europe into Asia.

F. A. L.

Spalding, JOHN FRANKLIN, D. D.: bishop; b. at Belgrade, Me., Aug. 25, 1828; graduated at the North Yarmouth Classical Academy, Maine, in 1849, at Bowdoin College, Maine, in 1853, and at the General Theological Seminary of the Protestant Episcopal Church, New York, in 1857; minister of St. James's church, Oldtown, Me., 1857-59; was rector of St. George's church, Lee, Mass., till 1860, when he became assistant minister of Grace church, Providence, R. I., for one year; rector of St. Paul's church, Erie, Pa., 1862-74; member of the general board of missions from 1865; dean of the Erie convocation Jan., 1866; member of the general convention 1868 and 1871; elected Oct. 24, 1873, by the House of Bishops missionary bishop of Colorado, with jurisdiction in Wyoming and New Mexico; consecrated bishop Dec. 31, 1873, and removed to Denver, Col., in Feb., 1874. He published *The Threefold Ministry* (1864), *Manual of Prayers* (1872), etc., and various articles, sermons, pamphlets, etc. Bishop Spalding has been for many years prominently connected with the movement to promote lay co-operation and women's work in the Church, deaconesses' institutions, and sisterhoods. He has also developed and placed on permanent foundations the educational work of the Church in Colorado, including, under the general charter of the College of St. John the Divine, Wolffe Hall for Girls, a school for boys, a theological training-school, etc.

Revised by W. S. PERRY.

Spalding, MARTIN JOHN, D. D.: bishop; b. in Marion co., Ky., May 23, 1810; graduated at St. Mary's College in 1826, and in 1830 went to Rome to enter the College of the Propaganda; returning to Kentucky, was ordained priest in 1834; appointed pastor of the cathedral church at Bardonia, and established *The Catholic Guardian*, with which he retained his connection until 1858; lectured in favor of Roman Catholicism in the U. S. and Canada, his lectures being published under the title *Evidences of Catholicity* (1847; 4th ed. 1866); in 1848 appointed coadjutor of the Roman Catholic diocese of Louisville; in 1850 became Bishop of Louisville, where he erected a cathedral. In 1864 he succeeded Dr. Kenrick as Archbishop of Baltimore; in 1866, as apostolic delegate, convened the second national council at Baltimore, and drew up the acts of the council. He took a prominent part in the Vatican Council of 1870-71, where he urged an immediate decision on the subject of papal infallibility, but wished it to be indirect and implied, rather than positive and affirmative; but he, with the other Roman Catholic bishops from America, yielded in favor of a positive declaration. His principal works are *Early Catholic Missions of Kentucky* (1844); *History of the Protestant Reformation in Germany and Switzerland*, written in opposition to Merle d'Aubigné (1860); and a translation, with notes and an introduction, of Darraz's *General History of the Catholic Church* (1866). His miscellaneous essays have also been published in book form. D. in Baltimore, Feb. 7, 1872.

Revised by J. J. KEANE.

Spallanza'ni, LAZARO: naturalist and physiologist; b. at Scandiano, duchy of Modena, Jan. 12, 1729; was ap-

joined Professor of Logic, Metaphysics, and Greek at Regensburg in 1704, and at Modena in 1706. At the re-establishment of the University of Pavia in 1708 he became Professor of Natural History, made extensive scientific travels in Italy and Sicily, Switzerland and Germany, Turkey, Asia Minor, Caria, and Cyprus. D. at Pavia, Feb. 12, 1760. His polemics against Needham and Buffon, whose theory of spontaneous generation among the infusoria he contested, attracted special attention, showing by a series of ingenious experiments that these animals originated from germs existing in the atmosphere. Among his works are *Vaggio alle Due Sicilie ed in alcune parti degli Appennini* (Pavia, 1732); *Opuscoli di fisica animale e vegetabile* (Modena, 1780), in which he demonstrated the true nature of digestion; and *Esposizione pour servir à l'histoire de la génération des animaux et des plantes* (1780), in which he determined the relative functions of the ovum and spermatozoa.

R. A. ROMERO.

Spandau, *spān'dau*: an old fortified town and military arsenal, province of Brandenburg, Prussia, at the confluence of the Havel and the Spree; 9 miles W. N. W. of Berlin (see map of German Empire, ref. B-4). The shield stands on an island in the Havel and is used by the Prussian Government as a prison for military and political criminals. The city is well built, has manufactures of busby, wooden fabrics, gunpowder, and arms, and carries on a large transit trade between Berlin and Hamburg. Pop. (1890) 15,065.

Revised by M. W. HARRINGTON.

Spangenberg, August Gottlieb: bishop; b. at Klettenberg, Germany, July 15, 1704; graduated Ph. D. at Jena 1720; became a professor at the University of Halle and assistant superintendent of Franke's orphan-house in the same city 1731; was dismissed at the instigation of the Pietists of Halle because he associated with the Moravians, and had expressed the opinion that Pietistic religion was formal and worldly 1733; naturally on his dismissal he joined the Moravians and became assistant to Count Zinzendorf at Herrnhut. From 1733-62 his care was the superintendence and organization of their missionary operations. With this end he visited England 1734; obtained lands from the trustees of Georgia for a Moravian settlement in that colony; landed at Savannah with nine Moravian settlers, the first who landed in America, 1735; labored as a missionary among his German countrymen in Georgia and Pennsylvania 1735-39, after which he returned to Europe; was instrumental in procuring the establishment of the settlement at Bethlehem, Pa.; founded in London 1741 the first regular Moravian society in England; became general director, and in 1744 bishop, of his Church; proceeded to Pennsylvania the same year; repeatedly visited the Oneida Indians; made another visit to Europe 1749-51; organized a Moravian community in North Carolina 1761; was elected successor of Count Zinzendorf at the supreme council; returned finally to Europe 1762. For the next thirty years he was the guide of the Moravians in the consolidation of the home Church, and paid particular attention to their educational methods. He became in 1760 president of the general directory. D. at Herrnhut, near Herrnhut, Saxony, Sept. 18, 1792. Author of a *Life of Zinzendorf* (9 vols., Harby, 1773-75; shortened English trans., London, 1838, by B. La Trobe), and of *Idem Fidel Proferum* (1776; English trans., *Exposition of Christian Doctrine*, London, 1784; 2d ed. 1796), the authoritative manual of Moravian theology. See the biography by J. Dieter (Harby, 1794); C. F. Loderhose (Herrnhut, 1846; Eng. trans., London, 1855); and G. U. Knapp, *Beitrag zur Lebensgeschichte A. G. Spangenberg's* (Halle, 1884), edited by O. Frick. Revised by S. M. JACKSON.

Spangier's Bay: a fishing-town on the west side of Conception Bay; 7 miles S. of Harbor Grace, Newfoundland; is surrounded by high hills and has some fine views. The inhabitants are mostly engaged in the Labrador cod-fishery. Pop. 1,200.

Spaniards: see *Deas and Seamen*.

Spanish-American Literature: the literature of the Spanish-speaking peoples of America. This is of no recent growth. Early in the sixteenth century civilized communities were established in Cuba, Mexico, Peru, and at the mouth of the Plata; and numerous other localities were rapidly colonized. In succeeding centuries intellectual activity steadily increased; so that Spanish America has furnished a long list of eminent men of letters.

Literary culture was more distinctive of the Spanish colonist than of his northern and Asian brethren. While the natural implements of the latter were the axe, the plow, and the hammer, those of the former were the sword and the pen. Moreover, the British settlers of North America were political or religious reformers who received little attention or support from the home government; whereas the colonization of Spanish America was a national project, in the success of which the sympathies, ambitions, and funds of all classes were involved.

The cities of Mexico and Lima had universities half a century before Cape Cod was discovered; and when Smith had entered the Chesapeake; and when Harvard College was founded in 1636, Spanish America possessed sixteen flourishing universities and colleges, including the Universidad de San Vincente at Quito and the Universidad de Santa Tomás at Bogotá. Peru with its present shrunken boundaries has six universities and 600-odd colleges, and a national library which contained over 50,000 volumes before the war with Chile in 1882, and now numbers about 35,000; Venezuela has two great universities and six smaller ones, together with fifty-four colleges and other higher institutions of learning; the library of the University of Caracas numbers 30,000 volumes. Spanish America produces many extensive and erudite works of history, archaeology, jurisprudence, and natural sciences, and the most beautiful editions of the classics are to be found there. Educational books and works of direct utility are numerous, and descend to such trifling, gardening, cooking, carpentry, and bookbinding. An official catalogue shows thirty-seven native text-books in use in the Argentine schools. Spanish-American thoroughness sometimes tends toward prolixity, and voluminous works are not uncommon. The *Historia de Méjico*, by Nicolás de Zamacois, fills twenty native volumes; and the recent collaboration, *Méjico a través de los siglos*—historical and descriptive, from the conquest to the present day—is embellished with nearly 3,000 illustrations.

A great part of the pictorial and hieroglyphic writings of the native races were destroyed by the Spanish conquerors. Yet considerable fragments remain, such as the *Popol Vuh* and the Inca drama of *Ullucuy*, translated by Carrasco and others. A great amount of labor was expended, especially by the Jesuit fathers, on these relics and the languages to which they pertain. The *Históricas Méjico-antiquarias*, of Brasseur de Bourbourg (Paris, 1871), gives much minute information regarding what has been written on the subject in Spanish America.

Writers of the Colonial Period.—In the early part of the colonial period writers in Spanish America were generally visitors from the Old World. Yet occasionally there appeared American writers whose brilliancy was enhanced by their isolation. Ullá claims an epic poet prior to the seventeenth century in Pedro de Oña, the author of *El Arauco Canónico* (pub. 1595). Mexico had Juana Inés de la Cruz y Ramírez, or Sor Juana Inés de la Cruz (d. 1695). Bred in the viceregal court of Mexico, she dazzled equally by her beauty and her immense learning; then, disappointed in life, she retired to a convent. Contemporary with her was Carlos de Sigüenza y Góngora (d. 1700), also of Mexico, who was one of the most diligent and versatile writers of the age. His works on all subjects from astronomy to rural life would fill a catalogue.

The very interest that was felt in Spain for matters Spanish-American, and which tended as an incentive and a support to culture in the colonies, eventually acted as a detriment; for the literary decadence in Spain from the latter part of the sixteenth century to the beginning of the eighteenth, could not fail to be reflected in the New World. Still there was in such literary blank in the colonies as existed in Spain. The revival which came with the eighteenth century was quickly felt in America, but the initial movement was scientific rather than literary. A long list of eminent physicists and naturalists might be given, but the three most prominent must suffice. José Antonio Alzate y Ramírez (Mexico, d. 1796), besides being a writer of note, did a great deal indirectly for scientific progress by means of the *Gaceta de Literatura*, of which he was editor. In what is now Colombia, Francisco José de Caldas (1696-1770) and José Celestino Mutis (1732-1808) rendered lasting services to natural science. Their investigations were principally in the fields of botany, geology, and astronomy; but their descriptive writings are extremely interesting and entitle their names to honorable places in the literature of the New World. The most distinguished master of style of this

period was Pedro de Peralta y Barnuevo (1670-1748), the Peruvian jurist, historian, and poet. His best-known work is the epic *Lima fundada*.

Writers of the Nineteenth Century.—Poets.—The nineteenth century has naturally produced more eminent writers than all previous ages. Foremost of these is Andrés Bello (b. Venezuela, 1781; d. Chile, 1865), revered in South America for his vast and varied learning and for his labors as jurist, educator, and poet, and conceded even by Spanish critics to be one of the greatest masters of Castilian that the nineteenth century has produced. His georgic *La agricultura en la zona tórrida* is especially admirable both for the beauty of its language and sentiment, and for its faithful descriptions of rural scenes and life in South America.

Spanish-American poetry and fiction, as might be expected, treat principally of three themes—the exploits of the early Spanish conquerors, the struggles of the colonies for independence, and the phases of life peculiar to a new country—which impart to the literature a unique and distinctive local coloring. Moreover, a number of poems and romances are founded on Indian legends, or tell of Indian life and customs, after the manner of Cooper and Longfellow. Two of the best of these are the *Paine* and *Relmú* of the Argentine publicist Estanislao S. Zeballos, who combines every form of literary activity. The earliest work of Juan León Mena (Ecuador, b. 1833) was an Indian epic which earned for him the title of Poet of the Indians. The *Huincahual* of the Chilean Alberto del Solar is one of the most powerful productions of this class. The dialect sketches of Estanislao del Campo, descriptive of the gauchos and life on the pampas, are especially quaint and entertaining. Nearly all the contemporaries of the struggles for independence were inspired by the patriotic deeds of America's heroes, but no one gave them more fitting expression than did the "American Pindar," José Joaquín Olmedo (Ecuador, d. 1857), a classicist of the purest type. His *Canto a Junín* is an epic ode without equal in the language. Some of the patriotic poems of Numa Pompilio Llona, of Peru, are especially fine; and the sonnet to Bolívar by the Peruvian Adolfo García is one of the most beautiful compositions of its kind. The best poetic productions based upon the days of the conquerors are *La grandeza de Méjico* of Bishop Valbuena (d. 1635); the beautiful epic *Gonzalo de Oyón*, by Julio Arboleda (Colombia, d. 1862); and Peralta's *Lima fundada* (already mentioned).

The Spanish language lends itself so readily to versification, especially when assonance is accepted instead of rhyme, that it may almost be assumed that every writer, not a scientific specialist, is also a poet. Juan León Mena published in 1868 a critical history of the poets of Ecuador, at a time when few were aware that that country had ever possessed any. Cuba has, of all Spanish-American countries, produced relatively the largest number of lyric poets. Gertrudis Gómez de Avellaneda, the greatest poetess of the language, was a native of Cuba; and persons of the lowest condition break forth in song. There the slave Juan Francisco Manzano (fl. 1890) won his freedom by his pen. Gabriel de la Concepción Valdés, another humble Negro, the author of *Siempre viva*, won laurels under the pseudonym of Plácido. Ramón Vélaz Herrera's tragedy of *Napoleón en Berlín*, the *Pasionarias* of Rafael M. Mendive, and the *Margaritas* of the unfortunate Francisco J. Blanchié may also be mentioned. Some of the odes of the Cuban José María Heredia, in particular *Al Niágara*, *A la noche*, *Al sol*, and *Versos escritos en una tempestad*, compare well with the best of Coleridge and Bryant. Turning to the continent one finds vigorous descriptive work in *La cena de Baltasar*, by Manuel Carpio (Mexico, d. 1860). In *La salida del sol*, by his compatriot Ignacio M. Altamirano, is description of a more placid kind. Altamirano is also the author of one of the best recent novels, *Clemencia*. The poems of Arnaldo Márquez and Clemente Althaus, of Peru, take very high rank for their beauty and tenderness of sentiment as well as purity of style. The *Noche de dolor en las montañas* and the *Canto de la vida* of the Peruvian Numa Pompilio Llona are compositions which will be admired for centuries. The *Flores del aire* of Dr. Adán Quiroga, of Argentina, is a collection of poems of great merit and originality. Compositions of remarkable beauty will be found in the *Brisas del mar* of the Peruvian Manuel Nicolás Corpancho, the *Lágrimas y recuerdos* of Doña Silveria Espinosa de Rendón, of Colombia, and the *Flores silvestres* of Francisco Javier de Acha, of Uruguay. José Batrés y Montúfar, of Guatemala, a lyric poet of merit, is one of the most noted satirists of

America. Matías Córdoba and García Goyena, of Guatemala, have been justly compared as fabulists to Æsop and La Fontaine.

Novelists and Dramatists.—The novels most widely known are the *Amalia* of José Mármol (Argentina); the *Maria* of Jorge Isaacs (Colombia); *La linterna mágica* of José T. de Cuellar (Mexico); *Alberto el jugador*, by Doña Rosario Orrego de Uribe (Chile); the historical novel *El Padre Orant*, by Narciso Aréstegui (Peru); and the sparkling romance of the Colombian Julio Arboleda, entitled *Casimiro el montañés*. The Mexican historian Orozco y Berra wrote a beautiful novel, *Escenas de treinta años*, relating the experiences of an unfortunate, disappointed invalid. Among the most powerful recent novels are the *Libro extraño* of Dr. Francisco Sicardi, of Argentina, and *Centra la marea*, by the Chilean Alberto del Solar.

Among noted dramatists of the century have been, in Mexico, Rodríguez Galván, author of the first national drama, Fernando Calderón, and Manuel E. Gorostiza, author of *Independencia para todos* and *Contigo pan y cebollas*; in Peru, Manuel Nicolás Corpancho and Manuel A. Segura; in Uruguay, Francisco J. Acha.

Two fine specimens of prose word-painting deserve mention here, namely, the description of the Falls of Tequendama, by the Colombian botanist Fran. Antonio Zea (1770-1822), and Simón Bolívar's *Delirio sobre el Chimborazo*.

Historians and Geographers.—Spanish America has been especially prolific of historians and writers of descriptive geographical works. The names of some of the most famous of these, with their principal works, are as follows: Rafael María Baralt (d. 1860), *Resumen de la historia antigua y moderna de Venezuela*; Lucas Alamán (d. 1853), *Historia de Méjico*, 5 vols.; José Manuel Restrepo, *Historia de la revolución de Colombia* (1827); José Antonio de Plaza, *Historia de la Nueva Granada*; Joaquín Acosta (d. 1852), *Viajes á las regiones ecuatoriales*; Manuel Orozco y Berra (d. 1885), *Historia antigua y de la conquista de Méjico* (4 vols.); Antonio García Cubas, *Diccionario geográfico, histórico y biográfico de los E.E. U.U. Mexicanos* (5 vols.); Manuel José Cortés, *Ensayo sobre la historia de Bolívar* (1861); Antonio de Alcedo (Ecuador, d. 1812), *Diccionario geográfico histórico de las Indias occidentales* (5 vols.); Miguel Lobo, *Historia general de las antiguas colonias hispano-americanas*; Pío Benigno Mesa, *Anales del Cuzco*; Miguel Luis and Gregorio Victor Amunátegui, *Los precursores de la independencia de Chile* (1872); Diego Barros Arana, *Historia de la independencia de Chile* (1870); Bartolomé Mitre, *Historia de Belgrano y de la independencia argentina* (3 vols.) and *Historia de San Martín y de la emancipación sud-americana* (4 vols.). Special mention should be given to Antonio Raimondi's great descriptive work, *El Perú*, which was cut short by the author's death in 1890, only four volumes and a part of the atlas having been published, and to the *Historia Argentina* of Mariano A. Pelliza, now in preparation, the fourth volume having been published in 1894.

AUTHORITIES.—*Lira Americana*, by R. Palma (Paris, 1865); *América Política* and the *Diccionario Biográfico Americano*, by Domingo Cortés (Paris, 1875); Francisco Largomaggiore, *América Literaria* (Buenos Ayres, 1883); Francisco Pimentel, *Historia crítica de la literatura y de las ciencias en Méjico*; J. M. Torres Caicedo, *Ensayos históricos y de crítica literaria sobre los principales publicistas y literatos de la América Latina*; Marcelino Menéndez y Pelayo, *Antología de poetas hispano-americanos* (3 vols., already published; Madrid, 1893-94); *Bocetos literarios de escritores argentinos*, by Martín García Merou (Buenos Ayres, 1892). García Merou's *Confidencias literarias* (1894), although treating principally of Argentine writers, devotes considerable space to the leading authors of other Spanish-American countries. MARATHON MONTROSE RAMSEY.

Spanish Armada: See ARMADA, THE SPANISH.

Spanish Fly: See CANTHARIS.

Spanish Fork: city (founded in 1851); Utah co., Utah: on the Spanish Fork river, and the Rio Grande W. and the Union Pac. railways; 12 miles S. by E. of Provo (for location, see map of Utah, ref. 4-M). It is a trading-point for a large agricultural region, and contains Lutheran, Mormon, and Presbyterian churches, ten public and denominational schools, an incorporated bank with capital of \$25,000, and a weekly newspaper. The battle of Diamond Creek was fought here on June 20, 1866. Pop. (1880) 2,304; (1890) 2,214; (1895) 3,576. EDITOR OF "SEN."

Spanish Grams: another name for *Esqueros* (q. v.).

Spanish Language: the national language of Spain and also of some other countries where it has been carried by colonists from Spain; as Mexico and the rest of Spanish America is called. In Spain itself certain regions are not properly included in the territory of the Spanish language; thus the dialect of Galicia belongs rather to Portuguese, and there is a small territory in the north where the language is Basque (see *Basques*), while Catalan is spoken in Catalonia, Valencia, and the Balearic islands. The dialect-forms of Spanish spoken in various parts of Spain have not yet been fully investigated, and the variations and peculiarities of American Spanish are not further study, though something has been done in this direction. (See the references below.) No exact approximate statement of the number of those whose native tongue is Spanish in some form or other is possible; for Spain itself estimates vary from less than 11,000,000 to 14,000,000.

The sounds of the standard or literary language may be approximately described as follows: There are five vowels only, *a, e, i, u, o*; *e* and *i* being intermediate between the close and open sounds of these letters in Italian, for instance. There are twenty-three (or twenty-four) consonants: *p, b* (written *b* and even *v*, *f*, *v* is bilabial *v*, written *b* or *v*); *t* is only as a result of elision that *b* and *v* are distinguished as written, so in consonantal *b*, written *b*, *v*, *t* of the last two more dental than in English), a voiceless spirant like *th* in English *there* (written *t*, or before *e* or *i*, *s*), sometimes even *d* in the singular, a voiced spirant like *th* in English *there* (written *d*, *z*, *z* two forms of *z*, one strongly bilabial (written *z*, *rr*), the other (written *z*) and *ss*, *s* more "refined" or "dental" than in English, *s* palatalized *z*, merely like *th* in English *outflow* (written *th*), a palatalized *s*, nearly like *ss* in English *union* (written *ss*), *y* (two forms of *y* are recognized by Araujo, one a consonantal *y*, written *y*, the other more like German *j*, written *j*); *k, g* (these two varying somewhat in sound according to the following vowel: written *x, g, m*, before *e* or *i*, *g* and *g* respectively), an aspiration resembling *sh* in German *sch* (written *j*, or, before *e* or *i*, sometimes *ch*), a voiced spirant (the voiced form of the German sound just mentioned, written *g*), and the sound of *ng* in English *long*, *ang* (written *ñ*). The voiced sound of *g*, namely *g*, occurs occasionally, but is not commonly recognized. An important consonant group is that written *ch*, with the sound of *ch* in English *church*. Noteworthy is the almost total lack of doubled consonants in Spanish words. The orthography, as regulated by the Academy, is a fairly good representation of the spoken language.

The pronunciation of modern Spanish is not the same as that of the older language, in which some sibilant sounds existed which have been lost. Thus *x* formerly had in popular words the sound it has in Portuguese, or that of *sh* in English *she* or French *sh*, but this has become the aspiration written *j* in *yo*; compare *Quixote*, formerly *Quixote*, with the French form *Quixote*, or English *sherry*, that is, wine of Xeres (now written *Jerez*). An initial *h*, now silent, often stands for older *f*.

The grammatical structure of the language is very similar to that of the other Romance languages. Certain peculiarities, especially of the neuter form (*lo*) of the article with adjectives, are noteworthy; *so, too*, are the frequent use of a proposition (*de*, "to") before the direct object of a verb, the distinction between the two words *ser* and *estar*, "to be," and that between *haber* and *tener*, "to have." The verb-tenses formed without the aid of separate auxiliary words are the same as in French, with the addition of a second conditional (also used as an imperfect subjunctive, and found in old Spanish in its original sense as a pluperfect indicative), and of a future subjunctive. Among the sources of the Spanish vocabulary, besides Latin, Greek, and old Germanic dialects (which, should be noticed especially the Arabic.

As in the case of the other Romance languages, there is no sharp line of division to be drawn between vulgar Latin and early Spanish, the latter being the vulgar Latin of Spain whose characteristics are so characteristic enough to have a new name. Traces of this vulgar speech are to be found in Latin documents as early as the eighth century, but distinctly Spanish facts are not preserved to us from an earlier time than the twelfth century. A Latin-Spanish dictionary (*Vocabulario vocabularum in latin y in romance*) by Palencia belongs to the year 1490, and in 1492 came the lexicon (*Latin-Spanish* and *Spanish-Latin*) and the grammar of *Isidoro* (Lectorius, Nabrius). Among the most noteworthy

early grammatical or lexicographical works are *Adreus, Del origen de la lengua castellana* (1598), and the etymological dictionary of Sebastian de Covarrubias Orozco (*Thesoro de la lengua castellana o española*, 1611). The Spanish Academy, established in 1713, published a *Diccionario de la lengua castellana*, 6 vols. (1726-39), condensed into one volume in 1780 (1825 ed. of this condensed form 1864). The Academy published in 1741 an *Orthographia española*, and in 1771 the first edition of the grammar. An outline of the historical grammar of the language is given by Rasis in Gröber's *Grundriss der romanischen Philologie*, 1. (1899), where many other references are given.

Additional references: V. Salvá, *Nuevo diccionario de la lengua castellana* (7th ed. 1864); R. J. Dominguez, *Diccionario manual o gran diccionario clásico de la lengua española*, 2 vols. (18th ed. 1897); Buxio, *Proceso diccionario general etimológico de la lengua española*, 6 vols. (1891-93); M. Valojos de la Cueva, *Primerísimo Diccionario de la Española and English Languages* (1892 and since); Villanar, *Nuevo diccionario español-alemán y alemán-español*, 2 vols. (1898-99); Morúa, *Diccionario etimológico de la lengua castellana* (2d ed. 1901); R. J. Cuervo, *Diccionario de sintaxis y régimen de la lengua castellana*, 1. A-B (1894); C-D (1894); Daz and Engelmann, *Glossaire des mots espagnols et portugais dérivés de l'arabe* (2d ed. 1869); *Gramática de la lengua castellana por la real Academia española* (new ed. 1830); A. Rold and R. J. Cuervo, *Gramática de la lengua castellana* (1873); P. Fournier, *Spanish-Spanish* (1880); W. J. Kuiper, *Grammar of the Modern Spanish Language* (1882 and since); M. M. Ramsey, *Textbook of Modern Spanish* (1894); A. Keller, *Historische Grammatik der Spanischen Sprache* (1894); F. Araujo, *Estudios de fonética hispanica* (1894); see also his articles in *Phonetische Studien*, III, v. vii; P. Wulf, *Un chapitre de phonétique, etc.*, in *Revue de sciences philologiques* (1901); M. G. Peris (1880); R. Lenz, *Chilische Studien, in Phonetische Studien*, v. 272 ff., vi. 18 ff., 161 ff., 274 ff.; ed., *Beiträge zur Kenntnis des Amerikanspanischen*, 1. in *Festschrift für romanische Philologie*, xvi, 199 ff., and articles by Schuchardt, Hant, etc., in this and other periodicals; C. Michaëlis de Vasconcelos, *Romanische Wortschöpfung*, 1879; R. J. Cuervo, *Apontamientos críticos sobre el lenguaje hispanico* (4th ed. 1890); P. de Miquel, *Tratado castellano, manifiesto, variado, original* (L. 1902); ed., *Gramática del castellano antiguo* (L. 1901), etc. See also ROMANCE LITERATURE, R. N. SHERMAN.

Spanish Literature: the literary productions of Spain, or the compositions in the Spanish language, whether by Spaniards or Spanish Americans. The latter application seems the more appropriate, but its two divisions are considered separately; the present article is confined to productions of the Iberian Peninsula in the language known as Spanish or Castilian,* while the literature of Spanish America is treated in a separate article.

Several circumstances tended to stamp the Spanish character with a distinct individuality. Long a favored Roman province, permeated by the language, the literature, and the religion cultivated in the later empire, Spain learned to look to Italy for support and guidance material, intellectual, and spiritual. Eight hundred years of war against an alien race with an Asiatic tongue and an infidel religion produced in the Spaniard a devotion to country and king and mother Church nowhere else to be found. The wars with the Moors, being largely a matter of border forays, encouraged personal prowess and a spirit of romantic adventure. It thus came about that the literature of Spain had three great sources—love, war, and religion.

Ballads and Songs.—As in other countries, the earliest essays at composition were songs, and ballads or tales in verse. Their most usual and seemingly oldest form is in lines of eight syllables, not divided into stanzas, but matching lines 2 and 4, 6 and 8, etc. These did not rhyme, but were measured—an easy compromise between rhythm and blank verse thought to be native and peculiar to Spanish. The style of these old ballads is extremely diversified; their tone is by turns devout, plaintive, gay, lightly satirical, or intensely heroic, according to the author and his subject, but without the coarse ferocity of the songs of the north. They were a spontaneous growth, preserved only by memory, chanted to simple music in social gatherings or by strolling singers. The first attempt at a printed collection of such

* There remains nothing in this language of a date known to be earlier than A. D. 1150. The Moors had then been in possession of the largest and best part of Spain for nearly two years.

songs was the *Cancionero General*, published in 1511. A later and more valuable collection, the *Romancero General*, was completed in 1614. Over 1,000 pieces have thus been rescued from oblivion. Many of them cluster around centers, partly historical, but largely imaginary. Twenty are devoted to Charlemagne and his peers, 50 gather around the name of Bernardo del Carpio, and 200 are songs of the Cid.

Epic Poetry.—The earliest Spanish epic is the *Poema del Cid*, which relates the adventures, real and imaginary, of the early hero Rodrigo (or Ruy) Díaz de Vivar. Although his death occurred as early as 1099, no portion of the poem is older than the twelfth century. It is without beginning, date, or name of author, and contains 8,744 assonant lines of fourteen syllables, more or less, arranged in quatrains. In its execution it is one of the finest productions of the Middle Ages. See Cid.

It is at least 350 years from the supposed date of the *Poema del Cid* to the next great outburst of the epic Muse, in the reign of Philip II. In 1560 Sempere published the *Carolea*, to glorify the victories of Charles V. Five years later appeared the *Carlo Famoso*, wherein Luis de Zapata celebrates the achievements of the same monarch in 5,000 prosy octave stanzas. Alonso de Ercilla y Zúñiga, courtier, soldier, and poet (d. 1596), wrote an epic, one-third longer than the *Iliad*, on the suppression of the Araucan Indians of Chile, in which he bore an active part. Portions of the poem are of great beauty, and its merit elicited praise even from Voltaire. Gabriel Laso de la Vega published *La Mexicana* (1594) in honor of the conquest of Mexico by Cortés; and five years later Antonio de Saavedra issued a romantic life of the conqueror in his *Pelegrino Indiano*. About the same time Juan de Castellanos composed a rhyming chronicle of the conquests in South America in some 90,000 lines, a narrative that strongly attracted the attention of Humboldt and Southey; and Juan de la Cueva (1603) produced the *Bética*, on the recapture of Seville from the Moors, in imitation of Tasso's *Jerusalem Delivered*.

Romances.—Besides epics resting on Spanish history, there were others having either no basis of fact or only a very remote one. All Europe swarmed for many centuries with marvelous recitals that gave rise to the modern words *romance* and *romantic*. The Scriptures, the lives of the saints, Greek and Roman antiquity, the legends of Charlemagne and of King Arthur, afforded inexhaustible material that was handled with the utmost disregard of proprieties of time and place; and peerless knights, giants, necromancers, dragons, and fair ladies imprisoned in enchanted castles were furnished regardless of cost. The earliest Spanish romance was the *Alexandro* of Juan Lorenzo Segura, priest of Astorga, in the second half of the thirteenth century. By far the most important and popular work of this class was the *Amadis de Gaula* (see AMADIS OF GAUL), conjectured to have been written in Portuguese about 1360. It was followed by an extensive aftergrowth of romances and *caballeros* (books of chivalry and knight-errantry) that became ever more fantastic and insipid, until put down by the strong but gentle hand of Cervantes.

In the pastoral romances that supplanted them fancy was not at such a high tension. The earliest of these in Spain was the *Diana Enamorada* of Montemayor (d. 1561)—an imitation of the *Arcadia* of Sannazaro, the Neapolitan. Later appeared the *Filida* of Gálvez de Montalvo, the *Galatea* of Cervantes, and the *Arcadia* of Lope de Vega.

But romance was destined to seek a still lower level. Diego Hurtado de Mendoza (1503-75), a member of one of the noblest families of Spain, and almost equally distinguished as soldier, statesman, scholar, poet, historian, and writer of fiction, chose a strange subject for a romance. His hero, *Lazarillo de Tormes* (Little Lazarus, Luke xvi. 20), was an outcast from his birth, and the guide of a blind beggar. His genius and assiduity secure promotion, until he reaches the height of roguish ambition as a kind of king among thieves. This was followed in 1599 by Mateo Alemán's similar story of *Guzmán de Alfarache*; and in 1626 appeared the exploits of the *Gran Tacaño Pablo de Segovia*, into which the author, Quevedo, put some of his most brilliant work. This style of literature became and remained popular. It had a foundation in real life, however low, and was called "picaresque" from *pícaro*, rogue. The *pícaro* was an intelligent scoundrel, and had the genial humor of the South that made him almost lovable. Out of the three kinds of fiction named has been developed the modern novel.

Rise of the Drama.—While the remains of the Greek and Roman theater had become so debasing that the Church

exerted all its power to suppress them, the advantage was seen as early as the fifth century of presenting something to catch the eyes and attention of its less educated members. Representations of the stable, the temptation, Gethsemane, the judgment-hall, and Calvary were given by servants of the churches and school-children. Scriptural readings and choral hymns were added. Buffoons were gradually introduced, and the devil and his imps were given humiliating positions. In time the devils and the fools became the favorite characters, and the Church had unwittingly created a comic theater of its own. A feeble attempt to keep these exhibitions within bounds was made in the code of Alfonso X. (1260). Still they kept growing in number and complexity, until in the seventeenth century, in the hands of Calderón, they became great allegorical sermons. In the meantime the worst of them had been turned into the streets, where they continued to be presented to the multitude. In 1492 appeared *La Celestina*, a book which in the U. S. would be excluded from the mails. Its merit lay in presenting live men and women—even though at their worst—instead of the allegorical figures to which the public had been accustomed. It was never acted nor intended to be acted, yet it had an immense popularity and a powerful effect in developing the drama. More than thirty editions were made of the work, at least seven translations, and a swarm of imitations.

The next important step was made by Juan de la Encina, musician, poet, and priest, who (1496-98) brought out eleven pieces, which show little of the playwright in their construction, but were really acted; hence their author is recognized as the founder of the Spanish stage. Bartolomé de Torres Naharro (1517) composed eight comedies in easy verse, and gave a more regular form to the drama, dividing it into five acts (*jornadas*), and prescribing sound regulations for maintaining consistency and truth to nature. But he gave little heed to his own rules, introducing allegorical and impossible persons and incidents. About 1553 Francisco de Avendaño wrote several plays of three acts. Lope de Rueda (d. 1567), a gold-beater of Seville, who turned actor and dramatist, wrote sixteen plays, and first introduced interludes (*entremeses* and *pasos*) between the acts. Juan de la Cueva, a poet of Seville (1579), adapted the great historical romances to the stage, and introduced the division into four *jornadas*.*

Religious and Historical Works.—As might be expected, there were from a very early period pieces in prose and verse intended for edification. The *Life of Saint Mary of Egypt*, the *Adoration of the Three Holy Kings*, and the *Danza General*, or Dance of Death, are so old as to be without known date or author. Then follow at irregular intervals *Miracles of the Virgin*, by Gonzalo de Berceo (1246); the *Caballería Celestial* of Hierónimo de San Pedro (1554); the *Monserate* of Virués (1581); the *Redención Universal*—30,000 lines—by Fran. Hern. Blasco (1584); and Diego de Hojeda's *Christiada* (1611). The excessive fondness for allegory, prevailing when these poems were written, makes them seem irreverent to modern readers. In the *Caballería*, Christ and Lucifer, as Spanish knights, with their followers, maintain a war with varying success from Bethlehem to Calvary. The *Christiada* covers the period from the Last Supper to the crucifixion. The whole is connected and well sustained, but disfigured by the symbolism which was exuberant in the Middle Ages.

Alfonso X. of Castile (1252-84), surnamed *el Sabio*, the most enlightened prince of the age, has been called the father of Spanish prose, although his part must have been chiefly to foster and direct. To him are due a translation of the Scriptures, *Libros de Astronomía* (containing the famous Alfonsine Tables), a *Lapidario*, a *Crónica General* or Universal History, *La Crónica ó Historia de España* down to his own time, and a great compendium of law still known and respected as the *Siete Partidas*. Other chronicles were written by Fernán Pérez de Guzmán, Diego Enríquez and Alonso de Palencia, Ambrosio de Morales, and Gerónimo Zurita. Fernando del Pulgar and Andrés Bernaldés recorded the reign of Ferdinand and Isabella. But these old chronicles merely narrate a succession of occurrences without logical connection. The first real historical work is the *Historia de España* by the Jesuit Juan de Mariana (1601). In his time Spain produced a galaxy of eminent historians. Among the most prominent works may be mentioned the

* All this time the exhibitions were given in gardens, courtyards, or the public streets, without scenery or costumes. The first theater for the reception of the public was opened in 1748.

Guerra de Granada of Hernando de Mendoza (1603); the *Historia de las Indias* of Herrera, as well as that of Bartolomé de las Casas; Mendoza's *Relación de las Indias* (1605); Meléndez Valdés's *Guerra de Cataluña* (1645); and the magnificent work of Antonio Solís, the *Conquista de México*.

Lope's poetry, especially that of the highest order, was much indebted to Italian models. Lope López de Mendoza, Marquis of Santillana (d. 1459), had an extensive acquaintance with the literature of Provence and Italy, and was largely influenced by their masterpieces. Most of his writings were infused with the learned conceits of the court and the Italian school; yet when he stepped to the free air of the mountains, nothing could surpass the sweet grace of his songs. His *Sorrenilla*, or the *Millennium of Fingona*, is often given as a beautiful example, and may be found in *Second's Literature of the South of Europe*, II, 162. The epic cycle described the love and esteem of his country as much for his encouragement to men of letters as for his own productions. Juan de Mena (d. 1456), one of his disciples, was court historian to John II, and a sort of poet-laureate. After a follower of Italian models, he did much to improve the Castilian language by enlarging its vocabulary and perfecting literary style.

Garcilaso de la Vega (d. 1526), descended from the Cid, and Juan Boscán (d. 1540) were the introducers of blank verse, and in their time the pillars of the Italian school. Francisco Castellón (d. 1556), author of short poems, religious, pastoral, and satirical, opened the growing fashion with patriotic zeal. Two poets, Luis Ponce (Fr. Luis de León) and Fernando de Herrera (d. 1597), were lyric poets of the first rank. Fray Luis held ideas too advanced, and had to seek refuge in song from the consequent persecution. Herrera's principal poems were a triumphal ode on the battle of Lepanto and an elegy on the defeat and death of Sebastian of Portugal. Luis de Góngora (d. 1627) did so much to promote the growing pedantic style that it took the name of Góngorism. At first simple and natural, he became the most stilted writer of his day. His stanzas became so intricate and full of strange words and meanings, metaphors, and obscure allusions, that a lexicon of 1,500 pages was compiled as a key to them. His style was imitated in the translations, satires, and other short poems of Francisco Gómez de Quevedo (d. 1645).

The classic era—1550 to 1650 approximately—produced writers more numerous and more distinguished than any equal period before or immediately after. A fair idea of their numbers may be gained from the long lists given by Cervantes in his *Galatea* and *Vida de Cervantes*, and by Lope de Vega in his *Laurel de Apolo*.

Don Quixote de la Mancha (1605), the classic work of Miguel de Cervantes Saavedra (see CERVANTES-SAAVEDRA and NOVELS), marks the central point of the golden era, as it is often called. *El Quixote* (as the Spaniards call the work) was brought out in two parts, the second appearing in 1615. Cervantes also wrote twelve *Novelas Ejemplares* (model novels), *Vida de Cervantes*, and a number of plays, of which few were successful. Cervantes's work was better appreciated after his death, for it soon was considered the perfection of Spanish style. His writings had almost the effect of checking originality of expression, and for many centuries Spanish writers hesitated to say anything in a way not authorized by him. Gregorio García, in his *Fundamentos del vigor y elegancia de la lengua castellana* (1790) draws 65 per cent. of his examples from Cervantes.

Lope Félix de Vega Carpio, the contemporary of Cervantes and his junior by fifteen years, far surpassed him in popularity. He wrote 2,300 dramatic pieces, large and small, and an incredible number of other poems. His productions took every form of which poetry is capable—by turns solemn, severe, musing, and frivolous. Luis Vélez de Guevara (d. 1644), a disciple of Lope, was a favorite both with the court and with the public. Of his 400 plays a few of great power remain. Juan Pírrica de Montalbán (d. 1625), a follower and biographer of Lope, wrote about fifty dramatic pieces, of which his tragedy *Los amantes de Teruel* has remained longest in favor.

The excellent comedies of Gabriel Téllez (d. 1648), better known as Tiro de Molina, and Ruiz de Alarcón (d. 1639) are still admired. Pedro Calderón de la Barca (d. 1681) was one of the most prolific and admired writers of Spain, and, after Cervantes, the one best known abroad. Among the mass of matter that circulated under his name, he admitted 113 full dramas and seventy sacramental plays as genuine, his comedies being generally cast in high life, he made

much turn upon "the point of honor." He was the first to give prominence to the profession of the professional comedian, who needed to be a rogue and a wit. He and Lope controlled the theater ninety years.

Decline of Literature.—Toward the middle of the seventeenth century literary activity began to decline, and the period from 1650 to 1750 is almost a blank. The last youth of Spain had been drawn away to colonize America or wasted in fruitless foreign wars. The country was exhausted by insurrections, civil strife, and the War of Succession, while the censorship of the press by Church and state was fatal to all freedom of thought. Philip V., the first Bourbon king of Spain, coming fresh from the brilliant court of his grandfather Louis XIV., not about reviving the literary spirit, and in that end established (1714) the Royal Spanish Academy, after the model of that of France. But the influence of Philip and his court was essentially French, and the old Spanish literature had been too seriously blighted to revive rapidly, so that nothing of importance was effected during the forty-six years of Philip's reign except the inception of the Academy's dictionary. Benito Feijóo, a quiet, laborious monk, had heard of Galileo, Bacon, and Newton, and what the outside world was thinking of, and between 1726 and 1790 published thirteen volumes entitled *Teatro crítico* and *Cartas Eruditas*, which did much to advance the intellectual life of his time. Ignacio de Luzán (d. 1754), a disciple of Boileau and an advocate of the French doctrines, wrote an *Arte Poética* based on them. Padre Isla (d. 1781) wrote a satirical romance, *Fr. Gerundio*, which had an immense popularity, and translated the *Ill Blaz* of Le Sage into Spanish. Nicolás Fernández Moratín (d. 1780) was the author of a small volume of minor poems and two long narrative poems, one, entitled *Diana*, on the chase, and the other on the burning of the ships by Cortés. The last is the finest epic which Spain produced during the century. His *Hermetismo* was the first original drama, according to the principles of Corneille and Racine, admitted in the Spanish stage. José Cadalso (d. 1782) was the author of *Morales Letters* in imitation of Montaigne and Marivaux; also of a satire on the still favorite system of acquiring all knowledge by a few easy lessons. Tomás de Iriarte (d. 1791) issued a little volume exposing the prevailing faults and follies in eighty fables, written with great ingenuity and elegance in half as many kinds of verse. Literature began gradually to revive; and in 1780 the young poet Meléndez Valdés obtained a prize from the Spanish Academy for a most original and delightful eclogue. All his lyric and pastoral poems show a true poetic spirit. Ramón de la Cruz produced (1765-95) a number of clever, short farce-comedies, and Ignacio González Castille (d. 1800) left about thirty plays, all in a vein of light and graceful satire.

Literature of the Nineteenth Century.—From 1780 to 1874 foreign domination, invasion, civil war, and the rapid alteration of hostile parties maintained a state of continual unrest. Interests of Spain, of France, and of Great Britain, claims of royal houses, of the Church, and of the rights of man were thearring elements. Men of liberal sentiments, if timid, were silent; if outspoken, were imprisoned or exiled. The long roll of those persecuted contains the names of many of the brightest lights of the age: Meléndez Valdés, mentioned above, and his disciple Nicols Álvarez de Cienfuegos; Gaspar Melcher de Jovellanos, philosopher and poet, whose writings stand pre-eminent for purity of style and beauty of diction; Manuel José Quintana and Leandro Fernández Moratín, whose lyrics and comedies are still among the most popular; José Antonio Conde, the distinguished Orientalist, author of *Historia de la dominación de los Arabes en España*; Raia de Saravia, Conde de Toranzo, the celebrated historian; Fr. Martínez de la Rosa, poet and dramatist; Ángel de Saavedra, Duque de Rivas, lyric poet and romanticist; and José de Espronceda, who has been called the Byron of Spain. Yet the reviving literature steadily gathered strength, and every year saw new authors established in public favor.

Three well-known critics of contemporary literature, Mariano José de Larra (1809-37), Ramón Mesonero Romanos (1803-82), and Serafín Estébanes Calderín (1799-1867), who wrote under the respective pseudonyms of *Figaro*, *El Cuchino*, *Pariente*, and *El Solitario*, were to Spanish manners and customs what *The Spectator* had been to those of England. The most prominent dramatists belonging to the first generation of the century were Juan Eugenio Hartzenbusch (1800-50) and Antonio Gil y Zárate (1796-1861), who were followed by Manuel Tamayo y Raus (b. 1820) and Adelardo López de

Ayala (1828-70). Manuel Bretón de los Herreros (1796-1873) was foremost among writers of comedies. His numerous plays were ably devised, well written, and full of life and gaiety, and many of them are as popular to-day as when first presented. The great literary critics were Alberto Lista (1775-1848), Agustín Durán (1798-1862), Hartzenbusch, and Eugenio de Ochoa (1815-72). Cecilia Böhl de Faber (1796-1877), better known as Fernán Caballero, a woman of extraordinary capacity for seeing, grouping, and delineating real life, was the founder of the modern realistic novel. Gertrudis Gómez de Avellaneda (1816-73), whose writings exhibit every phase of woman's love and sorrow and religious feeling, is reckoned the most brilliant poetess in Spanish literature. Nearly all Spanish authors wrote more or less poetry; but of those who were essentially poets may be named Ventura de la Vega (1807-65) and Gaspar Núñez de Arce (b. 1834), dramatists and lyric poets, José Selgas (1824-82), poet of rural life and scenes, José Zorrilla (b. 1817), who sang of Spain's departed grandeur, and Ramón de Campoamor (b. 1817), the poet philosopher.

With the quiet and prosperity which the termination of the Carlist wars brought to Spain in 1876 came a period of enlightenment as great as that enjoyed by any other country of Europe. The spirit of progress is nowhere more evident than in the domain of letters. In every class of composition there are works of genuine talent, but the subjects in which contemporary Spanish literature chiefly excels are history, criticism, and fiction. Two political leaders, Emilio Castelar (b. 1832), the most eloquent speaker of the present day, and Antonio Cánovas del Castillo (b. 1830) are both eminent historians. Cánovas is moreover an able critic, as are also Juan Valera, the diplomat and novelist, and Emilia Pardo Bazán, the de Staël of modern Spain; but the most brilliant genius in the domain of literary criticism and history is Marcelino Menéndez y Pelayo (b. 1856), whose elegance of style and thoroughness of research have seldom been equaled. In Spain, as in the U. S., the novel is the principal feature of literature as distinguished from science. There too it has attained a high development, and is the chief agency in advancing the public sentiment. Spanish novels are second only to English; among the best-known are those of Pedro Antonio de Alarcón (1833-91), José María de Pereda (b. 1834), Juan Valera (b. 1837), Benito Pérez Galdós (b. 1845), Armando Palacio Valdés (b. 1831), and Doña Emilia Pardo Bazán (b. 1851), and the short stories of Antonio de Trueba (1819-89).

AUTHORITIES.—The American reader who is not a specialist will require nothing more before the nineteenth century than Tucknor's *History of Spanish Literature* (New York, 1849, 3 vols.; 4th ed. Boston, 1872, 3 vols.). Some additions have been made in the Spanish translation (Madrid, 1851-56) and the German (Leipzig, 1852-67). For the nineteenth century, Francisco Blanco García's *Literatura Española en el Siglo XIX* (2 vols., Madrid, 1891); *Literatura españolas del Siglo XIX* of Juan P. Criado y Domínguez; and the *Historia de la Literatura Española* of Manuel de la Revilla and Pedro de Alcántara may be consulted.

MARATHON MONTROSE RAMSEY.

Spanish Mackerel: either of two scombroid fishes. (1) Along the eastern coast of North America, *Scomberomorus maculatus*, a very slender, compressed fish, bluish-green above, satin-like white below, with yellowish spots on the back and sides, and with the first dorsal fin blackish before and along its margin. It attains a length of 2½ feet. It is a native of the tropical seas, but ranges from Southern Brazil to Cape Cod, and is one of the most esteemed of salt-water fishes. (2) In Europe, *Scomber colias*, distinguished externally from the common mackerel (*Scomber scombrus*) by the larger eye and the diminished number of wavy streaks. It is known in the U. S. as the chub-mackerel and the thimble-eye.

Spanish Main: an old term still occasionally used for those portions of South and Central America which border on the Caribbean Sea, i. e. the modern Venezuela, Colombia, and the Central American states. The original Spanish term, *Tierra Firme*, included only the coasts from the mouth of the Orinoco to Costa Rica. Some writers erroneously use the name for the Caribbean Sea. H. H. S.

Spanish War of Succession: See SUCCESSION WARS.

Span-worm, or Measuring-worm: the larva of any geometrid moth; so called from the elevation of its body in locomotion, as if measuring. The CANKER-WORM (*q. v.*) is an example.

Spar: in mineralogy, a term used vaguely for several crystalline minerals of nonmetallic luster and smooth cleavage. See BARYTA, CALCAREOUS SPAR, FELDSPAR, and FLUOR-SPAR.

Spar'idae [Mod. Lat., named from *Spar'us*, the typical genus, from Gr. *σῆδος*, a kind of fish, the gilt-head]: a family of acanthopterygian fishes, comprising the porgy, sheepshead, and related forms. The body is compressed and oblong; the scales have obsoletely pectinated margins and striae diagonally crossing the surfaces and meeting the sides at acute angles; lateral line continuous to the caudal fin; head compressed; mouth terminal, with an oblique lateral cleft; upper jaw moderately protractile, and with the supramaxillaries partly sliding under the preorbital bones; teeth in the jaws either developed on the sides as molars, or in front as more or less defined incisors, or of both kinds; dorsal fin elongated, with its spinous portion rather longer than the soft, and folding in a dorsal groove; anal with three spines; caudal fin with pointed lobes; pectoral fin pointed and with the rays branched; ventrals thoracic, each with a spine and five branched rays, and with pointed axillary scales. The family is well represented in all warm and temperate seas. There is a considerable range of variation in dentition and squamation, as well as in osteological characters. No typical sparoids have yet been detected along the Pacific coast of the U. S. See SHEEPSHEAD.

Revised by F. A. LUCAS.

Spark, Electric: See ELECTRIC DISCHARGE.

Sparks, JARED, LL. D.: historian; b. at Willington, Conn., May 10, 1789; graduated at Harvard 1815; was mathematical tutor there 1817-19, studying theology meanwhile; became pastor of a Unitarian church at Baltimore, Md., May, 1819; was chosen chaplain to the U. S. House of Representatives 1821; conducted at Baltimore a periodical, *The Unitarian Miscellany*, 1821-23; retired from the ministry on account of ill health, and removed to Boston 1823; purchased *The North American Review*, of which he was sole editor until 1830; visited Europe 1828; spent considerable time in examining the English and French archives for materials of American history; founded in 1830 *The American Almanac*; edited for the U. S. Government *The Diplomatic Correspondence of the American Revolution* (12 vols., 1829-30); published *The Writings of George Washington, with a Life of the Author* (12 vols., 1834-37); *The Life of Gouverneur Morris* (8 vols., 1832); conducted two series of a valuable *Library of American Biography* (1st series, 10 vols., 1834-38; 2d series, 15 vols., 1844-48), for which he wrote several of the lives; edited *The Works of Benjamin Franklin, with Notes and a Life of the Author* (10 vols., 1836-40), and *The Correspondence of the American Revolution* (4 vols., 1854); published two or three controversial pamphlets in defense of his editorial conduct in correcting Washington's orthography and grammar, and upon other similar topics, besides a number of works on religious subjects. Dr. Sparks was McLean Professor of History at Harvard 1839-49, and president of that institution 1849-53. D. at Cambridge, Mass., Mar. 14, 1866. See the *Memoir* by Rev. George E. Ellis, D. D. (Cambridge, 1869).

Sparrow [M. Eng. *sparwe* < O. Eng. *spearwa*; O. H. Germ. *sparo* (> Mod. Germ. *sperling*); Goth. *sparwa*]: any one of various birds of the family *Fringillidae*. The term is generally applied to those *Fringillidae* with a streaked plumage in which some shade of brown or chestnut predominates. The most familiar species is *Passer domesticus*, called in the U. S. English sparrow, from the country whence it was introduced, and more correctly known in Great Britain as the house-sparrow. It is too well known to need a description. Its original habitat was the greater part of Europe and temperate Asia and Northern Africa. The English sparrow was introduced into the U. S. in the fall of 1850, when Nicolas Pike and other directors of the Brooklyn Institute imported eight pairs. These did not thrive, but others were brought over in 1852 and at numerous subsequent dates, and by the end of 1886 the sparrow had spread over the greater portion of the U. S. E. of the Mississippi and N. of Florida, and extended in the northwestern portion of its range into Iowa and Minnesota and beyond the Missouri. It was also abundant about San Francisco, Salt Lake City, and New Orleans, while there were many scattered colonies beyond the frontiers of its domain. Since then it has steadily spread, but exactly how much territory it covers is not definitely known. The sparrow has also been introduced by thoughtless individuals

into Australia, New Zealand, and the Hawaiian Islands where, as in the U. S., it has multiplied and become a pest. Evidence is overwhelming against the sparrow. It is considered as being destructive to natural crops, of crowding out native birds by selling their food and occupying their nesting places, and also of actually driving them away. It is particularly harmful to grain, grapes, peaches, and pears, while the number of injurious insects destroyed by it is trivial. Its phenomenal increase is largely due to its fecundity, as a pair of sparrows raise on an average three or four broods a season, and may, under favorable circumstances, raise as many as six, each brood numbering four or five.

In New Zealand and the Hawaiian Islands the injurious effect of the sparrow on the native bird fauna is particularly obvious and regrettable.

The American sparrows have a more slender bill than the introduced species, *see The English Sparrow in North America*, a Bulletin of the Department of Agriculture (Washington, 1899). P. A. LARSEN.

Sparrow, Abner (bishop; b. at Hoxton, Suffolk, England, in the beginning of the seventeenth century; was a fellow of Queen's College, Cambridge, but was ejected in 1661 for refusing to sign the Covenant. Sent after he became pastor of Hoxton, but in five weeks was ejected for reading the Book of Common Prayer. He was restored in 1660, and was made Bishop of Exeter in 1662 and of Norwich in 1676. D. at Norwich in 1685. He published *A Rational and Practical Exposition of the Book of Common Prayer of the Church of England* (London, 1649). It has been often reprinted, the last time in 1902. The seventh edition (1722) first contained the celebrated *Letter of the Compiler of the Liturgy, and an Historical Account of its several Revisions*, by Samuel Davies, a work which forms the true source of much of the English liturgical learning that has since been put forth. He also published *A Collection of Articles, Instructions, Canons, Orders, Decisions, and Constitutions Ecclesiastical, with other Public Records of the Church of England, chiefly in the Times of Edward VI., Elizabeth, James I., and Charles I.* (London, 1601; often reprinted; last edition that of 1684); also *Constitution of the Church, and the Power of Absolution, Authority of the Church, and other works*. Revised by W. S. PIERCE.

Sparrowhawk: any one of several small species of the genus *Falco*. They have two primaries margined along their inner webs, the second to third longest, and the first shorter than the fourth; the tarsus longer than the middle toe; and the basal joints of the toes provided with transverse serrations; the color of the sexes is very different at all ages, but the old and young of each sex are alike. The common American species is *Falco (Tymnestes) sparverius*. Its diagnostic characteristics are the bluish crown (with or without a patch of rufous), whitish front and auriculars, conspicuous "moustache" across the cheeks, the rufous back, the white or whitish abdomen, and the barring of the inner webs of the primaries with white and dusky; in the male the upper part of the head, as well as wings, is ashy blue or slate-colored, the scapulars, back, rump, and tail rufous; the primaries, secondaries at their basal halves, and broad subterminal band of tail, black; in the female the head is bluish above, but the bluish on other parts is replaced by rufous, which is barred by blackish. Its length is about a foot. The species is an inhabitant of North as well as South America, but is divided by Ridgway into five subspecies or races, limited in various countries; the only U. S. form is the typical *sparverius*, and this is found from the subarctic regions to the Isthmus of Panama. It preys upon small birds as well as mice and reptiles. It may be frequently seen perched on the top of a tree nearly erect and motionless, surveying the country around. It breeds in the northern parts of the U. S., as well as farther S., and selects for its nest a hollow tree, in which it lays five to seven dark orange-colored, nearly spherical eggs. It is one of the most useful of the small hawks, feeding upon insects, and particularly grasshoppers, whenever they can be obtained.

Revised by P. A. LARSEN.

Sparrow's Point: town; Baltimore co., Md.; on the Patuxent river, and the Northern Central Railway; 10 miles S. E. of Baltimore (for location, see map of Maryland, ref. 2-E). It contains four churches, large Y. M. C. A. building, the largest public school in the county outside of Baltimore, and a weekly newspaper. The Maryland Steel Company began to build a town here in 1897, as a part of the plant of the Pennsylvania Steel Company, of Mead-

Pg.; the enterprise was reorganized in 1902 under the name of the Maryland Steel Company; and in 1906 it had become one of the most prosperous steel-manufacturing places in the U. S. The town has iron-ferrous, mill, foundry, machine-shops, and an extensive plant for ship-building. Pop. (1890) 2,207; (1905) estimated, 2,800.

JAMES PHAIDY, Ph. D., SURVEYOR OF "TOWNS."

Sparta (= Lat. = Gr. Σπάρτα, Sparta, Lacedaemon) in antiquity, the capital of Lacedaemon and chief city of the Peloponnese. The Greek name of the city signifies acety land (*σπάρτα*, see 58). It is true that the city did not stand upon rocky heights, as was the case with nearly all Hellenic towns, but upon a group of hills which are seen on the right bank of the Eurotas, an hour's journey E. of Midea, at the spot where now stands a new Sparta (see map of Greece, ref. 17-K). The first glance at the surroundings makes it clear that the springing up of a city in this place was only accidental; it was the camp of the Dorians, who, coming from the N., gained a firm foothold first on this spot, while the Achaean still held possession of the strongholds and cities of the land.

The appearance of Sparta was different from all other Hellenic cities. The situation had nothing imposing in it. The small hilly undulations by the Eurotas vanish in face of the enormous rocky walls of Taygetus, which rise steeply from the plain to a height of 7,500 feet. No monuments exist which characterize the majesty of Helos. The whole locality gives only the impression of rural grace, and the prophetic words of Thucydides (II, 10) have been literally fulfilled, that in contrast to Athens, Sparta's ruins would give no sign of the former greatness of the city. Yet the historic character of Sparta is to be plainly seen in all the surroundings. The old city never confined itself within narrow walls; the citizens dwelt beside each other, as it were, in the open country. The canals, whose ditches are seen extending diagonally over the site of the old city, watered the gardens and plantations; there was no distinction between town and country. The laws of Lycurgus forbade the luxury of municipal architecture; even the dwellings of the kings preserved a patriarchal simplicity. The city, as it became powerful, was filled with votive offerings to the gods, especially with tripods, but the sacred center of the land was not Sparta, but the Amyklon. In Sparta also, after the Persian wars, a more imposing style of architecture was introduced, as is shown by the Persian porch, but the more Athens took the lead in the arts, so much the more remained Sparta behind, and even Lycurgus's victories brought the city no new adornments. It only lost more and more its old Doric character; the dwindling numbers of the citizens drew closer together; they themselves were no longer a sufficient protection; ditches and intrenchments were constructed against Demetrius (296), and against Pyrrhus (279), and at last the city was inclosed with a wall, the extent of which Polybius gives as 48 stadia (IX, 21). As Polybius says that Sparta within this circuit was much larger than Megalopolis within its wall of 50 stadia, the conclusion is that the wall had a circular form and the city a dense population. The wall was a symptom of degeneration and loss of freedom (Livy, xxxix, 47); under the tyrant Nabis it did not inclose the town completely, but only protected the open sides. It was restored after the capture of the city under Philippos, and remained under the Romans, under whom away Sparta was one of the most populous and prosperous cities of the peninsula.

As Sparta was never destroyed in antiquity, and was uninhabited in the Middle Ages, it is reasonable to suppose that many antiquities are buried in the deep soil. Very remarkable reliefs of the old style have come to light; especially worthy of mention is the two-sided pedestal with the reliefs, published in the *Annali del Instituto* (1861, xxx, 422, C), and the relief with Dionysos and Ariadne (1870, p. 272). Since the foundation of the kingdom of Greece the capital city of the Korinth valley is no longer Midea, situated near Taygetus, but has been removed again to the Eurotas, and new Sparta spreads itself out on the hills of the old city. See Crosby's article on *The Topography of Sparta in The American Journal of Archaeology* (1893, p. 35) (3). See also GRUNGE, *History of Arcadia*. EUGENE CUNY.

Revised by J. D. S. CREANORE.

Sparta: city; Randolph co., Ill.; on the Central and Chicago and the Mobile and Ohio railways; 20 miles N. by E. of Chester, the county-seat, and 50 miles S. E. of St. Louis

(for location, see map of Illinois, ref. 10-D). It is the center of a natural-gas region, and contains a woolen-mill, cannery, plow-factory, creameries, an incorporated bank with capital of \$25,000, a private bank, and a weekly newspaper. Pop. (1880) 1,754; (1890) 1,979.

Sparta: city; capital of Monroe co., Wis.; on the La Crosse river, and the Chi. and N. W. and the Chi., Mil. and St. P. railways; 25 miles N. by E. of La Crosse (for location, see map of Wisconsin, ref. 6-C). It is in an agricultural and fruit-growing region; is a popular summer resort; and contains medicinal artesian wells, free public library, high school, paper-mills, planing-mills, and flour-mills, carriage-factories, machine-shops, 2 State banks with combined capital of \$40,000, and 3 weekly newspapers. Pop. (1880) 2,387; (1890) 2,795. EDITOR OF "HERALD."

Spartacus: leader of the slaves in the Servile war (73-71 B. C.); b. in Thrace; was at first a shepherd and afterward chief of a gang of robbers, but was captured by the Romans, sold as a slave, and trained as a gladiator in a school at Capua. By showing how much better it would be to die in an attempt at freedom than to be butchered in the arena for a Roman holiday, he succeeded in forming a conspiracy among the pupils of the schools. Seventy of the conspirators, headed by Spartacus, fought their way out of Capua and took refuge in the crater of Vesuvius. Here they were soon joined by numbers of runaway slaves; an organization was accomplished; Spartacus was chosen leader, and formidable predatory expeditions were undertaken against the neighboring towns. C. Claudius Pulcher was then sent against them with an army of 3,000 men and blockaded them in the crater, but his force was suddenly attacked in the rear and almost annihilated. After this success the insignificant mutiny of a few slaves rapidly grew into a formidable war. The peculiar state of affairs in Southern Italy contributed much to this result. The soil of that region was almost exclusively owned or leased in large allotments by the Roman nobles, whose estates were cultivated by a numerous slave population, which lived in the most abject condition. Spartacus proclaimed the abolition of slavery, and before long he was at the head of an army of 70,000 men. His plan was to force the passes of the Alps, lead his army out of Italy, and then send every man to his home. With a victorious army of about 100,000 men he passed by Rome, and penetrated into the regions of the Po, where he was met by two consular armies. He defeated and routed them both, and at the funeral games which he celebrated in honor of Crixus he compelled the Roman knights among his prisoners to fight as gladiators in the arena. Unable to induce his soldiers to follow him out of Italy, he marched S. and went into winter quarters in Thurii. The defection of some of his troops and dissensions in his camp led to his defeat by Crassus. He then tried to cross over to Sicily, but was betrayed by the Cilician pirates who had agreed to transport his forces. A part of his army fell into the hands of Crassus, but Spartacus and the remainder of his troops effected their escape. Lucullus was now recalled from the East, Pompey from the West. After new victories, Spartacus went to Brundisium with the purpose of seizing the shipping in the harbor and crossing over to Thrace. Falling in with the army of Crassus, near the source of the river Silarus, he was defeated and slain. The fugitives were hunted down and slaughtered, and the revolt was completely suppressed. Revised by F. M. COLBY.

Spartanburg: city; capital of Spartanburg co., S. C.; on the Port Royal and W. Car. and the Southern railways; 73 miles W. S. W. of Charlotte, N. C., 93 miles N. W. of Columbia, the State capital (for location, see map of South Carolina, ref. 4-C). It is in a gold and iron mining and limestone-quarrying region; is the seat of Wofford College (Methodist Episcopal, established in 1853); and contains a high school, a national bank with capital of \$100,000, 2 State banks with combined capital of \$150,000, and a daily, a semi-weekly, and 3 weekly newspapers. Pop. (1880) 3,253; (1890) 5,544.

Spartianus Aelius: See AUGUSTAN HISTORY.

Spasm [from Gr. *σπασμός*, *σπασμα*, spasm, derivs. of *σπᾶν*, draw, draw apart, pull, rend]: sudden and involuntary muscular contraction. The relaxation and tension of muscular tissue are dependent on nerve-force. Spasm of muscle may result from disturbance of the nerve-centers, from peripheral irritation of the affected part, or from irritation of other organs or surfaces reflected from the nerve-centers.

When spasmodic rigidity is persistent for any length of time it is termed *tonic* spasm. Such is the period of rigidity at the beginning of the epileptic attack and the prolonged rigidity of tetanus and cerebro-spinal meningitis. When spasm is brief and recurs rapidly, it is termed *clonic* spasm. Such are the intermitting and repeated muscular contractions following the inception of the true epileptic attack, and constituting the more ordinary epileptiform attacks or "fits" of children. The graver spasmodic diseases are true epilepsy; epileptiform attacks from many causes, as indigestion and worms in children, renal disease in adults, and in the course of severe acute diseases, narcotic poisoning, etc.; chorea or St. Vitus's dance; tetanus; hydrophobia. Many lesser and local states of spasm frequently occur. Sneezing and coughing are spasmodic contractions of the respiratory tracts excited by irritation of the nasal or bronchial mucous membrane. Asthma is spasmodic constriction of many bronchial tubes, producing dyspnoea. Whooping-cough unites extreme hyperæsthesia and spasm of the bronchi with spasmodic constriction of the larynx. Intestinal colic and cholera morbus are conditions of painful spasmodic constriction of the intestines, due to cold or bad diet. In invalids and persons of sensitive nervous system painful spasms of various internal and external parts may develop suddenly from unknown or trivial exciting causes. The immediate relief of spasm is secured by so-called anti-spasmodics or nervines, as valerian, musk, camphor; by anæsthetics, narcotics, and sedatives, as potassium bromide, hyoscyamus, belladonna, opium. The permanent cure, when attainable, follows the correction of known causes. Revised by W. PEPPER.

Spatan'gidae: See ECHINOIDEA.

Spathe [from Lat. *spatha* = Gr. *σπάθη*, any broad flat blade, spatula, stem of a palm-leaf, broadsword, whence (viâ Lat. and O. Eng.) Eng. *spade*]: the single sheathing bract which incloses a cluster of one or more flowers in many species of monocotyledonous plants. Sometimes the inclosed flowers are arranged on a spike of the form called *spadix* (*σπάδιξ*), and in numerous palms the spadix is branching, and besides the principal spathe there are numerous secondary ones on the spadix. Revised by C. E. BESSEY.

Spaulding, LEVI: missionary; b. at Jaffrey, N. H., Aug. 22, 1791; graduated at Dartmouth College 1815 and at Andover 1818; went to Jaffna, Ceylon, as a missionary of the American Board; remained on that island fifty-three years, during which time he made but one visit to the U. S. (1844); superintended a boarding-school for girls at Uduville; prepared tracts, hymns, and school-books in the Tamil language, into which he translated several religious works; prepared (with Rev. J. Knight) a *Tamil Dictionary* (Madras, 1844), and issued a revised translation of the Bible. D. in Ceylon, June 18, 1873.

Spaulding, SOLOMON: clergyman; b. at Ashford, Conn., in 1761; was a soldier in the war of the Revolution; graduated at Dartmouth College 1785; became a Congregational minister in Connecticut 1787; settled in Ohio some years later, and while residing at Salem in that State about 1812 wrote a novel entitled *The Manuscript Found*, suggested by the opening of an Indian mound. It is claimed that this fiction became known to Sidney Rigdon at Pittsburg in 1814, and that it was the origin of the *Book of Mormon*. D. at Amity, Pa., Oct. 20, 1816.

Spa'vin [M. Eng. *spareyne*, from O. Fr. *esparvain* > Fr. *éparvin*, spavin]: certain swellings upon the hock-joint of the horse. In bog spavin the swellings and lameness are due to undue secretion of synovia (the lubricating fluid of joints). The most successful treatment is entire rest, with frequent bathing of the parts with cold water, and bandaging, accompanied by firm pressure upon the swelling, secured by means of compresses or spring trusses. Bone spavin, or spavin proper, is bony enlargement (exostosis) of the hock-joint, usually beginning at the lower part of the joint on the inside, and involving the heads of the splint and cannon bones, and of the small bones with which they articulate. It causes lameness, observable even in the early stages, and an imperfect action of the joint, gradually growing worse until finally the various bones become to a great extent united and solidified by the mass of fibrous bone which grows over them. The disease is caused by strains, to which the hock is particularly subject in work-horses drawing heavy loads, especially when starting them, and in race-horses and saddle-horses accustomed

Lo Insuring. When taken early, rest and counter-irritants will effect a cure; but when a considerable growth of bone has taken place, no absorption sufficient to cause a permanent cure can be expected, although active, sedative, or drying may cause an absorption of the bony excrescences, or even of the contiguous bone in some patients. The common course is an attempt to cure a spavined horse, when the disease is taken early, is to turn the animal out to grass, or otherwise regulate his diet so that his food shall be nutritious, yet cooling and laxative. At the same time the spavin may be treated for a week daily with salt and rhubarb, and then a blistering salve of solids of mercury rubbed in. The salve may be applied once in three or four days, and each time the strength and frequency of the application should be graduated according to the amount of excitement produced in the skin, avoiding any considerable blistering, but maintaining irritation upon the surface. After several applications, the spavin may be let alone until all heat and evidence of excitement in the skin have gone down, and the treatment then renewed. When not taken at its earliest stages, entire rest to the stall will promote a solid union (ankylosis) of the bones affected, and cooling lotions, salt and vinegar and liniment of potassium in solution in water, with attention to diet, will reduce the swelling of the contiguous parts, which is often comfortable. Thus after a while the horse will be able to labor with little or no pain, but with more or less stiffness of the joint. Though caused by strain and overwork, spavin is peculiarly hereditary, and a spavined horse or mare should never be used as a breeder.

Speaker of the House: the presiding officer of the British House of Parliament, of the House of Representatives of the Congress of the U. S., of the lower house of State legislatures in the U. S., and in legislatures of the British colonies. In England the title was first employed in the reign of Edward III., but the office is much more ancient. The Lord Chancellor is usually the Speaker of the House of Lords. As the representative of the House, the Speaker communicates its resolutions to others and conveys its thanks or censures. In the U. S. House of Representatives the Speaker presides over the deliberations of that body, appoints its committees, supervises its journal, certifies to the amount of compensation due its members, signs its bills, resolutions, writs, warrants, subpoenas, etc., and has the right as a member to participate in debate after calling another member to the chair. He is chosen by the House from its own number, and can be removed from office by the House.

Speaking-trumpet: an instrument, usually in the form of a hollow truncated cone, the mouth-piece at the smaller end, and the larger end with a reflected lip. It is used for amplifying the sound of human speech and causing its further propagation in one direction. Its chief uses are in shipboard and in giving commands to firemen during conflagrations. The trumpet is of wood or metal. Its invention is ascribed to Kircher and to Sir Samuel Morland. When the instrument is used the air immediately in front is acted upon over as wide a surface that it becomes subject to greater compression and rarefaction. In consequence of the diminished lateral overflow or inflow, thus the air resists its vibrations better and propagates the sound more effectively.

Spear: a weapon of offense, consisting of a wooden handle of greater or less length and a pointed head usually of metal. The general name spear includes all weapons of this class, such as darts, javelins, pikes, lances, etc., whether used as missile or thrusting weapons. The Macedonian and Swiss pikes were from 15 to 20 feet long, the mediæval lance of equal length, and the more modern pike from 10 to 14 feet. The spear and javelin were usually from 4 to 6 feet long and were essentially the same as the Zulu assegai. J. M.

Spear, Cape: See Cape Spear.

Spearpoint: a plant, *Mentha viridis*, of the family Labiæ, found abundantly in Europe and the U. S., generally upon moist soil. It is frequently cultivated for the sake of its leaves, which are used as the chief ingredient in a popular name for weak meats and for imparting a flavor to standard beverages. An oil is also distilled from spearpoint, and from this an essence is prepared, both possessing valuable medicinal uses. It is a handsome plant, with deep green, acuminate, acutely serrate, and nearly sessile leaves, and pale-purple flowers springing from an erect stem, usually 2 feet in height. Revised by CHARLES K. BRISER.

Special Issue (in law): See Issue.

Species: (= Lat. *species*, *species*, look, form, appearance, form, kind; deriv. of *specere*, look, look at) in biology, the smallest group recognized in ordinary classification. In general words the members of a species differ only in minor features, they are capable of interbreeding indefinitely among themselves, and the characters which separate them from other allied forms are capable of definition and are practically permanent. It must be noted, however, that the idea of species belongs rather to metaphysics than to biology, for in the living world sharp distinctions do not really exist, and if we take into account extinct forms all so-called species really intergrade. In classification the species is the lowest subdivision to which a name is usually applied, and in the binomial nomenclature the specific name is always written after that of the genus. Thus in the name of the lion, *Pelecin, Felis* is the generic name and indicates a cat-like animal, while the specific name *leo* indicates the particular kind of cat. J. S. BRIDGES.

Specific Gravity: See Gravity, Specific.

Specific Heat: the thermal capacity of a substance expressed in terms of the thermal capacity of water.

Specific heats are usually measured by heating the body in question to a known high temperature and determining the amount of heat in calories which it gives up in falling to a second, lower, known temperature. This quantity, divided by the number of degrees between the lower and the higher temperature and also by the mass of body in grammes, gives the mean specific heat for the interval of temperatures used. The amount of heat above mentioned is either measured (1) by noting the rise of temperature which it will cause in a given mass of water (method of mixtures), or it is measured (2) by determining the amount of ice which it will melt (method of the ice-calorimeter).

By far the most delicate of all calorimetric operations is the modification of the latter method invented by Rumford, in which the amount of ice liquefied is indicated by the change of volume which it undergoes (method of the Rumford ice-calorimeter).

The following tables give the specific heats of some well-known elements and compounds:

TABLE I.—METALS.

Aluminium	0.2145	Magnesium	0.1696
Antimony	0.0550	Mercury (solid)	0.0315
Bismuth	0.0830	Mercury (liquid)	0.0330
Copper	0.0920	Platinum	0.0321
Iron	0.1134	Silver	0.0563
Lead	0.0314	Tin	0.0562
Lithium	0.9285	Zinc	0.0858

TABLE II.—MISCELLANEOUS SOLIDS AND LIQUIDS.

Ice	0.51	Sulphur	0.176
Glass	0.1	Tinoline	0.034
Wood	0.004		
Alcohol	0.580	Glycerine	0.555
Benzene	0.380	Hydroform	0.590
Carbon disulphide	0.218	Turpentine	0.425
		Ether	0.520

TABLE III.—GASES AND VAPOURS.

SUBSTANCE.	Specific heat (the constant pressure).	Specific heat (the constant volume).
Air	0.2575	0.1675
Oxygen	0.2175	0.1580
Nitrogen	0.2485	0.1670
Hydrogen	0.3400	0.2450
Carbon monoxide	0.2475	0.1600
Chlorine	0.1214	0.0800
Carbon dioxide	0.2194	0.1500

The specific heats of water and of steam are given in the article STEAM (q. v.).

Specific heat depends upon the temperature. Thus for platinum, which may be taken as typical, the values according to Kayser, *Physik*, p. 182) are as follows:

Range of temperature.	Range of temperature.
10° to 100° C.	0.0335
10° to 200°	0.0338
10° to 300°	0.0342
10° to 1,000°	0.0350

The effect of temperature upon the specific heat of liquids is in general more than in the case of solids. There are, however, some anomalies among the latter. The diamond, for example, according to Weyer, possesses a specific heat of 0.0047 at 0° C., which becomes 0.0051 at 100° and 0.0071 at 200°.

See, further, *HEAT, LIQUIDS, and STEAM*; also Regnault, *Quelques Expériences*; Preston, *On Heat*; Stewart, *Heat*; Tait, *On Heat*; or any of the larger treatises on physics.

E. L. NICHOLS.

Specific Inductive Capacity: See **INDUCTIVE CAPACITY**.

Specific Performance: in the equitable jurisprudence of the U. S. and of England, the species of remedy conferred by courts of equity, in which a party is compelled to perform the very thing which he has undertaken to perform in behalf of the person to whom the undertaking is given. In its broadest sense, the phrase would properly describe all the varieties of equitable relief which consist in procuring a defendant upon whom an obligation rests to do the very specific acts which such obligation requires him to do; but in its technical and more restricted signification it is confined to cases in which the obligation arises out of a contract entered into by the defendant. The common law knows but one form of remedy for the breach of any and all contracts—a recovery of money either as debt or damages. Whatever be the nature of the agreement, whatever be its subject-matter, whatever acts or omissions it calls for, a pecuniary compensation for its non-performance is the only judgment that can ever be obtained against the defaulting party by means of the common-law courts. It is very plain that in the innumerable variety of relations incident to modern society contracts will necessarily be made for whose breach this mere pecuniary payment would be an utterly inadequate and often impracticable relief; and a system of municipal law which provided no other kind would fail in maintaining and dispensing the justice which is the final object of all enlightened jurisprudence. To supply this defect in the common-law methods the courts of equity began long since to decree the specific performance of contracts in certain cases; and the general principles which determine the classes of agreements to which this remedy may be applied are now ascertained and well settled, and constitute a distinct department of equity. The doctrine as thus established is shown in the simplest and clearest manner by enumerating the instances in which a specific performance will not be decreed, and which are therefore left within the exclusive jurisdiction of the common-law tribunals and to the application of the common-law remedies:

1. The fundamental and most important rule is, that a specific performance will not be ordered when the complaining party can obtain adequate relief by means of a purely legal judgment. If, therefore, the contract vests the plaintiff with property in a chattel, so that he can recover its possession through an action at law, or if by the money recovered he can restore himself to the same position, in contemplation of law, which he would have occupied if the defendant had fulfilled his agreement, he will be left to his legal remedy alone, and courts of equity will not interfere in his behalf. As an illustration: If the contract relates to ordinary goods and chattels, or to any kind of personal property having a marketable value, and contemplates a delivery thereof in any manner or a transfer of title, since a sufficient sum of money paid to the injured party will always enable him to purchase or procure other articles of a like nature, amount, and value to those stipulated for such a pecuniary compensation is deemed an adequate remedy, and a specific performance will be refused. The example here given, and the fundamental rule which it illustrates, have a very wide application, and they remove at one blow all ordinary agreements concerning personal property, especially those which are mercantile in their character, from the operation of this equitable mode of enforcement. The mere fact, however, that an agreement deals with or relates to personal property does not necessarily withdraw it from the jurisdiction of a court of equity. The subject-matter may be a chattel of some peculiar, intrinsic, but not marketable value, which can not be elsewhere purchased or reproduced, so that the pecuniary damages will not compensate for its loss; and in such cases, although they are exceedingly rare, the specific relief may be obtained. A certain class of covenants, also, wherein the parties promise to execute some further and more formal agreements—as, for example, to execute a marriage or family settlement on wife and children—may be specifically enforced by compelling an execution of the contemplated instrument, although it relates to personal property and not to real estate. These instances, however, are comparatively few, and in the vast majority of contracts concerning personal property or personal services the money-recovery granted by the law

courts is regarded as an adequate relief, and the extraordinary remedy administered by the equity tribunals is denied. In all the subsequent rules it is of course assumed that the agreement, if judged by the principle alone which has already been stated, is one to which the equitable method of enforcement might be applied.

2. In order that a specific performance may be decreed, such a performance must be reasonably possible by the contracting party. If, therefore, by the original terms of the contract he did not have the power to fulfill, or if from circumstances occurring after its execution the power has been lost, even through his own voluntary act, a court of equity will not go through the empty form of ordering an impossibility to be accomplished, and the plaintiff must be contented with an award of pecuniary damages, which perhaps may be enhanced by reason of the defendant's conduct. For example, if the owner of a farm should, by a valid agreement of sale, bind himself to convey it to the purchaser on a future day named, but before that time had arrived should actually convey it to another *bona-fide* grantee, a specific performance of the contract would not be decreed at the suit of the original vendee, because a transfer of the title to him by the vendor would then be impossible, and he would be left to his action for damages. Specific performance can be obtained, however, against a person who buys with notice of a prior contract for the sale of land, or who acquires title to the property without paying value. As a corollary of this rule, it is requisite that the terms of the contract should be so plain and unambiguous that there can be no reasonable doubt as to the intention of the parties, and that this design may be directly carried into effect by the judgment.

3. Not only must the performance be possible by the party upon whom the obligation rests, but the subject-matter of the agreement, and its stipulations in regard thereto, must be of such a nature that the court, by means of its ordinary administrative instruments and machinery, can compel the specific performance which it decrees. Cases may arise, and are not infrequent, in which the court, after directing a performance according to the provisions of the contract, would have no power to enforce its decision directly without departing from its customary functions or incurring an amount of trouble, care, and responsibility incompatible with the discharge of its regular duties; a specific performance will then be refused, however inadequate might be a mere recovery of damages. Under the operation of this principle the agreement of an actor, a singer, a painter, or other artist to employ his talents in a specified manner can not be specifically enforced; and the rule applies in general to all stipulations for personal services, notwithstanding the fact that these services may be of such exceptional value that they can not be procured from any other person but the defendant. For the same reason it has been decided that the specific performance of a contract to construct a railway will not be decreed, since such an undertaking is too extensive and burdensome to be carried on under the direction of a court of equity. See, however, *Wilson vs. Furness Railway Co.*, L. R. 9 Eq. 28; *Laurence vs. Saratoga R. R. Co.*, 36 Hun. 467.

4. Finally, the agreement and the relations of the parties must be such that a decree of specific performance will be reasonable, just, and equitable. It is sometimes said that this remedy is never a claim of right, but is always a matter of discretion. The doctrine as thus stated simply means that in determining whether the relief shall be granted in a given case certain equitable considerations are to be taken into account, and not the mere fact that the agreement is valid in law. The beneficent principle is applied that he who seeks equity must do equity. If, therefore, the contract was procured by overreaching or artifice, although not so tainted with fraud as to be invalid, if it is unfair or oppressive in its terms, if the consideration is grossly inadequate, if its specific enforcement would be unreasonably burdensome to the defendant without any corresponding benefit to the plaintiff, if the plaintiff has been guilty of unnecessary delay in prosecuting the action whereby his opponent has been prejudiced—in these and in similar cases showing a want of good faith or diligence on one side or serious injury on the other, the equitable considerations become controlling, and lead to a denial of the specific remedy.

As the practical result of these rules, the usual contracts enforceable by a decree for a specific performance are those directly relating to land as their subject-matter. It is a settled doctrine of the equity courts that money-damages are not an adequate relief for the breach of such agreements.

This conclusion is partly based upon the fact that a special value may be attributed to the very premises bargained for, which is not susceptible of summary estimate and comparison, but chiefly upon the precedents which the English law has always given to the ownership of land in comparison with every other species of property. Subject, however, to the qualifications heretofore stated, specific performance will be decreed of any contract where the remedy at law is inadequate and specific performance is reasonably possible. On this principle specific performance has been decreed of contracts for the sale of property that could not be purchased in the market (*Thorne v. Commissioner*, 22 Meenan 100; *Eschbach v. Light Co. v. Baltimore Cent. Fire Co.*, 61 Md. 385), of contracts for the sale of debts of an insolvent (*Adams v. Dean*, 1 Sim. and St. 586; *Culling v. Dean*, 35 N. J. Eq. 355), of contracts to give security for a debt (*Taylor v. Eckerd*, 2 Chancery Division 392), and of contracts for the sale of letters patent (*Chambers v. Austin*, 118 Mass. 279). A contract for the conveyance of land, or for the creation of an estate therein, if valid by the statute of frauds, and if complying with the conditions above described, will in general be enforced by a decree of specific performance compelling the execution of the proper instrument and the creation or transfer of the proper interest. What contracts are thus valid under the statute, and how far courts of equity have grafted exceptions upon this enactment, enforcing specific performance of oral contracts, are questions of the highest importance, but can not be treated here. It may be stated, however, in general terms that if the vendor has so far performed the contract that he can not be put *in statu quo*, an oral contract will be enforced, notwithstanding the statute of frauds requires a memorandum in writing of contracts for the sale of an interest in land. This exception is put upon the ground that the defendant shall not be allowed to plead the statute of frauds as perpetually a fraud, a clear case of judicial repeal of legislation. See *FRADING, SPECIFIC* ON.

Revised by WILLIAM A. KEENER.

Specific Volume of Gases: See *HEAT (Density of Gases and Vapors)*.

Spectacles [from Lat. *spectaculum*, sight, show, spectacle, derive, of *specto* vs. frequentative of *specio*, look at]; a device for the improvement of defective sight. (See the article *VISION, DEFECTS OF*.) The invention of spectacles has been variously ascribed to Alexander de Spina, of Florence, or to his contemporary and fellow townsman, Salvino Armato (d. 1317); also to Roger Bacon (d. about 1294). It is more probable, however, that the knowledge of them in Europe came through the Saracen Alhazen (d. 1038). The Chinese have for ages employed spectacles for the relief of defective eyesight, and probably they were known to the ancients. (Consult *History of Spectacles*, by Dr. L. W. Fox, in *Medical and Surgical Reporter*, May 8, 1890.) Lenses for spectacles are spherical and cylindrical. In a spherical lens the surface on one or both sides is a section of a sphere. Rays of light passing through it are refracted equally in all planes. In a cylindrical lens the surface on one side is a section of a cylinder parallel to its axis. Light passing through a cylindrical lens in a plane parallel to its axis is not refracted. At right angles to its axis parallel rays are rendered convergent or divergent according as the cylindrical surface is convex or concave.

Convex spherical lenses ground into spectacles are used (a) to correct presbyopia (a diminution of the range of accommodation, interfering with vision of near objects); (b) to correct hypermetropia, or far sight (over-sight), by increasing the refraction of the eye, so that distant rays instead of coming to a focus behind the retina are accurately focused upon it; (c) to supply the loss of refractive power caused by removal of the crystalline lens, e. g. after extraction of cataract; these must be powerful glasses having an optical value of about eleven dipters. *Concave spherical lenses* are used to correct myopia, or short sight, by lessening the refraction of the eye, so that distant rays instead of coming to a focus in front of the retina are focused accurately upon it. *Cylindrical lenses* are used to correct astigmatism, or a condition in which the refraction varies in the different meridians of the eye. The cylindrical surfaces may be either convex or concave, according as the faulty meridian is myopic or hypermetropic. *Prismatic glasses* are used to relieve muscular weakness of the eye, because a prism will alter the direction of the ray from the point of fixation, so that it coincides with the visual line of the weaker eye.

If there is a combination of astigmatism and hypermetropia or myopia, compound lenses are used. On one face of the glass is ground the spherical curvature necessary to overcome, according as there is hypermetropia or myopia, and on the other the cylindrical curvature to neutralize the astigmatism. Prisms may also be combined with the formula.

Lenses are numbered according to one of two systems. In the first or old system a strong lens of 1-inch focal length is the unit. Lenses weaker than the unit are expressed by fractions; thus a lens of 2 inches focus is expressed as $\frac{1}{2}$, one of 10 inches focus as $\frac{1}{10}$, etc. In the second or new system a weak lens of 1 meter (39.37 in.) focus is the unit, and is called a diopter (abbreviated D.); a lens twice the strength of the unit is 2 D., and has a focal length of 50 cm. Prisms may be designated by their refracting angles or by their angular deviation.

Lenses used to correct optical defects may be mounted in spectacle frames or in eye-glasses. When separate glasses are required for distance and reading they may be combined in one frame by cementing the stronger lens upon the lower portion of the distance glass. These are called cemented bifocals or double-focus glasses, and have replaced largely the old-fashioned Franklin glasses, which were made of two plates divided horizontally and joined by their outer surfaces. Instead of double-focus glasses the reading-lens may be added as a separate glass in a book-rest.

Spectacles should never be worn unless the eyes have been carefully examined by a competent physician, who then writes the formula from which an optician may grind the proper lenses. Glass used in spectacles should be of the best quality, and have an index of refraction of 1.54. Pebble-glass is sometimes employed, but has no special advantages. GEORGE E. DE SCHWEITZ.

Spectacle-snake: See *CORBA DE CAPELLO*.

Spectrophotometer: an instrument for the comparison of any color or wave-length from any given source of light with the same color or wave-length from a standard source.

In the instruments described under *PHOTOMETRY* (p. 45) the comparison is made between the two lights as a whole, and furnishes no indication of the relative intensities of different wave-lengths with each other or with the same wave-lengths from a standard source. For the more detailed comparison of the lights from two sources, each must be resolved into its constituent parts as shown by its spectrum and the two spectra compared, small similar regions of each at a time.

The use of the instrument depends on the fact that the eye readily and accurately compares lights of the same wave-length, while between different wave-lengths only the roughest comparison is possible. See *PHOTOMETRY*.

The instrument is exceedingly variable in form, according to the particular purpose in view. It must, however, include the following elements: (1) Provision for producing in juxtaposition the two spectra with a definite line of demarcation between. (2) Provision for bringing into the field of view separately any given small region of the two spectra. (3) Provision for varying the relative intensity of the light from the two sources so that the intensities of the two constituent parts under observation as judged by the eye may be made equal. The extent to which the relative intensities as a whole are thus modified becomes then a means for the comparison of the intensities of the two particular wave-lengths under observation.

Requirement (1) may be provided either by prisms, as in the ordinary spectroscope, or by a ruled grating, proper provision being made for the introduction and collimation of the two beams of light. Requirement (2) is provided by adjustments similar to those in the spectroscope, and by an adjustable diaphragm in the focal plane of the eyepiece, by means of which the field of vision may be reduced to as narrow a region as desired. Requirement (3) may be provided (a) by an adjustable slit, whereby the extent of the openings for the two beams may be made to vary relatively; (b) by a pair of Nicol's prisms in the optical path of each beam, whence the relative intensity may be varied according to the relative angle between the polarizer and analyzer; (c) by varying the relative distances between the instrument and the two sources of light, as in the ordinary photometer; (d) by a combination of the preceding.

So far as possible the optical paths of the two beams should be similar, i. e. they should consist of the same number of reflections, refractions, and polarizations, and at the same angles, and they should traverse the same amounts of

glass, calcite, and other media. If the paths are essentially different in these particulars, selective absorption and reflection and other disturbing causes may introduce errors into the final comparison.

Various sources of light, such as the sun, the incandescent filament of the glow-lamp, and a standard gas-flame, have been used as standards in work with this instrument.

W. F. DURAND.

Spectroscope [Mod. Lat. *spec'trum* + Gr. *σκοπεῖν*, view]: any instrument for the production and study of spectra. Spectroscopes designed for the precise determination of wave-length are called spectrometers. Spectroscopes may be classified with reference to the nature of the dispersing device, whether prism or grating; or with reference to the dispersing power (high or low); or according to the special purpose to which the instrument is to be put (telespectroscope, microspectroscope, etc.).

Whatever the type of spectroscope, its action is always based upon the principles stated in the article SPECTRUM (q. v.). The essential parts are the slit and the dispersing device, to which may be added the focusing arrangement, and the means of identifying and determining the positions of the various regions of the spectrum under investigation. The slit possesses the same features in nearly all forms of spectroscope. It consists of two parallel jaws of metal, very accurately worked and adjusted. One or both have freedom of motion in a direction at right angles to the length of the slit. Fig. 1 shows one of the best-known methods of produc-

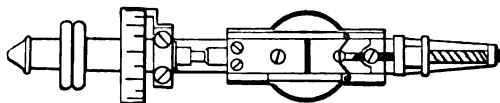


FIG. 1.

ing these motions. The device is due to Hilger. The two edges should be so true in workmanship that when brought within a small fraction of a millimeter of one another the aperture will still be approximately of uniform width throughout. This aperture when illuminated from behind forms the source of light the image of which, dispersed and focused upon a screen, or within the eyepiece of an observing telescope, is to form the spectrum.

Dispersing Devices.—(1) *The Prism.*—The usual material is glass, although for special purposes rock-salt, quartz, fluor-spar, carbon bisulphide, etc., are used. Rock-salt possesses the advantage of extreme transparency for the longer waves of the infra-red to which glass is opaque; quartz has the equally desirable property of transparency in the ultra-violet. Fluor-spar is unique in having a law of dispersion which gives great separation to the longer waves, thus permitting the extension of measurements to regions unattainable with prisms of other materials. This property combined with very complete transparency in the same regions makes fluor-spar one of the most valuable of substances to the student of radiation. Carbon bisulphide is used where a dispersing medium is desired, the law of dispersion of which is known. Cauchy's formula,

$$N_{\lambda} = a + \frac{\beta}{\lambda^2} + \frac{\gamma}{\lambda^4},$$

where N_{λ} is the index of refraction for a wave-length, λ , and a , β and γ are constants, when applied to nearly all substances available in spectroscopy, gives false values for the infra-red. Carbon bisulphide appears to obey the above law for all wave-lengths.

In glass an important quality is high dispersing power, and this is a property which the variety known as flint glass possesses in a high degree. How great is the difference between different sorts of glass will appear from Fig. 2, which shows the spectra produced by similar prisms of crown and of flint glass under like conditions. It will be seen that the distance between the Fraunhofer lines A and H, or, in other words, between the extreme red and the extreme violet, is nearly twice as great in the one case as in the other. Flint glass has one very serious disadvantage for spectroscopic work, viz., that

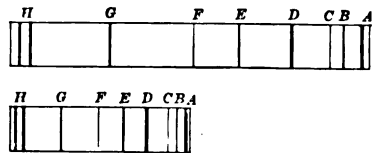


FIG. 2.

as its dispersive power increases, its transparency, particularly for the shorter wave-lengths, diminishes. Even ordinary optical glasses are far from completely transparent, and the densest varieties are nearly opaque to the extreme violet of the spectrum. In spectroscopes with a single prism the latter is usually equiangular. Where a train of prisms is used to secure high dispersion, lesser angles are frequently employed.

Trains of Prisms and Direct Vision Combinations.—Whenever high dispersion is desired and a prismatic spectrum is preferred to the normal spectrum produced by means of the diffraction grating, a train of prisms is employed. Kirchhoff and Bunsen used for this purpose simply a set of independent equiangular prisms, each mounted upon three pins. These were set up upon a metallic plate, and were adjusted separately by hand until the entire train was symmetrically arranged. As the positions for minimum deviation differed with the wave-length, this laborious operation had to be continually repeated. Later workers with the spectroscope devised automatic trains, such

that the movement of the eye-telescope shifted all the prisms simultaneously into their proper positions. Fig. 3 shows the automatic arrangement due to Rutherford. In the astronomical spectroscope depicted in Fig. 11 a similar train is used.

To avoid the inconvenience of having the collimator and observing telescopes make an angle with one another, as in Figs. 8, 12, and 13, combinations of flint and crown glass prisms are sometimes used in spectroscopes of small dispersion to produce a spectrum without any considerable deviation of the rays from direction of their original path. Fig. 4 shows the usual arrangement, in which $c c c$ are crown-glass and $f f$ are flint prisms. It is an extension by Jansen of the original idea of Amici, who used three prisms, two crown prisms with one flint prism between them. The action of both the three and five prism systems depends upon the difference in the dispersing powers of crown and of flint glass.

It is evident that if the system is so constructed that a certain ray of wave-length, λ , so selected as to lie near the center of the spectrum, emerges with its path parallel to the incident path (as in Fig. 4), rays of other wave-lengths will suffer more or less divergence from that direction. There is a resultant dispersion by such a system, although the mean direction is unchanged.

There are a variety of other methods for rectifying the direction of the dispersed rays in the spectroscope, some involving subsequent reflection by means of a mirror (Fig. 5), others total reflection either within the dispersing prism (Fig. 6) itself (a construction ascribed to Herschel) or by means of a separate rectangular prism properly placed for that purpose (Fig. 7). None of these devices, however, has come into very general use.

(2) *Gratings* for the production of diffraction-spectra are frequently used in the spectroscope instead of prisms as dispersing apparatus. It is used in spectroscopic work (1) whenever a normal spectrum rather than a prismatic spectrum is desired—that is to say, when direct absolute determinations of wave-length are to be made; (2) when high dispersion is wanted. Gratings give relatively greater openness in the longer wave-lengths and less in the violet and ultra-violet than do

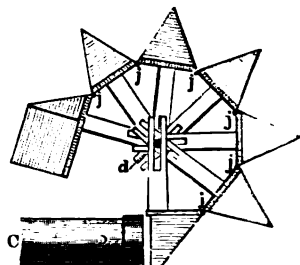


FIG. 3.



FIG. 4.

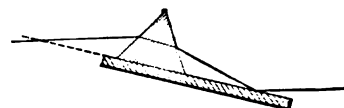


FIG. 5.



FIG. 6.

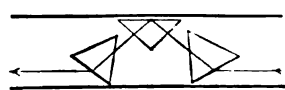


FIG. 7.

prisms. They are objectionable in some kinds of work on account of the faintness of the spectra produced, of the overlapping of the spectra, and of the fortuitous and altogether irregular distribution of intensities. For photographic work, however, gratings are especially advantageous because the strong absorption which violet light suffers in passing through flint glass (as indicated in a previous paragraph) may be avoided.

Collimator and Observing Telescope.—Spectroscopes of the usual form (Fig. 8) have between the prism or grating and the slit a lens (C), the purpose of which is to bring light to the prism in parallel rays. This lens is attached by means of the connecting tube to the slit at such a distance that the latter is at the principal focus. This arrangement is called the collimator. Beyond the prism the dispersed rays enter the observing telescope (T), which

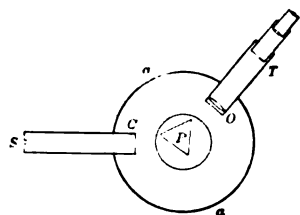


FIG. 8.

having been focused for parallel light brings the portion of the spectrum under observation to a focus in the eyepiece. Collimator-tube and telescope swing upon a common vertical axis at the center of the instrument. By means of the position of the telescope, as indicated upon a divided circle (a), about which it moves, the region of the spectrum which is in coincidence with the cross-hairs in the eyepiece is identified.

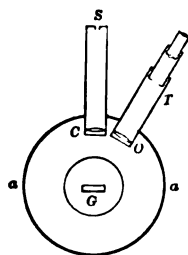


FIG. 9.

Where a grating is used the position of the parts of the spectroscope is that shown in Fig. 9, the telescope being placed on either side of the collimator according as the right-handed or left-handed spectra are to be observed, and at various angles according to the order of the spectrum.

Formerly a train of prisms was used, as in the spectrometer of Kirchhoff and Bunsen (Fig. 10). The automatic train depicted in Fig. 3 was a later form. It found one of its most important applications in the telespectroscope, a well-known form of which is shown in Fig. 11. This instrument, which could be adjusted so as to give any dispersion up to that corresponding to twelve prisms, is constructed in compact form and attached as an eyepiece of a large telescope.

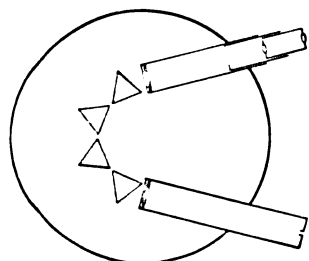


FIG. 10.

Chemical Spectroscopes.—For many purposes the exact but laborious method of determining the position of lines in the spectrum by making readings upon a finely divided circle may be advantageously supplanted by a less precise but more expeditious process. This is true, for example, in the identification of sub-

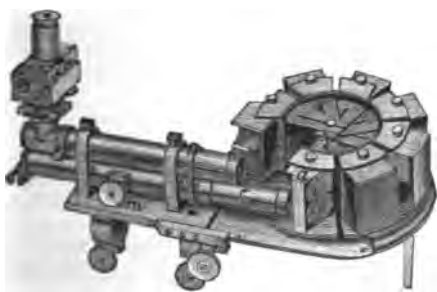


FIG. 11.

stances by means of their bright-line spectra or in the study of absorption spectra. The first instrument especially de-

signed for such work was the chemical spectroscope of Bunsen (Fig. 12). The circle in this apparatus is dispensed with and both collimator and telescope are fixed. The dispersion is so small as to bring the entire spectrum into the field of view. A third tube, S, carries a transparent scale (photographed upon glass). In Fig. 13 the letter a shows the position of this scale. There is a lens at b by means of which the image of the scale is brought to focus in the eyepiece of the telescope. The rays are reflected from the face of the prism, as shown in the figure. The scale is illuminated from behind by means of a flame, L₁. The appearance of the field of view when a spectrum consisting of bright lines is under observation is shown in Fig. 14.

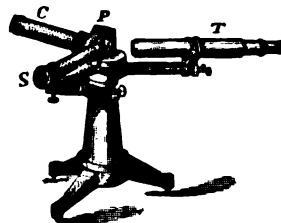


FIG. 12.

At the hands of Hofmann and of

Krüss and others, the chemical spectroscope has undergone many improvements, among which may be mentioned the introduction of direct-vision prisms and of a scale reading directly in wave-lengths. Fig. 15 shows such an instrument, with diagram of its parts. In the microspectroscope also, or spectroscopic eyepiece, direct-vision prisms are used and the direct-reading scale. This instrument indeed is simply a direct-vision spectroscope of small proportions and adapted to the eyepiece of the compound microscope. In Fig. 16 the cross-section of a microspectroscope is shown, with prism (p) for introduction of a reference spectrum and a scale (s).

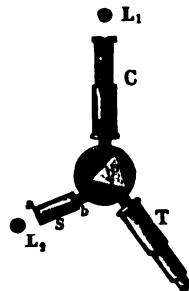


FIG. 13.



FIG. 14.

Spectroscopes for the Infra-red and the Ultra-violet.—For the study of the invisible spectrum spectroscopes of the usual forms are ill adapted. Various special types have accordingly been developed.

In the infra-red the conditions are transparency to the longer waves and sufficient dispersion of that part of the spectrum. Rubens uses in such work an instrument with a prism of fluor-spar. Lenses are dispensed with altogether in favor of concave mirrors, which bring the spectral image to a focus upon the filament of a linear bolometer.

In the ultra-violet, where the method is photographic, the best results are obtained by the use of the concave grating of Rowland.

Brashear, in his grating spectroscope for the ultra-violet, mounts grating (G) and plate-holder (P) at the ends of a rigid bar (B, Fig. 17). The grating is placed upon a car with two wheels, which runs along

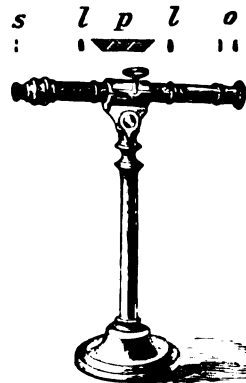


FIG. 15.

a metal track, $S R_1$. This track extends from the slit in the incident ray. Another track ($S R_2$) at right angles to the

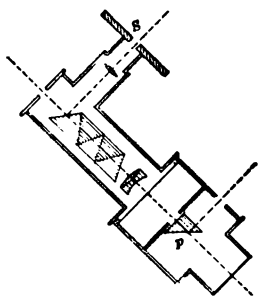


FIG. 16.

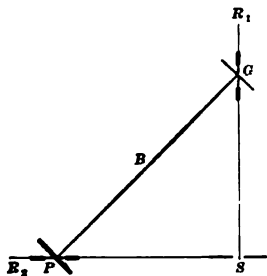


FIG. 17.

first carries a plate-holder. The bases upon which grating and plate-holder are mounted are pivoted to the cars on which they are placed, so that the bar can be brought to any angle with the incident ray, both grating and plate-holder remaining

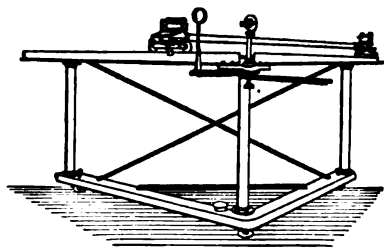


FIG. 18.

always normal to the direction of the bar and at the same distance apart. The law of the grating is such that if the distance between the grating and plate is equal to the radius of the curvature of the former the spectrum will be in focus upon the plate in all positions of the bar. The light to be investigated is focused upon the slit by means of a quartz lens or sometimes by a concave mirror of long focus. Fig. 18 shows the general form of the apparatus.

A description of some of the varied applications of the spectroscopy is given in the article SPECTRUM (q. v.); see also SPECTROPHOTOMETER; also the various treatises named at the end of the former article.

E. L. NICHOLS.

Spectrum [= Mod. Lat., from Lat. *spectrum*, appearance, image, apparition, deriv. of *specere*, look at]: in optics, the image obtained when a ray after dispersion, either by passage through a prism or by diffraction, is brought to a focus. The composite nature of light, through which a spectrum is possible, is explained in the article LIGHT.

The first systematic studies of the spectrum were made by Newton, 1666, and it was he who appears to have first recognized the supreme importance of the phenomena encountered in such observations. Modern spectroscopy, however, may be regarded as having its beginning in the experiments of Fraunhofer, who in 1817, by the use of a narrow slit, first produced well-defined and pure spectra.

The essential parts of the apparatus for the production of such a spectrum are (1) a slit illuminated from behind; (2) a dispersing device (usually a prism or a diffraction grating); (3) a focusing device (a lens or system of lenses, or sometimes a mirror); (4) a screen or an observing telescope, according to the method to be pursued in studying the spectrum.

In Fig. 1 is shown a slit through which light of a wave-length, λ , passes in the direction indicated by the arrow.

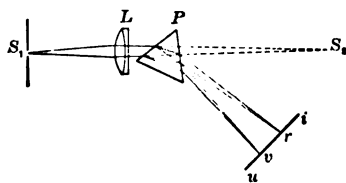


FIG. 1.

But for the interposition of the prism P, the lens L would produce an image of the slit S_1 at the conjugate focus S_2 . The prism, however, diverts the ray, and it comes to focus upon the screen t, u . The position of this refracted image depends upon the wave-length. If, for example, the wave-length is one which produces the impression of red upon the retina it will come to focus at r ; if of violet, at v . If the ray passing through the slit be of white light, the entire space between r and v , which we may suppose to be respectively the longest and the shortest rays capable of affecting

the eye, will be filled by colored images of the slit, each differing insensibly from its neighbors in hue. This infinite series of elementary images constitutes what is called a continuous spectrum. Each image has a width proportional to that of the slit, but the centers of contiguous members of the series are only infinitesimally distant from one another. Neighboring images overlap, therefore, with consequent color-mixing.

A pure spectrum, in the language of the spectroscopist, is one in which the effect of this color-mixing by fusion of the overlapping images is absent. In a strict geometrical sense a pure spectrum would be produced only by the use of a linear slit. The successive elementary images differ from one another, however, only infinitesimally in color, and a definite finite difference must exist before the effect of the blended images upon the retina will differ from that of their components. In practice the spectra produced by the dispersion of the light from any narrow slit (up to perhaps .05 cm. for an ordinary spectroscope) may be regarded as pure. The distribution of wave-lengths, and consequently of colors, in the prismatic spectrum is determined by what is called the law of dispersion of the prism. It has not been found possible to give a general expression to this law, applicable to all substances. The phenomenon of dispersion differs indeed in various transparent media, such as calcite, fluorite, rock-salt, quartz, etc., in ways the explanation of which has not yet been attained. In glass, which is an artificial mixture with varying components, the dispersion is to a considerable extent under the control of the maker.

For any particular case the dispersion can be indicated graphically in a simple manner. An important example is that of an equiangular prism of flint glass, the dispersion diagram of which appears in Fig. 2. The ordinates of the

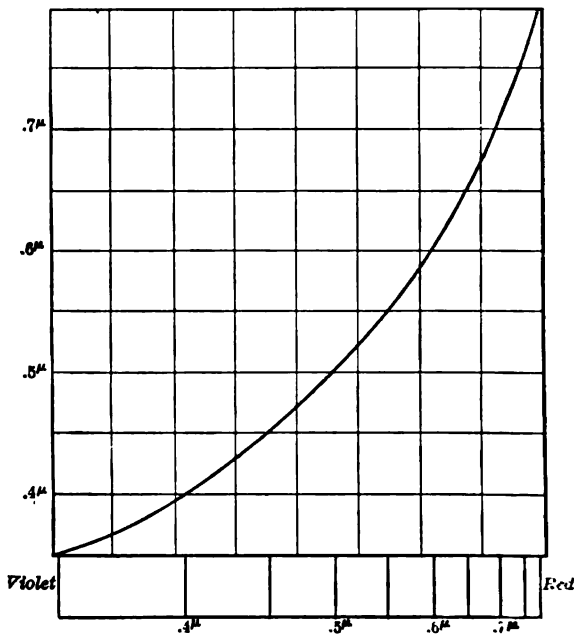


FIG. 2.

curve are wave-lengths in millionths of a meter; the abscissae are distances in passing through the spectrum from violet to red. The vertical lines at the base of the diagram show by their distances apart the relative spaces which exist between wave-lengths 0.40 μ , 0.50 μ , etc.

While this diagram applies only to a particular specimen of glass, it is characteristic to a certain extent of nearly all cases of prismatic dispersion, the peculiarity of which is the increasing separation of the rays as the wave-length diminishes, so that the red end of the spectrum is relatively much more crowded together than the violet end.

The diffraction spectrum (normal spectrum) is produced by means of apparatus, of which that shown in Fig. 3 is typical. The diagram gives only the essential parts, which are the same as those in Fig. 1, with the exception that a reflecting diffraction grating (G) is used instead of a prism. This grating, according to modern practice, would consist of a plate of speculum metal, the surface of which is accu-

ately ground to form a plane mirror, or sometimes a concave mirror with a radius of several feet. Upon this surface are ruled straight equidistant lines to the number of several thousand per centimeter. The process is that described in

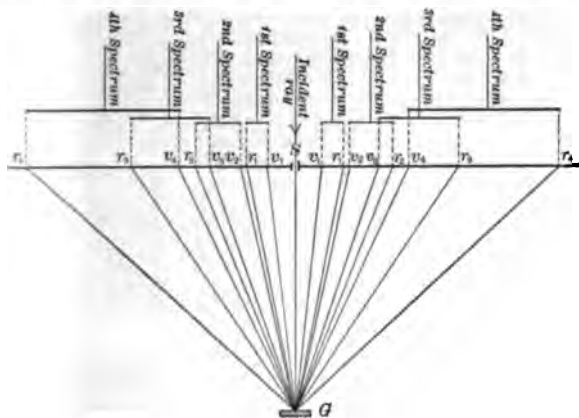


FIG. 3

the article **RULING-MACHINES** (q. v.). If monochromatic light from the slit falls upon this ruled surface, it is sent back by reflection from the lines in all directions, in a plane perpendicular to the ruling and to the face of the mirror, and diffraction-bands are formed. These are alternately black and of the color of the light. The law of the position of the colored bands, which are distributed symmetrically with reference to a plane normal to the grating, parallel to the ruling and passing through the slit, is given by the equation

$$\sin \alpha_n = \frac{n\lambda}{a+b}$$

In this formula α_n is the angle that the rays which go to form the n th band of the series make with the incident ray from the slit, λ is the wave-length, while n may be 1, 2, 3, or 4, etc., according to the number of the band which we are considering. The quantity $a+b$ is the distance from the edge of one line upon the grating to the corresponding edge of the next— a being the width of the line, and b the unruled space between it and the next line. The position of the bands with reference to the slit S and the grating G is shown in Fig. 3 (r_1, r_2, r_3 , etc.).

If the light which enters the slit be violet instead of red, the diffraction bands will have positions nearer the slit (v_1, r_2, v_3 , etc.). If white or other composite light be used overlapping diffraction images of the slit will be produced, and these will be so arranged with reference to each other as to form as a series of spectra on either side of the slit.

If, as in the discussion of the prismatic spectrum, we take r_1 , etc., to represent the longest visible wave-length, and v_1 , etc., the shortest, we shall have the intervening spaces in the diagram, viz., $v_1 - r_1, v_2 - r_2, v_3 - r_3$, etc., occupied by spectra. These are called for convenience spectra of the first, second, third, etc., order. It will be noticed that with the exception of the first and second all the spectra overlap.

The formula given above defines completely the position and character of the spectra produced by a grating. It will be seen, for example, that the distance out from the slit to the position occupied by any given wave-length, measured by the sine of the angle α , is proportional to the wave-length. The violet end of the diffraction-spectrum is therefore always nearest the slit. The distribution of wave-lengths throughout the spectrum, moreover, is a uniform one, instead of varying as in prismatic spectra. It is on account of this property that the name *normal spectrum* is applied to a spectrum produced by means of a grating. It is obvious from the formula likewise that $\sin \alpha$ for a given wave-length is directly proportional to the number of lines in a centimeter contained upon the grating, so that the dispersion is entirely a question of the fineness of the ruled surface.

Advantages and Disadvantages of Diffraction-spectra.—The chief advantage of the diffraction-spectrum lies in the simplicity of the law of distribution of wave-lengths. On this account it affords much the best means for the accurate measurement of wave-lengths. It is also a great advantage

to be able to secure any desired degree of dispersion without recourse to the complication and inconvenience arising from the use of a train of prisms. On the other hand, the prismatic spectrum, by equal dispersion, is much more intense, since all the dispersed light goes to the formation of a single spectrum instead of a double series of spectra, and because the losses by reflection, etc., are much less important. Spectra furnished by gratings, moreover, show vagaries in the distribution of intensities, which depend in a complicated manner upon the nature of the ruling. Certain spectra will be very weak or altogether missing, others of abnormal brilliancy. Some spectra will be strong in a certain color and faint in others, etc. The consequence is that diffraction-spectra are ill fitted for use where the question of the relative intensity of the various wave-lengths of a source of light is to be determined.

Classes of Spectra.—Thus far those spectra have been considered in which all wave-lengths between the extreme red and the extreme violet are present. Such spectra are produced by the radiation from glowing solids or liquids; they are called *continuous spectra*.

Where the source of light is an incandescent vapor or gas, radiation is confined to one or more definite wave-lengths. Spectral images corresponding to these wave-lengths only are present in the spectrum, which consists of a group of bright lines, each possessing the color due to its particular wave-length. The intervals lying between are black. Such spectra are called *bright-line spectra*.

A third and very important class of spectra consists of those produced by the passage of light (which would otherwise form a continuous spectrum) through an absorbent medium. This medium may be a solid or liquid, or it may be a vapor. In accordance with the law of Kirchhoff, there is, however, a perfectly definite relation between radiation and absorbing power. Each material, in a word, absorbs the precise wave-length or wave-lengths which it is capable of radiating, and in the same proportion. Gases and vapors, therefore, cut out well-defined and perfectly monochromatic lines from the transmitted light, and thus produce what are called *dark-line spectra*. Solids and liquids, on the other hand, absorb selectively and continuously throughout extended regions, and the spectrum of the rays transmitted by them is crossed by dark transverse bands, varying in position and width and also in density and sharpness of definition according to the character of the medium. Frequently the absorption is such as to weaken or destroy one end of the spectrum instead of producing a band.

Relation of Bright-line and Dark-line Spectra: the Fraunhofer Lines.—When, in 1817, Fraunhofer made the first application of the narrow slit to the analysis of sunlight, he observed that the solar spectrum was crossed by numerous fine black lines. Repetition of the experiment showed him that these lines were always present, and that they were always in the same positions. Fraunhofer made a map of the spectrum in which he designated some of the lines alphabetically. It is by the letters which he assigned

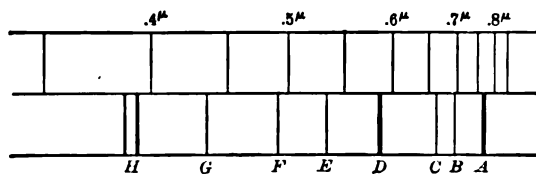


FIG. 4.

to them that they are still known. Fig. 4 shows the positions of a few of the most important Fraunhofer lines in the prismatic spectrum. The wave-lengths are given in the following table:

TABLE I.

Wave-lengths, in millionths of a meter, of the principal Fraunhofer lines. Rowland's values to four places.

Line.	Wave-length.	Line.	Wave-length.
A.....	0.7594 μ	E.....	0.5270 μ
B.....	0.6867	F.....	0.4861
C.....	0.6563	G.....	0.4308
D.....	(0.5896 (D_1))	H.....	(0.3908 (H_1))
	(0.5890 (D_2))		(0.3833 (H_2 or K))

It was nearly half a century after Fraunhofer's observations before the cause of the dark lines in the solar spectrum was determined and their supreme importance in the science of spectroscopy was appreciated. In the meantime the bright-line spectra obtained from the burning vapors of

various metals had been described, and finally, about the middle of the century, certain coincidences of position having been noticed, it began to be suspected that there was some connection between the two classes. Finally Kirchhoff and Bunsen in Heidelberg took the matter up, and by means of an exhaustive series of experiments demonstrated that the dark lines of Fraunhofer are produced by absorption, by the sun's atmosphere, and by that of the earth; also that the materials producing absorption in the sun's atmosphere are, in part at least, identical with those which go to form the crust of the earth. The proof is based in part upon the celebrated experiment of the reversal of the sodium lines, which consists essentially in placing in the path of the rays from any incandescent source of light which



FIG. 5.

In front of an arc-lamp (A, Fig. 5) is placed a condensing lens (C), a vertical slit (S), an object-lens (O), and a prism (P). The lamp A should be tipped back so as give the bright continuous spectrum of the light from the crater of the upper carbon. Before the slit, at *b*, a Bunsen burner is placed, into the flame of which metallic sodium is introduced. The sodium vapor thus produced rises into the path of the ray from A and absorbs light of wave-lengths 5890 and 5896, to which rays it is opaque.

In the spectrum upon the screen *ab* two dark lines are formed, but these lie so close together that under ordinary conditions they are merged into a single heavy black band.

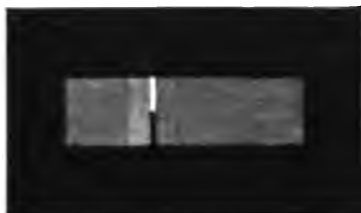


FIG. 6.

By slight modifications of the apparatus it is possible to project upon the screen, one above another, spectra containing the bright line due to incandescent sodium, superimposed upon a continuous spectrum, and the artificially produced Fraunhofer

line D, and thus to note the precise coincidence in the positions of the two. See Fig. 6.

The direct evidence of experiments like the above was supported by measurement of the position of thousands of dark lines in the solar spectrum and of the positions of the thousands of lines obtained by the incandescence of the various chemical elements. The comparison of the two showed the identity of many of the solar lines with those of well-known terrestrial substances. In the cases of metals possessing complicated-line spectra, such as iron, nickel, and calcium, the number of lines in coincidence was so great as to preclude all question of agreement by chance.

A most important example is afforded by the metal iron,

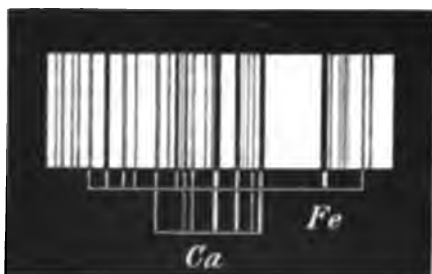


FIG. 7.

in the spectrum of the vapor of which hundreds of lines have been mapped and found to coincide with solar lines.

Kirchhoff and Bunsen explored the entire visible spectrum in the most painstaking and precise manner, measur-

ing the position of thousands of lines in the spectrum of the sun and in those of the different elements. For this purpose they used a spectrometer with a train of four prisms. The results were mapped upon a large scale. Ångström and Thalen made a set of equally careful measurements and produced maps agreeing well with that of the former servers. By the use of concave gratings and photographic plates Rowland has since been able to obtain absolute values of wave-lengths much more accurate than any hitherto made by the system of hand measurements, while Abney and also Cornu, likewise by photographic methods, have extended the spectrum map to regions lying far beyond the limits of visibility in the direction of the red and of the violet. Fig. 7 shows a small portion of the solar map (in the green), which contains lines due to the vapors of iron and of calcium. The coincidence of these with certain bright lines in the spectra of those metals is also indicated.

The application of spectrum analysis in astronomy has led to extraordinary extensions of our knowledge of the chemical constitution and physical condition of the sun, and even of fixed stars, comets, and nebulae. The attachment of the spectroscopic eyepiece to the telescope, for example, has made it possible to explore the surface of the sun in detail with reference to its constitution. Only a few of the numerous striking and beautiful results obtained in this field of research can be mentioned here.

Spectrum of the Chromosphere and Protuberances.

—If the telescope be so adjusted that the field of view, through the slit of the spectroscopic eyepiece (the slit being perpendicular to the limb of the sun), comprises a portion of the sun's face, the chromosphere, with a protuberance, and the sky lying beyond the limits of the latter, as shown in Fig. 8, a triple spectrum will be formed: (1) The spectrum of the photosphere, consisting of the continuous spectrum of the underlying molten constituents of the body of the sun, crossed by the black lines produced by passage through the cooler gases of the solar atmosphere; (2) the spectrum of the protuberance, which consists of the bright lines of the cooler gases corresponding to C and F of Fraunhofer, and a line known as D₃. Until 1895 it was believed that this line had no counterpart among the lines of terrestrial elements, and it was accordingly ascribed to a hypothetical solar element to which the name *helium* was given. In that year, however, the chemist Ramsay announced the discovery of the helium line in the spark discharge of a gas obtained from cleveite, a mineral found in Norway. This bright spectrum is superimposed upon a faint solar spectrum of the usual character, due to diffused or stray sunlight. (3) Diffused sunlight also fills the remainder of the slit, which otherwise would have for its field the blackness of space, so that beyond the limits of the chromosphere we can still distinguish the faint spectrum to which reference has just been made.

This method makes it possible to determine the height to which a given constituent of the chromosphere, such as hydrogen, rises above the limb of the sun, the temperature under which it exists, and even the motions which it undergoes.

The hydrogen-line (F), for example, seen through a narrow slit, the field of which extends across the sun, into and through the chromosphere, sometimes appears as a doublet, the line being reversed at the limb and converging to a point. This effect is indicative of the pressure. Frequently the reversed line of the chromosphere is distorted in a manner of which Fig. 10 is typical. A displacement shows that the glowing gases are moving.



FIG. 8.

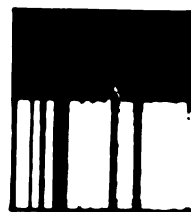
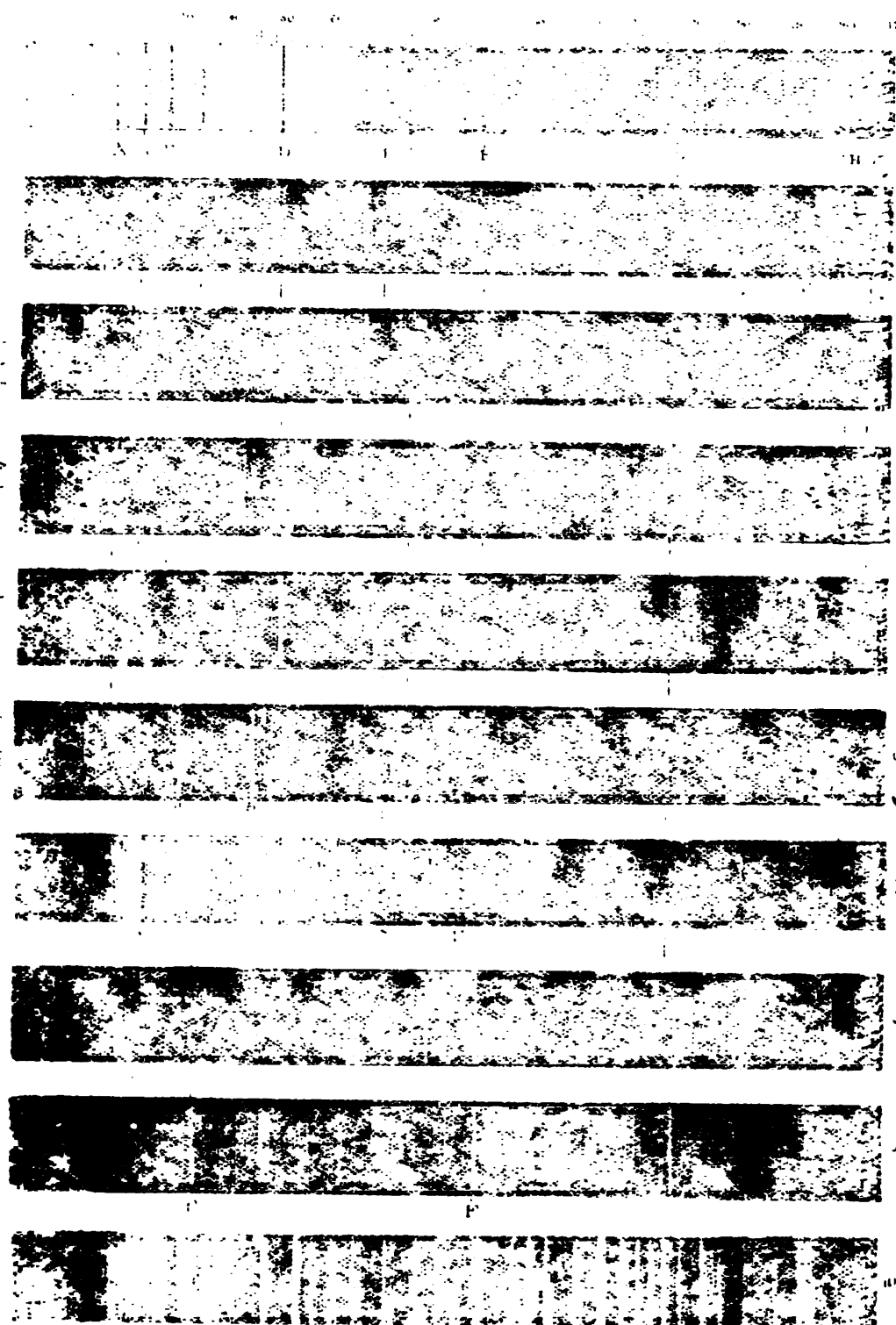


FIG. 9.

TABLE OF THE SOLAR AND SOME OTHER SPECTRA.



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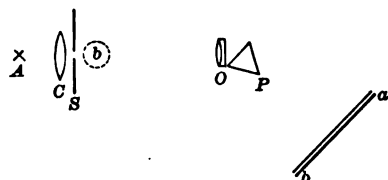


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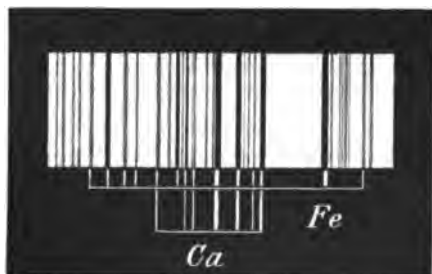


Fig. 7.

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Fig. 8.



Fig. 9.

THE HISTORY OF THE UNITED STATES OF AMERICA

CHAPTER I. THE DISCOVERY OF AMERICA.

SECTION I. THE DISCOVERY OF AMERICA.

SECTION II. THE DISCOVERY OF AMERICA.

SECTION III. THE DISCOVERY OF AMERICA.

SECTION IV. THE DISCOVERY OF AMERICA.

SECTION V. THE DISCOVERY OF AMERICA.

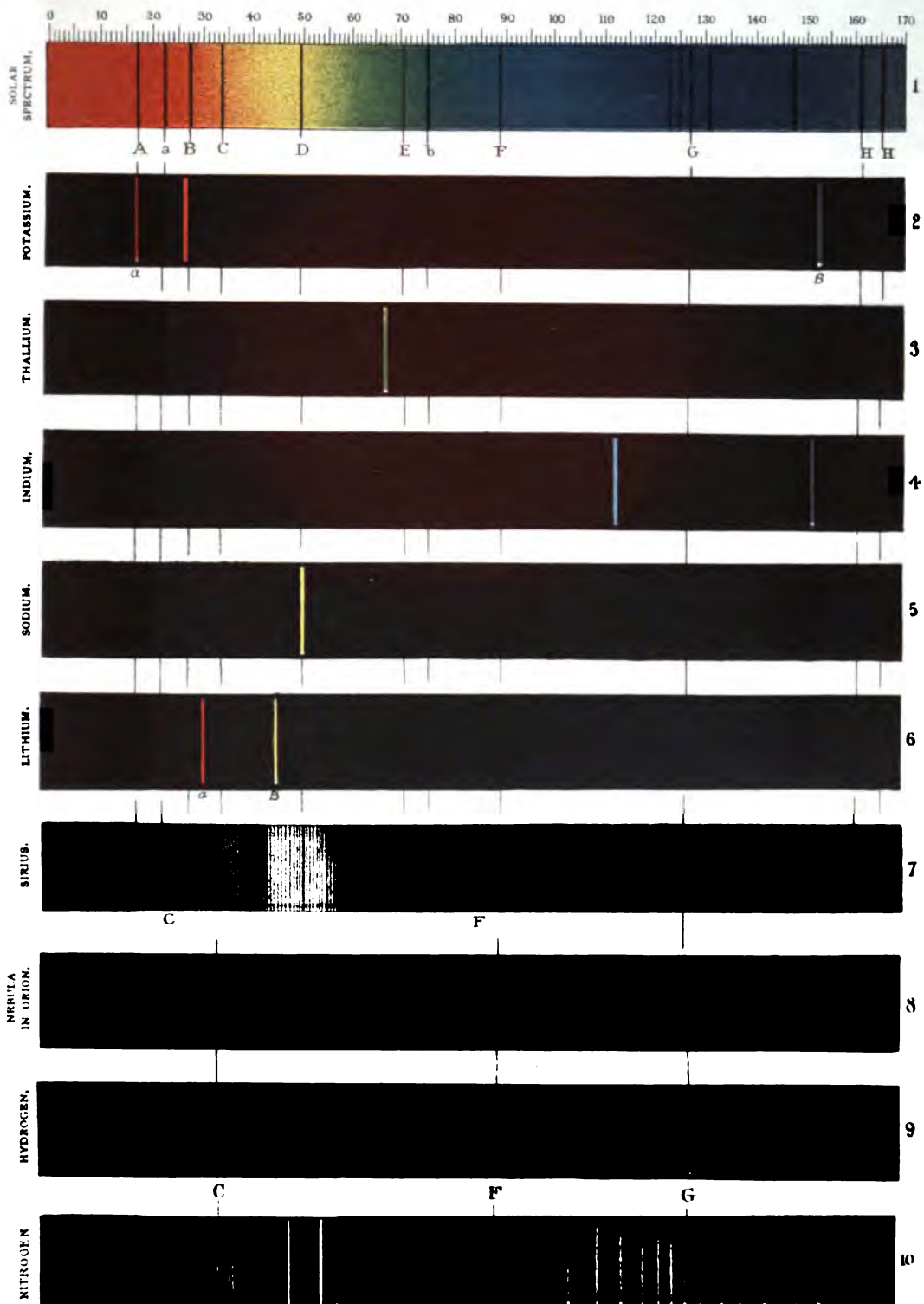
SECTION VI. THE DISCOVERY OF AMERICA.

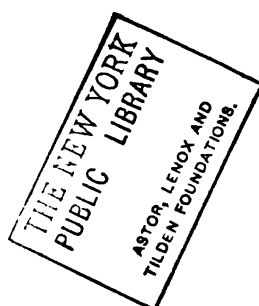
SECTION VII. THE DISCOVERY OF AMERICA.

SECTION VIII. THE DISCOVERY OF AMERICA.

SECTION IX. THE DISCOVERY OF AMERICA.

TABLE OF THE SOLAR AND SOME OTHER SPECTRA.





toward the observer (when the displacement is to the violet) or away from him (when the displacement is toward the red).



FIG. 10.

The same displacement of the lines in the spectra of fixed stars is used in computing the component of their velocity which lies in the line of sight.

The spectra of nebulae and comets show for these bodies a gaseous constitution. Instead of a continuous spectrum with absorption lines, we find in the case of the former class two or three bright lines, ascribable to hydrogen and nitrogen. (See Fig. 11.) Comets also show bright bands which correspond in position to the groups of lines which constitute the spark spectrum of the hydrocarbons. See Fig. 12.

Applications to Chemical Analysis.—The fact that each



FIG. 11.

metal when vaporized and heated emits light of certain definite wave-lengths affords an important means of detecting its presence.



FIG. 12.

The method is used chiefly for the determination of the alkaline metals and the metals of the alkaline earths, since these almost without exception can be made to give their characteristic colors at the temperature of the Bunsen flame. For such purposes a



FIG. 13.

one-prism spectroscopy with an arbitrary scale is commonly used, and the bright lines are mapped with reference to that scale. No accurate determination of wave-lengths is necessary, since the object is simply to recognize the existence of certain well-defined lines, or groups of lines, and to distinguish them from one another. Fig. 13 shows the grouping of lines in the prismatic spectra of the most important of the above-mentioned classes of metals.

Spectrum analysis by means of the bright lines of the elements is a qualitative method of the greatest delicacy.

In the case of the metals easily volatilized in the Bunsen burner it is possible, according to the determinations of Kirchhoff and Bunsen, and of Simmler, of Cappel, and others (see Kayser, *Lehrbuch der Spektral Analyse*, p. 88), to detect the following minute quantities:

TABLE II.

Metal.	Amount detected, grammes.	Metal.	Amount detected, grammes.
Caesium.....	4.00×10^{-8}	Strontium.....	3.33×10^{-8}
Rubidium.....	1.43×10^{-7}	Calcium.....	2.00×10^{-8}
Potassium.....	3.33×10^{-7}	Manganese.....	1.2×10^{-6}
Sodium.....	7.16×10^{-11}	Iodine.....	5.00×10^{-7}
Lithium.....	1.66×10^{-9}	Thallium.....	2.00×10^{-8}
Barium.....	5.00×10^{-7}	Copper.....	3.5×10^{-8}

The spectrum of the metals depends to a great extent upon the temperature of the incandescent vapor. Heating does not shift the position of the lines, but it increases their brilliancy and brings into view new ones, which had been too weak to be seen in the spectrum of the cooler vapor. Sodium, for example, which in the Bunsen flame shows only the well-known double line D, has been found by Liveing and Dewar to possess at higher temperatures at least seven other pairs of lines distributed throughout the spectrum from red to violet. A convenient method of getting high-temperature spectra consists in volatilizing the metals in the electric spark. In this way the brilliancy of the spectrum is enhanced, and new metals, too refractory for vaporization at flame-temperatures, are made amenable to the methods of spectrum analysis. The delicacy of the method of the spark-spectrum, in the case of various metals, many of which give no line-spectrum whatever in the Bunsen flame, is given in table III.

TABLE III.

Metal	Amount detected, grammes.	Metal.	Amount detected, grammes.
Caesium.....	2.5×10^{-7}	Cobalt.....	6.66×10^{-8}
Rubidium.....	1.00×10^{-6}	Nickel.....	1.66×10^{-6}
Potassium.....	2.5×10^{-6}	Iron.....	3.84×10^{-6}
Lithium.....	2.5×10^{-11}	Thallium.....	1.25×10^{-11}
Barium.....	1.11×10^{-11}	Cadmium.....	5.55×10^{-8}
Strontium.....	1.00×10^{-11}	Lead.....	5.00×10^{-8}
Calcium.....	1.00×10^{-10}	Bismuth.....	1.43×10^{-8}
Magnesium.....	2.00×10^{-9}	Copper.....	5.00×10^{-8}
Chromium.....	2.5×10^{-10}	Silver.....	8.33×10^{-8}
Manganese.....	5.00×10^{-9}	Mercury.....	1.00×10^{-7}
Zinc.....	1.66×10^{-9}	Gold.....	2.50×10^{-7}
Iodine.....	1.11×10^{-8}	Tin.....	5.88×10^{-8}

Absorption Phenomena by Transmission through Solids and Liquids.—Spectrum analysis is not confined to the detection of elements by means of the bright lines of their emission spectra and the corresponding black lines in the spectra of the sun and stars. It makes use also of the selective absorption which light suffers when transmitted through various solids and solutions. In cases in which the absorption is confined to certain definite regions dark bands are formed, the position of which indicates the character of the absorbing medium, while the density and width of the



FIG. 14.

bands enables the experimenter to estimate the strength of the solution with considerable accuracy. Well-known cases are those of chlorophyll and blood, the spectra of which are shown in Fig. 14. Cerium, didymium, and other of the

rare earths lend themselves peculiarly to this method, on account of the sharpness of their bands. (See Fig. 15.) When



FIG. 15.—Absorption bands due to didymium.

small dispersion is used some of the narrower bands might easily be mistaken for true Fraunhofer lines, but higher dispersion shows them in their true character.

Even when no sharply marked bands are produced a spectrophotometric study of the absorption spectrum often

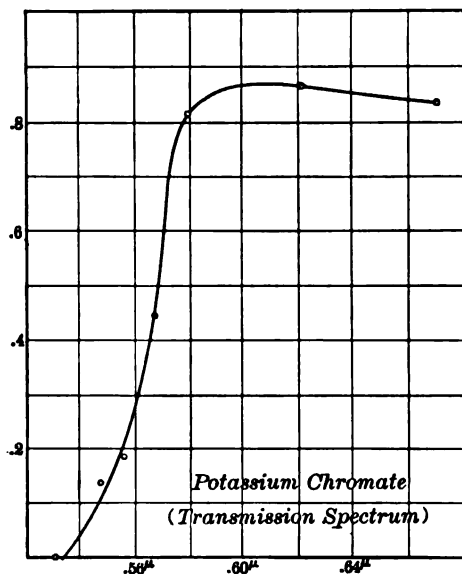


FIG. 16.

affords definite information concerning the character of the transmitting medium. A solution of potassium chromate, for example, submitted to measurement gave the curve of brightness shown in Fig. 16, in which abscissas are wave-lengths and ordinates are percentages of light transmitted. Pigments, viewed by reflected light, give spectra, likewise capable of spectrophotometric analysis and characteristic of the chromatic properties of the material. Figs. 17a and 17b

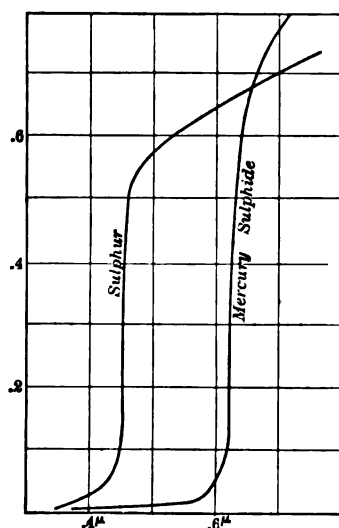


FIG. 17 a.

of a glowing body at different stages of incandescence and comparison of the same, wave-length by wave-length, with the spectrum of a standard lamp, the development of radiation with rise of temperature can be definitely determined.

Fig. 18 shows the results of such an investigation of the spectrum of platinum between 700° C. and 1,000° C. The ordinates are ratios of the brightness of the platinum spectrum to that of the standard lamp, which was an electric glow-lamp maintained as nearly as possible at a temperature of incandescence corresponding to that of a luminous gas-flame. The adjustment was such that the brightness of the platinum spectrum at 1,000°, wave-length 59μ, was equal to that of the corresponding wave-length in the spectrum of the standard.

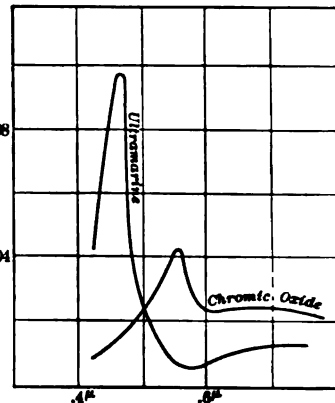


FIG. 17 b.

Invisible Parts of the Spectrum (the Infra-red and Ultra-violet).—When a spectrum is produced by refraction or diffraction, the only rays capable of affecting the retina lie between wave-lengths 39μ and 76μ. Rays of wave-lengths both longer and shorter than the above are present, however, and these constitute the *invisible spectrum*. Waves greater than 76μ find positions lying beyond the extreme limit of the red. They form what is termed the region of the *infra-red*. Waves shorter than 39μ are all more strongly refracted than the rays of the visible spectrum. They lie beyond the limits of the violet and constitute the *ultra-violet* spectrum.

In the investigation of these invisible rays indirect methods have to be used. For the infra-red the rays may be allowed to fall upon some surface which becomes luminescent (phosphorescent) under their action. This is the method used by Draper, by Becquerel, and by Lommel and others.

The result of this process is to cause those portions of the luminescent surface upon which the infra-red rays fall to shine, while the other portions remain dark. In this way the intenser portions of the infra-red spectrum can be explored, and if the law of the dispersion apparatus is known they can be mapped.

It is possible also, as has been shown by Abney, to obtain photographic plates which are sensitive to long wave-lengths, and by the use of these to photograph a considerable portion of the infra-red spectrum.

The most complete method of studying the invisible regions beyond the red consists in measuring the intensity of the rays directly by means of their heating effect. For this purpose Fizeau and Foucault used thermometers; Laman-sky, Mouton, Dessains, Nichols, and others the linear thermopile; Langley, Ångström, Snow, Paschen, and many other observers the bolometer.

By these various methods it is known that the region of the infra-red is similar to the visible region of the spectrum in nearly every particular, but that it comprises a very much greater range of wave-lengths. While the visible spectrum is all included within about an octave, the bolometer gives evidence of waves more than ten times as long as the longest visible ray. If the spectrum of an incandescent solid be explored by means of thermopile or bolometer, the infra-red spectrum will be found to be continuous, the intensities rising to a maximum in some region, the wave-length of which depends upon the temperature of the source. See Fig. 18, which gives Langley's curve of intensities in the spectrum of a luminous gas-flame.

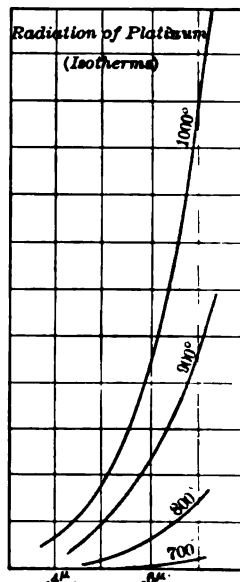
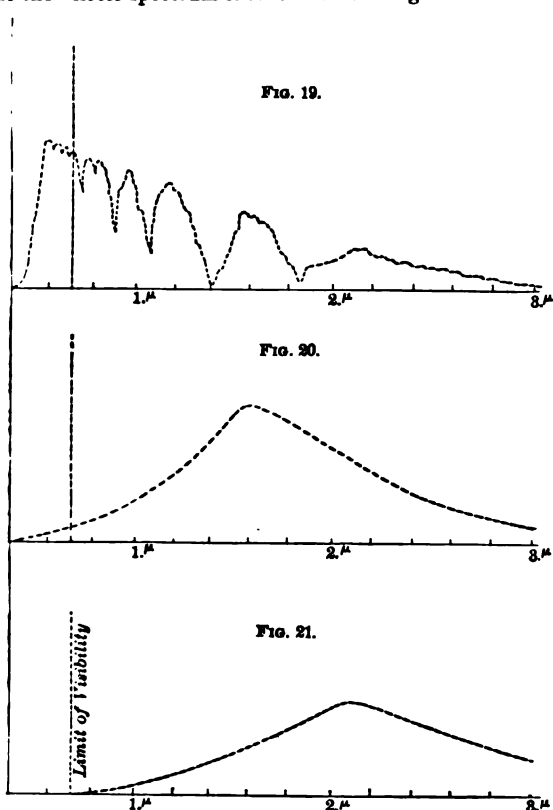


FIG. 18.

If the source have a temperature below the red heat an infra-red spectrum will still be found to exist, the intensities of which are all less and the maximum in a region of greater wave-length. The curve of intensities, moreover, will disappear on the side toward the red, before the boundary of the visible spectrum is reached. See Fig. 21.



FIGS. 19, 20, and 21, showing the curves of intensities of sunlight, of gas flame, and of a solid below red heat, respectively.

If the source be sunlight we find its spectrum crossed by dark lines and also by bands due to absorption on the part of the atmosphere of the earth. The curve then appears as in Fig. 19, which is also from measurements by Langley.

If the source be a metallic vapor the bolometer indicates the extension of a bright-line spectrum characteristic of that metal throughout the infra-red. Fig. 22 is a diagram giving the results of bolometric exploration of the spectrum of potassium, made by Snow. Abscissas are wave-lengths and

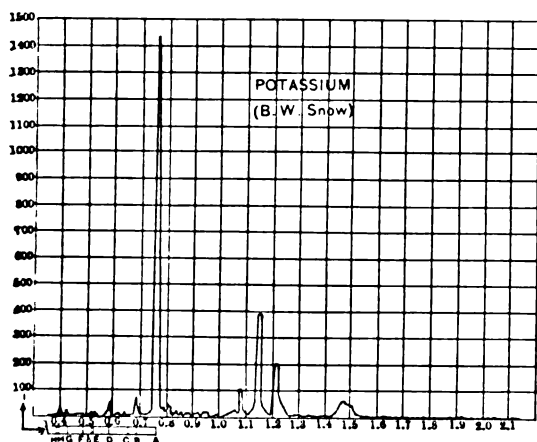


FIG. 22.

ordinates are intensities. It will be seen that there are three bright lines between 1.0μ and 1.3μ , and probably a group of lines, which could not be resolved by means of the bolometer, in the region 1.5μ .

In the ultra-violet region of the spectrum the intensity of radiation is too small to admit of the general use of bolometric measurements. These shorter wave-lengths are, however, readily studied by photography, and they can also be rendered visible by the use of a luminescent (fluorescent) substance, as has been shown by H. Becquerel, Soret, and others. Among the materials which give back visible rays when exposed to the action of the ultra-violet are chlorophyll solution, petroleum, various coal-tar dyes in solution; also uranium-glass and some sorts of fluor-spar. See FLUORESCENCE.

Of the two methods, the photographic is by far the more complete and satisfactory. By means of the sensitive plate and the concave grating, maps giving every detail may be obtained. If the apparatus be of such a character that the rays pass through glass, the spectrum will seem to come to an end in the neighborhood of $.32\mu$, because glass becomes opaque to still shorter wave-lengths. If quartz lenses be substituted, or if concave mirrors be used instead of lenses, the map can be extended even further beyond the violet.

The results of investigations in the ultra-violet, as in the case of those upon the infra-red of the spectrum, show that no sudden changes take place as we pass beyond the limit of visibility. Sunlight, in the ultra-violet, still shows a continuous spectrum crossed by a multitude of dark lines: glowing vapors, such as those of the electric arc, show groups of lines which to an eye capable of vision in such rays would constitute a bright-line spectrum of the usual type.

See, further, article SPECTROSCOPE; also Schellen, *Spectrum Analysis*; Roscoe, *Lectures on Spectrum Analysis*; and the works of Lockyer, Huggins, Langley, Vogel, K. Ångström, Abney, H. Becquerel, Soret, etc. E. L. NICHOLS.

Spectrum Analysis: See SPECTROSCOPE and SPECTRUM.

Speculation: See POLITICAL ECONOMY.

Speculum [Lat., mirror]: in optics and astronomy, a reflecting surface, usually of metal, though the term has also been frequently applied to unsilvered glass since the introduction of silvered-glass telescopes by Foucault and Steinheil in 1857. See TELESCOPE.

Spedding, JAMES: scholar; b. near Bassenthwaite, Cumberland, England, in June, 1808. He studied at Trinity College, Cambridge, of which college he was afterward made an honorary fellow; graduated in 1831. His life-work was the study and exposition of Bacon, begun by a pitiless exposure of Macaulay's showy and inaccurate essay on Bacon, *Evenings with a Reviewer* (privately printed in 1848 and reissued in 1882). His great edition of the *Works of Francis Bacon* was published in 7 vols. in 1857-59. In this he was assisted by R. L. Ellis and D. D. Heath. In 1870-76 he published a *Life and Letters of Francis Bacon*, including all his occasional writings, also in 7 vols.; and in 1878 *Life and Times of Francis Bacon* (2 vols.). Besides his work on Bacon he was the author of *Publishers and Authors* (1867) and *Reviews and Discussions* (1869). D. in London, Mar. 9, 1881. H. A. BEERS.

Speech: See LANGUAGE and ACOUSTICS (*The Voice*).

Speed, JAMES: lawyer; b. in Jefferson co., Ky., Mar. 11, 1812; graduated at St. Joseph's College 1828; studied law at Transylvania University; began its practice at Louisville 1833; was a member of the Legislature in 1847, State Senator 1861, U. S. Attorney-General Nov., 1864-July, 1866, and in the same year was chosen president of the Philadelphia Loyalists' convention; was Professor of Law in the University of Louisville. D. at Louisville, Ky., June 25, 1887.

Speed, JOHN: antiquary; b. at Farrington, Cheshire, England, in 1542; was a tailor in London until late in life, but at the same time was amassing an extensive knowledge of English antiquities, and was enabled by Sir Fulke Greville to publish a costly and valuable series of works. He published anonymously about 1590 a treatise on the *Genealogies of the Scriptures*, afterward prefixed to the first edition of King James's Bible (1611), but his first appearance as an author was in 1608, when he printed fifty-four maps of various counties and cities, and engravings of antiquities of England and Wales, which were incorporated into *The Theatre of the Empire of Great Britain* (folio, 1611). In the same year he published his *History of Great Britain under the Conquests of the Romans, Saxons, Danes, and Normans*. D. in London, July 28, 1629.

Speedwell: a plant of the genus *Veronica* of the family *Scrophulariaceae*. The species are very numerous, comprising annual and perennial herbaceous plants and small shrubs,

natives of temperate and cold climates in all parts of the globe, some of them growing in wet ditches or in marshes, others on the driest soils, but all having very beautiful blue, white, or pink flowers. Revised by CHARLES E. BESSEY.

Spelchorn, or Spichern: See SAARBRÜCKEN.

Speler: See SPEYER.

Speke, JOHN HANNING: explorer; b. at Jordans, Somersetshire, England, May 4, 1827; entered the army in 1841; served in India and in the Crimean war; accompanied Capt. Richard F. Burton in the expedition which resulted in the discovery of the great lakes of Central Africa, and afterward was at the head of another expedition (with Capt. Grant) which discovered the connection of the Nile with those lakes. Capt. Speke published a *Journal of the Discovery of the Source of the Nile* (1863), and *What Led to the Discovery of the Source of the Nile* (1864); received gold medals from the geographical societies of France (1860) and England (1861), and from the King of Italy; and was engaged after his second expedition in a bitter controversy with Capt. Burton as to the merits of their respective discoveries. He accidentally shot himself near Bath, Sept. 15, 1864, and died on the same day.

Revised by M. W. HARRINGTON.

Spelman, Sir HENRY: antiquary; b. at Congham, Norfolk, England, in 1562; graduated at Cambridge about 1580; studied law at Lincoln's Inn, but devoted himself chiefly to archaeology; was in 1604 high sheriff of Norfolk; was employed by James I. upon important commissions; was knighted about 1612, in which year he withdrew from public business and settled in London; published his treatise *De Non Temerandis Ecclesiis; of the Rights and Respects due to Churches* (1613). D. in London in 1641, and, by special order of Charles I., was buried in Westminster Abbey, near the monument of Camden. Vol. i. of his *Glossarium Archæologicum*, extending to the letter L, was published 1626; vol. ii., completed by his son, Sir John, and by William Dugdale, appeared in 1664, and the whole work was issued in a single folio volume in 1687. Vol. i. of the *Concilia* was issued in 1639; vol. ii., chiefly by Dugdale, in 1664. The *Reliquiæ Spelmannianæ* (Oxford, folio, 1698), with a *Life*, was edited by Bishop Edmund Gibson.—His son, Sir JOHN, was knighted 1641 "in consideration of his father's good services both to Church and state," and was made master of Sutton's Hospital. He edited the *Saxon Psalter* (1641) and a *Life of Alfred the Great* (Lat. trans. 1678; Eng. original edited by Thomas Hearne, 1709). D. at Oxford, July 25, 1643.—EDWARD SPELMAN, a great-grandson of Sir Henry, published an elegant translation of Xenophon's *Anabasis* (1742) and of the *Roman Antiquities* of Dionysius Halicarnassus (4 vols. 4to, 1758). D. in Norfolk in 1767.

Spelt [O. Eng. *spelt*, from Lat. *spelta*, spelt]: the *Triticum spelta*, probably the far of the ancient Romans and the *zea* of the Greeks; a grain somewhat resembling wheat, but distinct from it. It can be grown on poorer soils than those which are required for wheat. It is much raised in parts of Europe, and crops of it are occasionally seen in the U. S., as in Virginia. In quality it is much inferior to wheat. *T. bengalense* is raised in India. Lesser spelt, or St. Peter's corn (*Triticum monococcum*), called also one-grained wheat, is raised to some extent on poor soils in Europe.

Spelter: the commercial name for zinc in pigs or blocks. See ZINC.

Spencer: city; capital of Owen co., Ind.; on the White river, and the Penn. Railroad; 52 miles S. W. of Indianapolis (for location, see map of Indiana, ref. 8-C). It is in an agricultural, stock-raising, and lumbering region; has valuable building-stone quarries, block and cannon coal mines, woolen, flour, saw, and planing mills, machine-shops, and pork-packing house; and contains a State bank with capital of \$50,000, a private bank, and two weekly newspapers. Pop. (1880) 1,655; (1890) 1,868.

Spencer: town; capital of Clay co., Ia.; on the Little Sioux river, and the Chi., Mil. and St. P. Railway; 80 miles N. W. of Fort Dodge (for location, see map of Iowa, ref. 2-E). It is in an agricultural and stock-raising region, and contains a national bank with capital of \$100,000, a State bank with capital of \$25,000, 2 private banks, and 3 weekly newspapers. Pop. (1880) 1,392; (1890) 1,813.

Spencer: town; Worcester co., Mass.; on the Boston and Albany Railroad; 11 miles S. W. of Worcester, one of

the county-seats (for location, see map of Massachusetts, ref. 3-F). It contains a public high school, the Richard Sugden Public Library (founded in 1857), electric railway, a national bank with capital of \$150,000, a savings-bank, and three weekly newspapers. The principal industries are the manufacture of shoes and wire. Here, it is claimed, is the largest shoe-factory in the world. Spencer was originally in the grant of Leicester; was made the West Parish of Leicester in 1744; incorporated as a town under its present name in 1753; and its first church was organized in 1744. Pop. (1880) 7,466; (1890) 8,747.

EDITOR OF "LEADER."

Spencer, HERBERT: philosopher; b. in Derby, England, Apr. 27, 1820; was an only surviving child. His father and grandfather were teachers. Of delicate health in boyhood, he was subjected to little outside pressure, his father, a man of strong character, more than usual breadth of culture, and original views, supervising his early education, but leaving him very much to himself. At the age of thirteen he was sent to study with an uncle, the Rev. Thomas Spencer, a liberal clergyman and a scholar, at that time perpetual curate of Hinton Charterhouse, near Bath. Here he remained three years, carrying on the study of natural history, begun in early childhood under his father's encouragement, and devoting himself to mathematics, where the originality of his mind was strikingly shown by the development of a taste and capacity for working out original problems. He then, too, became familiar with physical and chemical operations, his intellectual bias being strongly in the direction of experimental inquiry and original research. Deciding, in opposition to his uncle's wishes, not to prepare himself for a university career, he returned to Derby, where he was busied for a short time with inventions and miscellaneous study, and, after a brief interval of teaching, in 1837 entered the office of Sir Charles Fox, and began work as a civil engineer. After this he was engaged for several years on railways, devoting his spare time to scientific experiments and studies, and to occasional contributions to *The Civil Engineer and Architect's Journal*. The first indication of his awakening interest in other directions was given in 1842 by the publication in *The Nonconformist* of a series of letters on *The Proper Sphere of Government*. These were reprinted in pamphlet form during the following year, and are interesting as containing, in crude form, the first suggestions of many opinions on social questions afterward so fully developed in his maturer works. Growing discouraged with the prospects of his profession, he presently gave up engineering work and moved to London, where he secured a position on the staff of *The Economist* newspaper, of which in 1848 he became sub-editor. In 1850 he published his first considerable work, *Social Statics*, which was largely a development in more scientific form of the ethical and sociological ideas contained in his letters on government. The work was a treatise on social science, based upon the conception of the evolution of society through the operation of natural laws; and, though Spencer afterward grew dissatisfied with its metaphysical implications, it excited widespread interest at the time on account of its original and advanced views. He then devoted himself to literary work, contributing elaborate articles on a large variety of subjects to the leading English reviews. But though the subject-matter of his work led him into widely diversified fields of knowledge and inquiry, his course of thought was systematic; and the numerous masterly essays which he published from 1852 to 1860 were mainly devoted to the elaboration and application to various important questions of the principle of evolution. These papers reappeared in the U. S. in the collections entitled *Illustrations of Universal Progress; Essays, Moral, Political, and Æsthetic; Education, Intellectual, Moral, and Physical; and Recent Discussions in Science, Philosophy, and Morals*. In 1855 Spencer published a very able and original work entitled *The Principles of Psychology*, pronounced by J. S. Mill to be "the finest example we possess of the psychological method in its full power." In this work (afterward included in his larger treatise on the same subject) the doctrine of evolution was applied to the science of mind. Life is conceived as "the definite combination of heterogeneous changes, both simultaneous and successive, in correspondence with external coexistences and sequences"; and the ground taken is therefore that mental faculties throughout the whole scale of animal life, from lowest to highest, have been developed by experience through the intercourse of organisms with their environment, the principles of variation

and heredity being marked out as the causes of the slow modifications which have taken place during vast periods of time. The work was so profound in exposition, and so greatly in advance of the thought of the day, that it produced but little public impression. Spencer had grasped the conception of evolution in its broad relations, and in 1852, while engaged on an essay on the nebular hypothesis, he reached the conclusion that it is a universal process, dependent upon the laws of matter and force, unperformed in by all orders of phenomena, and capable of being resolved and formulated. Being the great principle or law of the successive changes of phenomena, involving the unfolding and on its obscure side and as its necessary corollary the dissolution of all things, it seemed to offer the basis of a philosophy of nature from the genetic point of view—understanding by the term "philosophy" the complete unification of positive knowledge by universal principles. In other words, the conception of evolution presented itself to him as the basis of a system of thought under which was to be generalized the complete history of the knowable universe, and by virtue of which all branches of scientific knowledge were to be unified by affiliation upon the primal laws underlying them all. Though a rough sketch of the main outlines of the system, as they occurred to him at the time, was mapped out almost immediately, it was not till the following year, 1853 (a year otherwise memorable for the publication of Darwin's *Origin of Species*), that a detailed plan of the various connected works in which these conceptions were to be developed was finally drawn up, and not till 1893 that it was given to the small handful of readers interested in such subjects in the form of a prospectus. This prospectus contained a complete outline of the ten volumes which were to be devoted to the carrying out of the task, and brief comparison of the analysis there given with the works themselves, so far as they have been issued, will show how clearly he must have had the whole vast scheme sketched out in his mind, down to the minutest details, before he set himself to the penning of a single line. To the prosecution of this great enterprise the major part of the energies of his life has from that time forth been devoted, and the *System of Synthetic Philosophy* has been actually brought within measurable distance of completion. Plans have been left in the methodological divisions, and will probably never be altogether filled up; but save for these lacunae the work stands in practically finished form. The introductory volume of the series, *First Principles*, was published in 1862, and was concerned with the establishment of those first or foundation principles which, there classed together in their most general and abstract statements, were in subsequent volumes to be worked out through the special phenomena of biology, psychology, sociology, and ethics. The initial task was to define the limits of philosophy, and this is done by the postulation of two categories, the unknowable and the knowable, to the former of which is relegated the absolute, infinite, or unconditioned, and all that pertains thereto, while the latter is seen to include the relative, finite, or conditioned, which alone constitutes the sphere and subject-matter of philosophy properly so called. In this way Spencer aimed to clear the field of his inquiry of what he deemed to be the fruitless speculations of metaphysics, so that his proper work might be coextensive with the sphere of science and strictly conform to its methods. Yet, while confining his attention within the limits of the phenomenal universe, Spencer shows that by the very terms of its cognitions the mind can not escape the consciousness of an unknowable power, of which all phenomena are manifestations, and which remains the ultimate and unmovable basis of consciousness, though, from the nature of human intelligence, it can be neither grasped nor understood. Covering these preliminary considerations in the space of something over 100 pages, *First Principles* proceeds to deal with the foundations of the scheme; and here the law of evolution is broadly worked out and formulated in terms of matter and motion, or rather in terms of force, into which our conceptions of matter and motion alike are shown to be in the last analysis resolvable. Thus, as legitimate concepts of science, furnish a proper basis for a superstructure of philosophy. All the "phenomena of the universe," from their great features down to their minutest details, are necessary results of the persistence of force under its forms of matter and motion. This persistence of force gives rise "throughout the universe in general and detail," to unceasing redistributions of matter and motion; and these redistributions constitute evolution "where there is a predominant integration of matter and

dissipation of motion," and dissolution "where there is a predominant absorption of motion and disintegration of matter." The rhythm thus set up by these changes and counterchanges "is, so far as we can see, universal and eternal, each alternate phase of the process predominating now in this region of space and now in that, as local conditions determine"; the tendency in that portion of the universe with which we are acquainted being now in the direction of evolution. There is thus reached the famous definition of evolution as "a change from an indefinite, incoherent homogeneity to a definite, coherent heterogeneity, accompanying the dissipation of motion and integration of matter" (or, as the author statement read: "through continuous differentiations and integrations"). This formula sums up and covers all the processes of development in nature and in mind (in other words, all changes along what we should call the ascending scale as contradistinguished from the descending scale of dissipation, from the unravelling of a planetary system to the opening of a way-side flower, and from the genesis of intelligence to the latest variations of social life. These first principles being thus laid down in their broadest and most abstract statements, Spencer proceeded to the task of working them out in greater detail through all the varied phenomena presented by the universe at large. First in order should properly have come the application of such principles to inorganic nature, but this great division was passed over entirely, partly (in quite his own words) because "even without it the scheme is too extensive, and partly because the interpretation of organic nature after the proposed method is of more immediate importance." Spencer therefore at once went to work upon the *Principles of Biology*, which he completed in two volumes in 1867. Here the principles of evolution are traced out through the phenomena of life and the laws of organization, one of the most profound and noteworthy parts being that dealing with the "laws of multiplication," and the inferences to be deduced from them in regard to the "multiplication of the human race" and "human evolution in the future." This leads forward inevitably (since we know intelligence only as a concomitant of organization) into the region of psychology; and in 1873 Spencer published *The Principles of Psychology*, also in two volumes. This new work was based upon the treatise of 1853, but embraced many important modifications and extensions to which he had been led by his subsequent studies. It is an elaborate exposition of mental science grounded on biology and interpenetrated everywhere by the doctrines of evolution; and in it, in the opinion of many good judges, Spencer's powers as a thinker and writer reached their culminating point. The fourth division of the system, *The Principles of Sociology*, outlined to occupy three volumes, is at present (1895) incomplete. The first volume, of great bulk, comprising the *Data and the Antecedents of Sociology*, and a consideration of domestic relations, was finished in 1876; and this was followed at irregular intervals by parts iv., v., and vi., treating of *Ceremonial Institutions*, *Political Institutions*, and *Ecclesiastical Institutions*, all from the standpoint of evolution. But meanwhile, led by increasing ill health to fear lest persistence in the order sketched out in the original prospectus might result in the final and most important portion of the work—*The Principles of Ethics*—being left untouched altogether, Spencer decided to drop the uncompleted part of the *Sociology*, and to devote what remained of life and energy to carrying his principles forward as far as possible into the region of ethics. As a result of this determination appeared in 1879 the first installment of the proposed *Principles of Morality*, *The Data of Ethics*, which, as the first systematic attempt to place ethical questions upon the new basis of evolution, merits the closest attention. This was followed in 1881 by part iv., on *Justice*, a little work dealing with some of the most important issues at present under discussion; in 1892, by parts iii. and v., the *Inductions of Ethics*, and the *Ethics of Individual Life*; and in 1893 by parts v. and vi., on negative and positive beneficence; the treatise on morality being thus completed in two volumes. The volumes comprising the *Synthetic Philosophy*, vast as is the labor which they represent do not exhaust the list of Spencer's works. In 1873 appeared in the International Scientific Series, his delightful little introductory treatise on *The Study of Sociology*; and in preparation for his work in that subject, he also supervised the publication of the *Descriptive Sociology*—an immense cyclopedia of facts designed to exhibit the characters of human societies of all types and in every stage of

development. Eight out of the proposed eighteen parts of this were produced, and then, owing to the enormous expense incurred and the scanty public support, Spencer found himself forced to relinquish the undertaking. The astounding extent of Spencer's life labors becomes all the more marvelous when one considers the impaired health which has for many years past incapacitated him for regular and persistent work. His life has thus necessarily been a very retired and, externally considered, a very uneventful one. He has never married, and has uniformly declined all university honors and invitations to join scientific societies. He visited the U. S. in 1882, remaining from August to November. See POSITIVISM.

WILLIAM HENRY HUDSON.

Spencer, JESSE AMES, D. D.: educator and author; b. at Hyde Park, N. Y., June 17, 1816; graduated at Columbia College 1837; studied theology at the General Seminary of the Protestant Episcopal Church; was ordained 1840; was rector of St. James's church, Goshen, N. Y., 1840-42; Professor of Latin and of Oriental Languages at Burlington College, New Jersey, 1849-50; editor and secretary of the Episcopal Sunday-school Union and Church Book Society 1851-57; declined the vice-presidency of Troy University 1858; was rector of St. Paul's, Flatbush, L. I., 1863-65, and was from 1869 Professor of Greek in the College of the City of New York. He was the author of a volume of religious *Discourses* (1843); *History of the English Reformation* (1846); *The East, Sketches of Travel in Egypt and the Holy Land* (1850); a widely circulated *History of the United States* (4 vols., 1856-69); *Greek Praxis* (1870); and *A Course of English Reading* (1873). Dr. Spencer was editor of *The Young Churchman's Miscellany* (1846-68); of 6 vols. of the Classical Series of Thomas K. Arnold (1846-50); of a *New Testament in Greek* (1847), with notes; *Cæsar's Commentaries* (1848), with notes and a lexicon; of *Pycroft's Course of Reading* (1844); of Archbishop Trench's *Poems* (1856); of a new edition of Prof. Alpheus Crosby's *Anabasis* (1875); and *Origen's Works* (vol. iv. in Ante-Nicene Library, 1885).

Revised by W. S. PERRY.

Spencer, JOHN, D. D.: b. at Bocton, Kent, England, in 1630; educated at the King's School, Canterbury; graduated at Cambridge about 1650; obtained a fellowship at Corpus Christi College 1655; took orders in the Church of England; became rector of Landbeach, master of Corpus, and archdeacon of Sudbury 1667; prebendary of Ely 1672 and dean of Ely 1677. D. at Cambridge, May 27, 1695. He was the author of *A Discourse concerning Prodiges* (1663; 2d ed. 1665); *Dissertatio de Urin et Thummin* (1669). He is best remembered by his *De Legibus Hebraeorum Ritualibus et earum Rationibus* (Cambridge, 1685), a work of great learning which excited much controversy. It maintained that the Hebrew ritual was almost entirely borrowed from the Egyptian—a view previously upheld by Maimonides in his *More Nevochim*, and by Sir John Marsham in his *Canon Chronicus Egyptiacus*, defended by Bishop Warburton and combated by Witsius, Shuckford, Dr. Woodward, and William Jones of Nayland, but now abandoned. Editions of this work were published at The Hague (1686), and at Leipzig (1705). A new edition, brought out by Dr. Leonard Chappelow (Cambridge, 2 vols., 1727), contained a supplementary book (the fourth) left in MS. by the author, and the whole work, with a memoir and a commentary by C. M. Pfaff, was published at Tübingen (2 vols., 1732).

Revised by S. M. JACKSON.

Spencer, JOHN CANFIELD, LL.D.: lawyer; son of Ambrose Spencer (1765-1848), chief justice of the State of New York; b. at Hudson, N. Y., Jan. 8, 1788; graduated at Union College 1806; was private secretary to Gov. Daniel D. Tompkins 1807-08; admitted to the bar at Canandaigua 1809; became master in chancery 1811, judge-advocate-general on the northern frontier 1813, assistant attorney-general for Western New York 1815, member of Congress 1817-19, of the State Assembly 1819-20, being Speaker the latter year; State Senator 1824-28; commissioner to revise the statutes of New York 1829; special attorney-general to prosecute the murderers of William Morgan; was secretary of State and superintendent of common schools 1839-41; Secretary of War under President Tyler from Oct., 1841, to Mar., 1843, when he was transferred to the Treasury Department; resigned the latter post 1844 in consequence of his opposition to the annexation of Texas, and thenceforth devoted himself to the practice of his profession. The organization of the State asylum for idiots and the improvement of the common-school system were largely due to him, and he served on

many important State commissions. He edited, with a preface and notes, de Tocqueville's *Democracy in America* (2 vols., New York, 1838), and with John Duer and Benjamin F. Butler a *Revision of the Statutes of New York* (3 vols., Albany, 1846). D. at Albany, N. Y., May 18, 1855.

Spencer, JOHN CHARLES, third Earl Spencer, better known as Lord Althorp: statesman; b. May 30, 1782; eldest son of George John, second Earl of Spencer; educated at Harrow and at Trinity College, Cambridge; was elected to Parliament 1804; held office under Fox as Junior Lord of the Treasury from Feb. 11, 1806 to Mar., 1807; sat in Parliament for the county of Northampton from Dec., 1806, till the passage of the Reform Bill 1832, during which long period he was one of the leading members of the opposition; was especially prominent in the attacks upon the financial policy of the Tory administrations; was Chancellor of the Exchequer and ministerial leader of the House of Commons in the reform ministry of Earl Grey 1830-34; succeeded his father as Earl Spencer in Nov., 1834, and soon afterward withdrew from active political life; devoted himself to scientific agriculture; was many years president of the Smithfield Cattle Club; was one of the founders and the first president of the Royal Agricultural Society 1838; was an active member of the Roxburghe Club for reprinting rare books; and vice-chairman of the Society for the Diffusion of Useful Knowledge. D. at Wiseton Hall, Nottinghamshire, Oct. 1, 1845. See Bagehot, *Biographical Studies* (1881), and Myers, *Lord Althorp* (1890).

F. M. COLBY.

Spencer, JOHN POYNTE, Earl: statesman; b. at Spencer House, London, Oct. 27, 1835; educated at Harrow and Cambridge; entered Parliament 1857, but succeeded to the peerage in the same year; Lord-Lieutenant of Ireland 1868-74; Lord President of the Council 1880; again Lord-Lieutenant of Ireland 1882-85; for a second time Lord President of the Council in the Gladstone administration 1866; First Lord of the Admiralty in the Gladstone government of 1892.

Spencer, SARA (Andrews): reformer; b. at Savona, N. Y., Oct. 21, 1837; educated in high and normal schools in St. Louis, Mo.; was a teacher from the age of sixteen till her marriage in 1864 with Henry C. Spencer. They removed to Washington, D. C., where they founded a Spencerian Business College. In 1871-72 Mrs. Spencer defeated attempts to license the "social evil" in Washington. On Apr. 14, 1871, Mrs. Spencer and seventy-two other ladies in Washington were refused the right to register and vote. She brought suit in the D. C. Supreme Court, and Judge Carter's decision that "women are citizens, but have not the right to vote without local legislation" was reaffirmed by the U. S. Supreme Court in 1874. Mrs. Spencer represented the National Woman's Suffrage Association at the Republican presidential convention in Cincinnati in 1876, addressing the platform committee and the convention; engrossed, signed, and with five other women presented the woman's *Declaration of Rights* at the Centennial celebration in Independence Square, Philadelphia, Pa., July 4, 1876. She was vice-president of the first seven congresses of women 1873-90, representing the District of Columbia; was official delegate from the District to national conference of charities seven years, 1881-88; since the death of her husband in 1891 has been president and proprietor of Spencerian Business College, District of Columbia. She has published *Problems on the Woman Question* (Washington, 1871) and *Thirty Lessons in the English Language* (1873).

SUSAN B. ANTHONY.

Spencer Rifle: a breech-loading magazine-gun, extensively used as an arm for the Union cavalry during the civil war in the U. S. It is characterized by having in the butt of the stock a magazine holding seven cartridges, which are brought one by one into the chamber by a movement of the trigger-guard as a lever, which at the same time throws out the shell of the exploded cartridge. A new magazine can be inserted whenever the cartridges have been exhausted, or the magazine may be shut off and the rifle used as a single breech-loader. See MAGAZINE-GUNS.

Spener, PHILIPP JAKOB: "The Father of Pietism"; b. at Rappoltsweiler, Upper Alsace, Jan. 13, 1635; studied at Strassburg, Tübingen, and Basel, principally theology; became private tutor to the princes Christian and Charles of the Palatinate, and pastor in Strassburg and lecturer in the university in philology and history 1663; was appointed first pastor in 1666 at Frankfort, where he instituted his famous *collegia pietatis* (prayer-meetings), which finally brought him into conflict with the orthodox clergy; became preacher to

the electoral court of Saxony at Dresden in 1696, but lost favor here by reproaching the elector (privately) for his vices; was invited in 1698 to Berlin, where he was appointed professor of the Church of St. Nicola. D. in Berlin, Feb. 5, 1705. He owed his religious views chiefly to English Puritan writers, and neither in his writings nor in his person was there anything of that mysticism and eccentricity which characterized some of his adherents, whose existences were charged falsely upon him. The Pietism which he developed was quite unlike that developed in Halle and elsewhere, which was formal and lifeless. In opposition to the orthodox theological system of his time, he conceived Christianity principally as a living duty and comfort, not as a science; and, leaving all subtle definitions to others, he simply recommended his hearers to look at the Bible in the light of their own lives, and then to look at their lives in the light of the Bible. The impression he made was both wide and deep. He was the object of virulent and persistent abuse and misrepresentation, but the way he bore those attacks was eloquent testimony to the sincerity and depth of his piety. He was a voluminous writer. Perhaps the best of his works are: *Pia theologiae Gedanken* (4 parts, Halle, 1700-05); *Lezte theologische Gedanken* (1711); *Concilium et judicium Theologiae Latinae* (Frankfurt, 1709); *Pia Desideria* (Frankfurt, 1675); *Das geistliche Priesterthum* (1677); *Das thätige Christenthum* (1679); *Evangelische Glaubenslehre* (1699). His *Life* was written by W. Rosebach (2 vols., Berlin, 1828; 3d ed. 1861) and C. A. Wildenbruch (Leipzig, 1842; 2d ed. 1847; Eng. trans. Philadelphia, 1881).

Revised by S. M. Jackson.

Spengel, LEONHARD: Greek scholar; b. in Munich, Germany, Sept. 24, 1801; became privat dozent in the university of his native city in 1827, professor at Heidelberg in 1842; recalled to Munich in 1847, where he died Nov. 9, 1880. Spengel's fame rests upon his work in Greek rhetoric, which field he made especially his own. See his *Zusammenfassung* (1828), an attempt to reconstruct from extant fragments the systematic development of Greek rhetoric; *Rhetores Graeci* (6 vols., new ed. 1858); *Aristotle's Rhetoric* (1844); *Rhetoric of Anaximenes*; *Aristotelische Studien* (4 parts, 1868). He also published, besides many smaller treatises on his favorite subject, an elaborate text edition of Varro's *De Lingua Latina* (now ed. by his son Andreas, 1893). See Burdian's *Biographisches Jahrbuch* (III, pp. 39-50); W. Christ, *Leonhard Spengel* (1881); Ch. Thurn, *Revue de Philologie* (v. pp. 181-180).

ALFRED GUERMAN.

Spenser, EDWARD: poet; b. at East Smithfield, near the Tower, London, England, in 1552. Nothing is known with certainty of his family, but it is almost proved that he was descended from the Spencers of Hurstwood, Lancashire, and was related to the Spencers of Althorp. He was educated at Merchant Taylors' School. He entered as a sizar at Pembroke Hall, Cambridge, May 29, 1569, in which month he contributed a number of sonnets and epigrams to *The Theatre of Worldlings*, a volume printed at London by Dr. John van der Noet, a Flemish physician; graduated Jan. 16, 1573. In 1573 he left Cambridge without a fellowship and visited his relatives in Lancashire, where he fell in love with a lady supposed to have been Rose Denley, whose charms he celebrated under the name of Rosalinde in a pastoral poem, *The Shepherds' Colloquy*, published anonymously in 1579, the dedication of which to Sir Philip Sidney had been preceded by personal acquaintances in London; printed soon afterward *Three Proper and Wittie Familiar Letters lately passed between two Universitie Men* (1580), being a literary correspondence with his college friend, Gabriel Harvey; obtained in the autumn of 1580, through the influence of Sidney, the post of secretary to the Government under Lord Grey of Wilton, Lord-Lieutenant of Ireland; was probably resident in Dublin from 1582 to 1586, when he resigned his clerkship of degrees; his services were rewarded in 1589 by a grant from the crown of an estate forfeited by the Earl of Desmond, consisting of 3,028 acres of land, including the castle and manor of Killeadman, near Doneraile, in the county of Cork, where he resided, and where he completed the composition of his *Faerie Queene*; wrote in 1588 his *Astrophel*, a pastoral elegy on the death of Sir Philip Sidney—not published till 1595; was in 1588 appointed clerk of the council of Munster; received in 1588 a memorable visit from Sir Walter Raleigh on his return from the Lisbon expedition; read to Raleigh the first two books of his great poem, which the latter thought "a dish to set before a queen," and accordingly persuaded the poet to accom-

pany him to London. Spenser's reception by Queen Elizabeth both appears to have been appreciative, for the publication of the first three books of the *Faerie Queene* in 1590 not only placed him in the front rank of poets, but procured him a pension of £20. In 1590 he also published *Monoposia*. During this visit to London Spenser also published in 1591 *Complaints, containing Nondrie Sonnet Poemes of the Worlds Vanitie* (1591), *The Ruines of Time*, *The Teares of the Muses*, and *Prolegomena*. His marriage in 1594 to an Elizabeth, whose surname has not been preserved, inspired his beautiful love sonnets entitled *Amoretti* and a magnificent *Epithalamium* (1595), which were shortly followed by *Colloquy about a come Home Again*. In 1596 he published *The Shepheard's Calendar*, containing the *Fourth*, *Fifth*, and *Sixth Booke*, and *Four Epigrams* addressed to the Countess of Cumberland; he also presented the queen a MS. dialogue in prose, *A View of the State of Ireland*, not published until 1621. Spenser was appointed in 1598 sheriff of the county of Cork, thus incurring the enmity of the insurgents of "the Earl of Tyrone's rebellion," who toward the close of that year burned his house and plundered his estate, forcing him to fly to England, on which occasion an infant child of the poet is said to have perished in the flames. Reduced to poverty, Spenser passed a few miserable months in London, and died in King Street, Westminster, Jan. 10, 1599. According to Ben Jonson, he "died for lack of bread," after having refused twenty pieces (of gold?) sent him by the Earl of Essex, saying that "he had no time to spend them"; these details are revealed by Drummond of Hawthornden. He was buried in Westminster Abbey, near the tomb of Chaucer, as he had desired, the funeral being at the expense of the Earl of Essex; and a monument in his honor was erected in 1630 by Anne Clifford, Countess of Dorset, afterward Countess of Pembroke. He left two sons, Sylvanus and Peregrine. Hugolin, a son of Peregrine, was outlawed for adhesion to James II., and was living, "very old and unmarried," in 1700. Many editions of Spenser's complete works have appeared, the best being the variorum edition of Henry J. Todd (London, 8 vols., 1805), that of J. Payne Collier (London, 5 vols., 1862), with glossary, notes, and a *Life*, and that of Rev. R. Morris (Globe ed., 1889). These were, however, superseded by a critical edition published by the Rev. A. B. Grosart in 1882, with the assistance of a number of eminent English scholars. G. L. Craik's *Spenser and his Poetry* (3 vols., 1845) is a satisfactory critical work. Dean Church's excellent study on this poet was published in 1870. An edition by Prof. Francis J. Child, of Harvard (1885, 1878), is highly esteemed.

Revised by ROBERT GOSSET.

Spess Artem'idos [Gr., grotto of Artemis; Arab. *Stall Antur*, stable of Antar]: an Egyptian rock-been temple dedicated to the local deity, the lion-headed goddess Paebet, whom the Greeks identified with Artemis. It was situated just S. of Bent-Hasan (28° N. lat.), on the east side of the Nile. Apparently it was the work of Thothmes III., but under his cartouches there are traces of an earlier name which has been identified by Golitschew with that of Hattus. The name of Set I. is also found. The grotto is cut from the solid rock, and consists of a vestibule, a corridor, and a rectangular chamber with a naos, at the rear of which is a niche for the image of the goddess. In the vestibule only two of the original eight pillars are now standing. The mural texts are nearly all of a religious character, and there are representations of several deities besides Paebet. The whole is considerably dilapidated.

C. R. G.

Spergula: See SCURLET.

Spermaceti, **Spermaceti-fat**, or **Cetina** [*spermace'tis*, in Mod. Lat.; Lat. *sperma*, sperm + *cetus* = Gr. *cetus*, whale]: a substance ($C_{42}H_{84}O_2$) which exists ready formed in the cavities of the head of the sperm-whale (*Physeter macrocephalus*), and also in that of some other whales and of *Delphinus dentatus*. It crystallizes out of the sperm oil of the head-cavities after the vital heat is lost, forming a magma or microle, from which in cold weather the sperm oil is expressed by hydraulic pressure ("cold-drawn sperm oil"), the spermaceti being left behind. It is purified by melting it by steam in separate mechanical impurities, and recrystallizing. It then forms a lustrous, pearly, white mass of eminent crystalline texture, feeling soft and soapy to the touch; does not grease paper if quite freed from oil. It pure, it is without taste or odor, and has a neutral reaction. The natural product, freed from sperm oil by cold alcohol and repeatedly crystallized from hot alcohol or ether, is the essence of Chervol, which melts at 120°-128°. It yields by sapon-

ification (see FATS) cetyl alcohol and palmitic acid. The ethereal nature of spermaceti was distinctly recognized by Chevreul (*Recherches sur les Corps gras*). Spermaceti was formerly much used in the production of sperm-candles, which are no longer so common as in the prosperous days of the sperm-whale fisheries, the decline of which dates from the general introduction of refined petroleum and paraffin. Spermaceti burns with a bright, clear flame like wax. The standard sperm-candle, which is the common unit of comparison for photometric experiments in Great Britain and the U. S., is taken to burn 120 grains of sperm in an hour, which it rarely does with accuracy. Revised by LEA REMSEN.

Sper'maphytes [from Gr. σπέρμα, seed + φυτόν, plant]: another name for the ANTHOPHYTES (q. v.).

Spermatozo'a [Mod. Lat.; Gr. σπέρμα, seed + ζῶν (plur. ζῶα), animal, living creature]: the male reproductive cells of animals, which by union with the female cell (egg) render the latter able to develop. They consist largely of the cell-nucleus with the addition of other accessory structures to facilitate the union with the egg (impregnation). In shape they vary greatly, but the most common shape recalls the tadpole. In these forms there is a head, composed of the nucleus, followed by a "middle piece," and this in turn by the tail, which may either be thread-like, or may have an undulatory membrane attached to it. Usually the spermatozoa have the power of motion, by means of the vibrations of the tail, but in some forms they are motionless. Recent investigations show that both nucleus and "middle piece" are concerned in impregnation; the tail and analogous structures play no part after the union. J. S. KINGSLEY.

Sperm Oil: See OILS and SPERMACEITI.

Spermophile: any rodent of the genus *Spermophilus*. See PRAIRIE-SQUIRREL.

Sperm-whale: See CACHALOT and PHYSETERIDÆ.

Spessartite: See GARNET.

Speusip'pus (in Gr. Σπυσιππος): philosopher; b. at Athens about 395 B. C.; a nephew of Plato; received the instruction of his uncle, whom he accompanied to Syracuse, and succeeded as president of the Academy. D. at Athens in 339 B. C. Of his writings nothing is left. J. R. S. S.

Speyer, or Speler, sp'fer: city and railway junction; capital of Rhenish Bavaria, at the junction of the Speyerbach with the Rhine (see map of German Empire, ref. 6-D). It has some sugar-refineries and manufactures of vinegar and tobacco, and carries on an active trade in grain, timber, and wine on the Rhine. It is one of the oldest cities of Germany, and in the Middle Ages the German emperors often resided and held their diets here. Nevertheless, it has only one monumental building, the cathedral, erected in the eleventh century, thoroughly restored in 1858, and one of the finest church buildings of Germany. The other great edifices Speyer once possessed were destroyed by the French, who twice conquered and devastated the city. Pop. (1890) 17,585. Revised by M. W. HARRINGTON.

Spezia, spā't'si-ā: town; in the province of Genoa, Italy; beautifully situated on a gulf of the same name in lat. 44° 7' N., lon. 9° 48' E. (see map of Italy, ref. 4-C). The old walls and gates of Spezia have been mostly demolished in the course of the changes necessitated by the rapid growth of the town consequent upon the construction of the naval arsenal. The town is the chief naval station of Italy and is defended by formidable batteries; it has extensive ship-building yards, docks, etc., a foundry, and manufactures of sail-cloth, white lead, cables, and leather. It is the seat of a school of navigation, and is much frequented as a seaside resort. Pop. about 19,860.

Spezzia, spet'si-ā: an island at the entrance of the Gulf of Nauplia, Greece; has a fine harbor; became distinguished in the Greek revolution (1821-29). The inhabitants are mostly engaged in commerce and navigation. Area, 26 sq. miles. Pop. (1890) 5,192. E. A. G.

Sphag'num [Mod. Lat., from Gr. σφάγνυς, a kind of moss]: a large and interesting genus of mosses, many species of which grow in the U. S., mainly in bogs, forming deep, spongy masses, almost always damp. They are called peat-mosses, being the principal ingredient in pure peat. See MOSSWORTS. Revised by CHARLES E. BESSEY.

Sphag'idæ [Mod. Lat., named irregularly from *Sphex*, the typical genus, from Gr. σφήξ, σφῆκος, wasp]: a family of hymenopterous insects, including the so-called sand-wasps and mud-wasps. See HYMENOPTERA.

Sphenis'eidæ: See PENGUIN.

Sphen'odon: See HATTERIA.

Sphenoid Bone [*sphenoid* is from Gr. σφην, wedge + suffix -oid, like]: a bone of the skull, situated in man at the anterior part of the base. It has been likened in shape to a bat with open wings. It consists of a body, four wings, two greater and two less, and the two pterygoid processes. The body is quadrilateral, and hollowed out into a mere shell. This body is conceived to represent the centrum of the third cephalic vertebra (constituting the posterior portion of the sphenoid), joined to the centrum of the second vertebra (the anterior portion). The two greater wings are the neurapophyses of the third vertebra, and the two lesser wings are neurapophyses of the second vertebra. The sphenoid is exceedingly complicated and irregular in its outlines. It is developed from ten centers. It is usually joined anteriorly in the adult to the two sphenoidal spongy bones (a pair of thin, curved irregular plates). Posteriorly, it becomes continuously united to the occipital bone. It articulates with all the bones of the skull and with five of those of the face.

Sphere [(readapted to Latin) < M. Eng. *sphere*, viâ O. Fr. from Lat. *sphæra* = Gr. σφαῖρα, ball, sphere]: a surface all of whose points are equally distant from a point within called the *center*. It may be generated by a semicircle revolving about its diameter as an axis. Any line from the center to a point of the surface is a *radius*, and any line drawn through the center and limited by the surface is a *diameter*: all radii of the same sphere are equal; also all diameters of the same sphere are equal. Every plane section of a sphere is a circle; if the plane passes through the center, the section is called a *great circle*; if it does not pass through the center, the section is called a *small circle*; the radius of a great circle is equal to that of the sphere; the radius of a small circle may have any value from the radius of the sphere to 0, in which case the cutting plane merges into a tangent plane. The surface of a sphere is equal to four great circles, or it is equal to the circumference of a great circle multiplied by its diameter. The surface of a zone, viz., the portion of surface included between two parallel planes, is equal to the circumference of a great circle multiplied by the altitude of the zone. The volume of a sphere is equal to its surface multiplied by one-third of its radius. The volume of a spherical sector is equal to the zone which forms its base multiplied by one-third of the radius of the sphere.

In analysis, the surface of a sphere is a surface of the second order, whose equation in rectangular Cartesian co-ordinates is of the form

$$(x - \alpha)^2 + (y - \beta)^2 + (z - \gamma)^2 = R^2,$$

in which α, β , and γ are the co-ordinates of the center, and R is the radius of the sphere. Revised by S. NEWCOMB.

Spherical Trigonometry: See TRIGONOMETRY.

Sphe'roid [from Gr. σφαῖρα, sphere + suffix -oid, like]: a surface generated by an ellipse revolving about one of its principal axes. If the ellipse revolves about its conjugate axis, it generates a surface resembling a flattened sphere called an *oblate spheroid*; if it revolves about its transverse axis, it generates an elongated surface called a *prolate spheroid*. The surface of the earth is very approximately an oblate spheroid.

Spheroidal State: See HEAT and LIQUIDS.

Spherom'eter: an instrument for measuring the radius of a sphere when only a portion of the spherical surface, as, for instance, a lens, is given. The usual form consists of a vertical screw turning in a socket, which is equidistant from three supporting legs with sharp steel points. Above the sockets the screw has a graduated circular head. The points of the legs are brought in contact with the spherical surface, and the screw is turned until its extremity also touches it. This process is repeated with a plane. Thus the distance between the center of the circle through the ends of the legs and its pole on the sphere is obtained, from which the radius of the sphere can be calculated. R. A. R.

Sphincter [Mod. Lat., from Gr. σφινκτηρ, anything which binds tight, deriv. of σφίγγω, compress, squeeze, bind tight]: in anatomy, a muscle the fibers of which, generally circular, surround some passage in the animal organism, closing the passage, in opposition to certain other muscles called dilators. Some of the sphincters are composed of striped fiber, some of unstriped, and some of both combined. The eyes, pupils,

mouth, rectum, vagina, bladder, and urethra are the most important passages which are provided with sphincters; but there are numerous other sets of circular fibres which have more or less of the action of sphincter muscles.

Sphit'gidae: a family of moths including the hawk-moths. See HAWK-MOTH and LEPIDOPTERA.

Sphinx (Lat. = Gr. *sphynx*, *sphynx*): in Grecian mythology and art, a malevolent being, usually represented as having the head of a woman, the breast, feet, and claws of a lion, the tail of a serpent, and the wings of a bird. It was also represented as having the fore part of a lion, the body of a man, the claws of a vulture, and the wings of an eagle. It was reputed to have originated in Ethiopia. In this latter point there may be an historical reminiscence, but in respect to the features which were combined to form the Greek sphinx there are few items of similarity with the Egyptian prototypes. The Egyptian sphinx proper is composed of the head of a man and the body, legs, feet, and tail of a lion, but it was represented as destitute of wings, except in the period when Greek influence had come to be felt, and its artistic designs to be required. In Egyptian symbolism the sphinx was the guardian of temples and tombs, the incorporation of Ra-Harmachis. The face, however, was sculptured presumably to represent the reigning Pharaoh. It was the form assumed by Ra and Horus when opposed to their enemies, and it was supposed properly to be a quadruped of the desert. Similar figures are frequent in which the human head is replaced by that of the ram (criosphinx) or of the hawk (hieracosphinx); but when applied to these composites the name sphinx is a misnomer, as they are merely variations in the forms given to the deities to whom these animals were sacred. The ram-headed figures and the real sphinx (androsphinx) were, however, used for similar purposes, as they alternate in the "avenues of sphinxes" which mark the passageways from the Nile to the temples. Used thus they were supposed to ward off evil from the dwellings of the gods and of their sacred animals.

There are few, if any, specimens of this style of sculpture from the old kingdom, from the twelfth dynasty there are several, and during the remainder of Egyptian history it was a favorite device. The so-called Hyksos sphinxes from Taxis are of a different type from those found in other parts of Egypt, and also from some other examples found even in Taxis itself. Their bodies are shorter, more sinewy and powerful, and the human heads are also of a different type, with high cheek-bones, broad faces, and powerful features. They are also adorned with manes and shaggy bristles. Several theories have been advanced to account for the variations. It was at first supposed that they were genuine Hyksos remains, produced by foreign artists settled in Egypt; but against this is the fact that the name of Apepi, the Hyksos, is merely scratched upon the shoulder, and does not occupy the place of honor—that it resembles a graffiti rather than an inscription. The main argument rests upon the un-Egyptian cast of feature shown. Mariette proposed this view, and it has heretofore been generally accepted. It has also been suggested that they are productions of a local Egyptian school of sculpture not under the ordinary canon of Egyptian art. Meyer holds that they are memorials of an invading race, which apparently gained the upper hand in Egypt between the ninth and tenth dynasties, of which Khru is the representative. (See Petrie, *History of Egypt*, i, p. 117 ff.) Golenischeff considers that they were memorials of Amenemha III. of the twelfth dynasty (*Bulletin de l'Association*, xv, 121) to whom they bear a striking resemblance. The whole subject, however, is involved in much doubt.

The date of the Great Sphinx of Gizeh, located about half a mile S. E. of the Great Pyramid, is absolutely unknown (see illustration in the article EGYPTOLOGY). It has been assigned to prehistoric times, to the age of Cheops (Khufu), and Khafra of the fourth dynasty, and even to Thothmes IV., but of proof there is none. Fundamental to the whole discussion are two facts—no dated sphinxes earlier than the twelfth dynasty can be proved, and the Egyptian inscriptions of the Old Kingdom do not contain the sphinx-hieroglyphic sign at all, as do those of later periods. The assignment to a period antedating the fourth dynasty rests upon an inscription found in a neighboring temple, which purported to be from the fourth dynasty, but which was really composed in the twenty-first. It alleges that at the earlier date the sphinx was in need of repairs,

but internal evidence points to the probable conclusion that the story is entirely unhistorical. The assignment to Khafra was based upon the fact that a statue of that king was found in the immediate neighborhood. On a pillar in the small temple, between the paws of the figure, was found a tablet of Thothmes IV., in which he is understood to record a dream in which Ra-Harmachis, whose emblem the sphinx was, appeared to him and promised him long life and prosperity if he would clear the figure from the desert sand that had encroached upon it, and repair it. The question of age promises to remain a riddle, and the assignment of it to the time of the Heracleopolite dynasties (ninth and tenth) is only a guess which has something in its favor. It is certain that it was uncovered twice in ancient times, once under Thothmes IV., and once under Ramesses II., but little else is known. Curiously enough, it is not mentioned by Herodotus, though it finds place in other ancient writings. In modern times it has been thrice cleared, by Cavillia, Mariette, and Maspero. When uncovered it was found to be hewn out of the native rock, the head having been carved with great care, but the body left comparatively rough. Breaks or inequalities in the stone were patched with rough masonry, apparently of the Roman period. The whole figure faces eastward, and is about 150 feet long. The top of the head is about 60 feet above the pavement between the paws. The paws are 50 feet long, the head 30 feet long and nearly 14 feet broad. The face was originally colored red, but all traces of the tint have disappeared. It is supposed to have been veneered, in part, at least, with a limestone covering. The face is much damaged and the nose and beard have disappeared. This defacement was largely due to the fact that the Mamelukes used it for a target. The mouth is broad and pleasing, and the face has a benign aspect. It is quite probable that it originally represented the face of the Pharaoh by whom it was cut.

Between the paws of the sphinx is a stone platform approached by a flight of steps, and close to the breast is a small open temple, which is divided into two parts. Three pillars form the rear, and on the central one was the tablet of Thothmes IV., dated from his first year. Another temple is near at hand, which has the general appearance of a tomb or mastaba, and it has been supposed that the sphinx was regarded as the guardian of this building and its contents.

CHARLES R. GILBERT.

Sphinx-caterpillar: See HAWK-MOTH.

Sphyg'mograph (Gr. *sphynx*, pulse, heart-beat + *graphein*, write): an instrument for measuring and recording the shape, frequency, and force of the blood-wave in an artery. It consists of a series of delicate levers set in motion by the pulse-beat, and of a moving surface of paper, on which are recorded the results of the measurement. There are several forms of sphygmograph. They simply amplify on the record the successive changes in the caliber of the blood-vessel. Considerable skill is requisite in working with the sphygmograph. In diseased conditions of the heart its records have a diagnostic value. Revised by W. PETER.

Spice [M. Eng. *spice*, *spice*, from O. Fr. *epicea*, *spice* (> Fr. *épice*): Ital. *spezie* < Lat. *species*, *species*, appearance, kind, wares, goods, spices]: certain aromatic seeds, barks, roots, dried fruits, etc., used in cookery for their flavoring qualities, and in medicine as stimulants and carminatives. Such are cloves, ginger, allspice, nutmeg, pepper, mace, capsaicum, cinnamon, cassia, vanilla, etc. Besides the above, which are extensively exported from tropical countries, and especially from the East, there are others now nearly forgotten, such as cassanuniar, zerumeth, edinary, callawan, and the so-called clove-bark. These have nearly disappeared from general commerce—some because they are inferior in quality, and others on account of their limited supply. Most of the spices are natives of the Old World, but a few are American, and nearly all the important ones are now generally naturalized throughout the tropical world.

Spice Bush: See PEPPER BUSH.

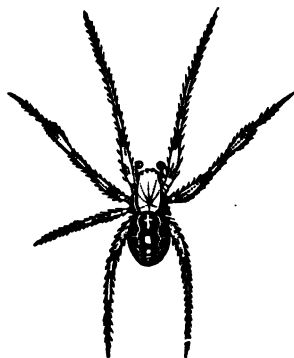
Spice Islands: See MOLUCCAS.

Spiechern, or Speichern: See SAABERBUCKEN.

Spider-crab: See CRAB.

Spiders [M. Eng. *spider*, or *spibre* < O. Eng. **spidre* for **spian-per*; deriv. of verb *spinnan*, to spin]: an order of arachnid animals, the *Araneida*. The chief characters which distinguish them from other groups are the possession of a body divided into two regions, cephalothorax and abdomen,

both without distinct joints, and the latter, which is joined to the former by a slender stalk, bearing spinning manmills on the hinder end. The cephalothorax bears four pairs of legs and two pairs of smaller appendages, the first of which



Orb web spider, *Epeira insularis*.

are the poison-jaws, while the second are curiously modified in the male for reproductive purposes. There are usually eight eyes (sometimes six or fewer) upon the front of the cephalothorax. Respiration is accomplished by lungs or lungs and tracheæ. When lungs alone are present there are two pairs of these organs on the under side of the abdomen. In other forms there is a single pair of lungs, the other pair being replaced by air-tubes like those of true insects.

Spiders are carnivorous, and live upon other insects which they kill by the poison forced through the poison-jaws. They do not eat the prey, but merely suck its juices. Some spiders hunt their prey, jumping upon it like a miniature tiger, but the majority form webs of silken threads covered with a viscid substance. The shape and character of these webs varies exceedingly. In general it may be said that the spider has a lair where he can recognize any vibration of the web, and whence he can rush out to further entangle the prey. The web is secreted by glands inside the body, and as it comes in contact with the air in its passage through the spinning organs it hardens into the familiar thread, which in reality is a cable formed of a number of smaller fibers. Besides its use in forming webs the silk is employed in making nests, as a means of flying, and for the formation of cocoons to contain the eggs. "The males are smaller than the females, and their approaches to the latter are made with extreme caution, as they run the risk of being devoured; extending their pedipalps, they deposit the spermatophores in the female genital aperture and betake themselves to flight" (*Huxley*). In their habits spiders are among the most interesting of animals, well repaying observation. Besides the European works of Thorell and Simon, the student should consult papers by Emerton, *Trans. Connecticut Acad. Science* (1882-84); Peckham, *Trans. Wisconsin Acad. Science* (1888); and McCook, *American Spiders* (3 vols., Philadelphia, 1889-94). J. S. KINGSLEY.

Spie'gel, FRIEDRICH: Orientalist; b. at Kitzingen, near Würzburg, Bavaria, July 11, 1820; studied Oriental languages at Erlangen, Leipzig, and Bonn 1838-42, and at Copenhagen and Oxford 1842-47, and in 1849 was appointed Professor of Oriental Languages at the University of Erlangen. Besides editions of various Persian works and grammars of the Old Persian and Old Bactrian languages, he published *Einleitung in die traditionellen Schriften der Parzen* (2 vols., Leipzig, 1856-60); *Die Altpersischen Keilschriften* (1862; 2d ed. 1881); *Eran, das Land zwischen Indus und Tigris* (1863); *Eranische Alterthumskunde* (3 vols., Leipzig, 1871-78); *Vergleichende Grammatik der alteranischen Sprachen* (1882); *Die arische Periode und ihre Zustände* (1887).

Spiel'hagen, FRIEDRICH: novelist; b. at Magdeburg, Germany, Feb. 24, 1829; studied jurisprudence, and afterward philosophy, philology, and literature at Berlin, Bonn, and Greifswald; taught for some time at the university at Leipzig, and finally devoted himself entirely to literary pursuits. In 1859 he removed from Leipzig to Hanover, where he became literary editor of the *Zeitung für Norddeutschland*; but in 1862 he took up his permanent residence in Berlin. Spielhagen has successfully aspired to treat the great questions of the day in a series of novels distinguished by their artistic composition, their elegant style, and their philosophic thought. The most important of these novels, many of which have passed through numerous editions, are *Problematische Naturen* (1860); *Durch Nacht zum Licht* (1861); *Die von Hohenstein* (1863); *In Reih und Glied* (1866); *Hammer und Amboss* (1869); *Sturmflut* (1877); *Quisisana* (1880); *Angela* (1881); *Was soll das werden* (1886); *Noblesse oblige* (1888); *Der neue Pharao* (1889). In his excellent book *Beiträge zur Theorie und Technik des Romans* (1888), Spiel-

hagen attempts to fix the æsthetic laws which govern the art of novel-writing, and in his autobiography, *Finder und Erfinder* (1890), he gives a charming account of the influences which conspired to make him a novel-writer. An edition of selected novels appeared in 1889-92, comprising twenty-three volumes. JULIUS GOEBEL.

Spilers, ALEXANDER, Ph. D.: lexicographer; b. at Gosport, England, in 1807; graduated at the Universities of Paris and Giessen; settled at Paris 1829; was Professor of English successively at the School of Commerce, at the School of Public Works (Ponts et Chaussées), at the Lycée Bonaparte (1833), and at the University of France; became inspector of colleges; received from Napoleon III. in 1869 the cross of the Legion of Honor in acknowledgment of the value of his series of English grammars, and especially of his standard French-English and English-French *Dictionary* (Paris and London, 2 vols., 1846-49), of which two editions appeared in the U. S.—one edited by G. P. Quackenbos (New York, 1852), the other by J. L. Jewett (1856). D. at Passy, near Paris, France, Aug. 26, 1869.

Spike [from Lat. *spīca*, point, spike, ear of corn, tuft or head of a plant]: in botany, a flower-cluster, of the centripetal or indeterminate order, in which sessile flowers are arranged along an axis. The spadix and ament are varieties of the spike. The ears of wheat and rye are familiar instances of the spike, which in some instances is compound—that is, contains many sessile spikelets. When the flowers are stalked instead of sessile, the spike becomes a raceme.

Spikenard, or **Nard** [*spikenard* is *spike* (see SPIKE) + *nard* < O. Eng. *nard*, from Lat. *nar'dus* = Gr. *νάρδος*; cf. Heb. *nērd*, Pers. *nard*]: (1) in the East the *Nardostachys jatamansi*, a valerianaceous plant of India. Its strong odor is disagreeable to most persons of European and American birth, but it is considered very precious in the East. Its medicinal properties are precisely those of valerian. (2) Roots of various species of valerian are exported from Europe to the Levant under the name of Frankish nard, Celtic nard, and mountain nard. Cretan nard is also the root of a valerian. These are much used in the East as substitutes for the true spikenard. (3) In England the fragrant oil of *Andropogon nardus*, an East Indian grass, is called oil of spikenard. It is used in perfumery. (4) In the U. S. the name spikenard is given to *Aralia racemosa*, and the *A. nudicaulis*, or false sarsaparilla, is called small spikenard. They have each a limited use in domestic medicine.

Spike, Oil of: the volatile oil of the *Lavandula spica*, the broad-leaf lavender of Europe. It has an odor much like that of oil of turpentine. It is used by artists in preparing their varnishes, and by veterinarians as a horse medicine. Much of the commercial oil of spike is an entirely factitious mixture, of which oil of turpentine is the basis.

Spinach, or **Spinage**: the *Spinacia oleracea*, a chenopodiaceous Old World herb, much cultivated in nearly all parts of the world as a potherb, especially for use in the spring. There are about twenty varieties grown in the U. S. Other plants of this and of other genera having similar uses are locally called by this name.

Spinal Caries, or **Potts's Disease of the Spine**: an inflammatory condition of the vertebræ, a spondylitis, destructive in its nature, usually tuberculous in character, and slow in its course. A slight injury is often sufficient to awaken the process in an individual predisposed to struma. Gradual disintegration of the bodies of one or more vertebræ takes place with subsequent bending, which produces a kyphosis or sharp projection backward. The early symptoms are colicky pains in the abdomen (often mistaken for indigestion), reflex pains in the limbs, and a peculiar rigidity of the back in walking and stooping. If the disease is situated in the cervical or upper dorsal regions, an irritative cough is often among the earliest symptoms.

The name Potts's disease was given to this affection from the fact that Dr. Percival Potts, in 1779, was the first physician to describe accurately this special condition of the bones which gives rise to the hunch-back deformity. That this disease existed in prehistoric times is evidenced by the specimens in the Peabody Museum at Cambridge, Mass.

The treatment consists in keeping the diseased bones perfectly at rest until nature throws a bony bridge across the diseased gap and ankyloses the spine. This result may be accomplished by placing the patient continuously in the recumbent posture, or by the application of a steel support, a hard leather or rigid jacket, plaster-of-Paris splint, or other

device. The disease is necessarily long and tedious, its course often extending over many years. Abscesses frequently form in the back or groin, more commonly in the latter situation. The latter condition is known as a psoas abscess, from the fact that the pus follows the sheath of the psoas muscle. When the pus seeks exit in the back, the process constitutes a lumbar abscess.

Paralysis of the lower limbs occasionally results, which though tedious is usually curable, provided extension and fixation are rigidly enforced. Laminectomy is rarely required. See CARES.

DE FOREST WILLARD.

Spinal Column [*spinal* is from Lat. *spina* is, deriv. of *spina*, back-bone, liter.,



FIG. 1.—Lateral view of spine.



FIG. 2.—A vertebra.

Spinal Column. So called from the shape of a vertebra; the backbone, the composite bony column of the back of vertebrate animals which affords attachments, direct or indirect, for the ribs and other bony parts, and for the numerous groups of voluntary muscles. In man it is a flexible column of thirty-three vertebrae united by ligaments, with interposed cartilaginous junctions. The column is from 2 to 24 feet in length, and viewed laterally presents marked curves, which add to the grace and free movements of the trunk. (Fig. 1.) The column is divided into regions—the cervical, dorsal, lumbar, and pelvic—corresponding to the neck, chest, abdomen, and pelvis. The vertebrae, excepting in the pelvic region, rotate freely and flex both antero-posteriorly and laterally. A single vertebra (Fig. 2) consists of the *body*, which unites it to other vertebrae, and a bony ring which encloses the vertebral foramen or vertebral canal, protecting the spinal cord; this ring has articular and spinous processes for attachment of ribs, ligaments, and muscles.

Revised by W. PIERCE.

Spinal Cord: See MEDULLA SPINALIS.

Spinal Curvatures: three kinds—(1) rachitic curvature; (2) lateral curvature; (3) angular curvature. The curvature of rickets (rachitis) is usually a simple exaggeration of the normal curves of the spine—convexity or kyphosis in the dorsal, and concavity or lordosis in the lumbar region; occasionally there is a lateral bending (scottosis), but unaccompanied with the rotation of true lateral curvature. Lateral curvature is a deviation of the spinal column at one or several points from the position which it occupies in health to the median line of the back, accompanied by marked rotation of the bodies of the vertebrae around the axis of the spinal column, which is thus much more distorted in front than behind. It occurs in children, in young, imperfectly developed, feeble, and growing adults; more especially women, and less often in men. The spine normally occupies the middle of the back, with a slight convexity to the right in the dorsal region; in this central position it is acted upon by many forces—the weight of the head and trunk, the lateral traction of the arms in all physical efforts, of the thoracic and abdominal muscles in breathing—and beneath has a divided support of the two lower extremities through the intervention of the pelvis. A lateral curvature may develop connected with any one of these forces; when the tissues are poorly nourished the spine may yield to the weight it supports. Habitual use of one arm to the exclusion of the other may cause deviation of the spine, cervico-dorsal, to the stronger side—a common occurrence in weakly children at school, housemaids, and in some confining mechanical vocations. Disease of one lung, as phthisis, chronic pneumonia, pleuritic adhesions and chest-contraction, by limiting respiratory movement on one side, often causes dorsal curvature to the more active side. Shortening of one limb, hip-joint disease, persistent limping from any cause, by tilt-

ing the pelvis throws the spine out of center and develops lumbar curvature. Whenever a curvature is thus primarily established, a secondary curvature develops at another part of the vertebral column, and as the opposite side, and thus the erect position of the body is maintained. The affected spine, viewed anteriorly or posteriorly, presents a double curvature, a tortuous line whose upper and lower ends can be connected by a vertical straight line, representing the component of all the forces, weight, etc., while the spine sustains. Occasionally there are four curves, two in the dorsal and two in the lumbar region.

Lateral curvature, if of long standing, may so modify the size and conformation of the lung, as change the nutrition and structure of the intervertebral cartilages and the muscular volume of the two sides of the body, that cure is impossible or incomplete. More often it is curable by correcting bad habits, as favoring one side in standing, sitting, or sleeping, by resort to light gymnastics and special passive movements, and by the use of apparatus which removes weight from the spine and applies pressure or traction to counteract the curves. Great advantage may, in early cases, be derived from dividing the period during which the body is erect, by lying flat on the back, without a pillow and on a hard mattress, for at least an hour in the mid part of the day. General tonic treatment, cod-liver oil, and phosphates, out-of-door life, warm clothing, stimulating baths, and regulated diet are indicated in all cases.

Angular curvature, or SPINAL CURVATURE (*q. v.*), is of more serious nature. It may be followed by paralysis of the lower extremities, due to pressure on or inflammation of the spinal cord, but paralysis and abscess do not usually coexist in the same cases.

Revised by JOHN ANTHONY, Jr.

Spinal Diseases: See MENINGITIS and SPINAL CURVATURES.

Spindler, KARL: novelist; b. at Breslau, Prussian Silesia, Oct. 16, 1796; educated at Strassburg, afterward at Augsburg; was connected for some time with a company of strolling actors; published in 1824 his first novel, *Kugen von Kromstein* (2 vols.); chose literature for his occupation; lived at Hanau, Stuttgart, Munich, and finally at Baden-Baden. D. at Friderichshagen, Baden, July 12, 1855. The best of his novels are *Der Bastard* (3 vols., 1825); *Der Jude* (3 vols., 1827); *Der Jesuit* (3 vols., 1829); and especially *Der Isoldide* (1831). The latter story is an excellent specimen of the early historical novel in Germany, giving a picture of the French Revolution and the subsequent rôle of Napoleon which has not yet been surpassed in fiction. Many of his minor novels were published in a periodical, *Vergangenheitswerk*, which he edited after 1831. A collected edition of his works appeared in 102 vols. at Stuttgart from 1831 to 1854.

Revised by JULIUS GUNZERT.

Spindle-tree, Staff-tree, or Bittersweet Family: the *Celastraceae*; a small family containing 500 species of dicotyledonous, shrubby or tree-like plants, mostly of the temperate and tropical climates, eighteen of which occur in North America. The climbing bittersweet (*Celastrus scandens*) is one of the prettiest woody climbers of the U. S., especially in the winter, when its red-berried seeds remain long in conspicuous clusters. The genus *Euonymus* includes the spindle-trees proper. *E. atropurpureus* is the ornamental shrub known in the U. S. as the wahoo, or burning-bush.

CHARLES E. HENRY.

Spine: See SPINAL COLUMN.

Spinel (Fr. *spinelle*): a mineral, essentially a compound of alumina and magnesia, but with variations and admixtures that give rise to a great variety of colors and tints. It crystallizes in regular octahedrons, sometimes of large size in the black and opaque kinds. The transparent spinels make beautiful gems, especially the deep-red, flame-red, and carmine-colored stones, which are known as ruby spinels, and command high prices, from one-eighth to one-half that of diamonds, the finest having often been erroneously sold for true rubies. The pink variety is known as balasruby or rubicelle, the blue sapphire spinel, the green chrysospinel, the purple almandine spinel. They are also blue, green, yellow, and purple, and even white. The so-called Black Prince's ruby in the English crown is a spinel. The best spinel gems are from Ceylon, Burma, and Siam. H. P. ROSE.

Spinello di Luca Spinelli, called SPINELLO AFRICANO; painter; b. at Arezzo, Italy, about 1380. He was the pupil of

Jacopo di Casentino, and at the age of twenty surpassed his master. It is supposed that in 1347 he was assisting his master to decorate the Church of Santa Maria Novella in Florence with frescoes representing the Virgin and St. Anthony. Of these little remains. Some scenes from the life of St. Benedict, by Spinello, at San Miniato, near Florence, are still in good preservation. These were painted in 1384, when Spinello took refuge in Florence after the sack of Arezzo. Before this date he had decorated many churches in his native city; in San Francesco an *Annunciation* still exists in the chapel of St. Michael. He painted a fantastic composition of the archangel driving Lucifer from heaven, a fragment of which fresco is in the National Gallery, London. This composition was afterward repeated by him for the guild of St. Angelo. In 1361 Spinello painted a panel for the abbey of the Camaldolesi, in the Casentino. The side-frescoes for the altar of Monte Oliveto Maggiore of Chiusi are to be seen in the Ramboux collection at Cologne. In 1387 Spinello was invited to Pisa to work in the Campo Santo there, and painted pictures considered his masterpieces, but now nearly destroyed. He left Pisa on account of political disturbances, and after a year in Florence he returned to Arezzo about 1394. Here he worked, decorating many churches with frescoes till 1405, when he went with his son and assistant, Parri, to Sienna, to paint the series of frescoes still preserved in the town-hall of that city. The last that is heard of him in Sienna is in 1408, after which he returned to his birthplace, where he died in Mar., 1410. For further information, see Vasari (*Le Monner*), vol. ii., and Kugler's *Handbook* (1887).

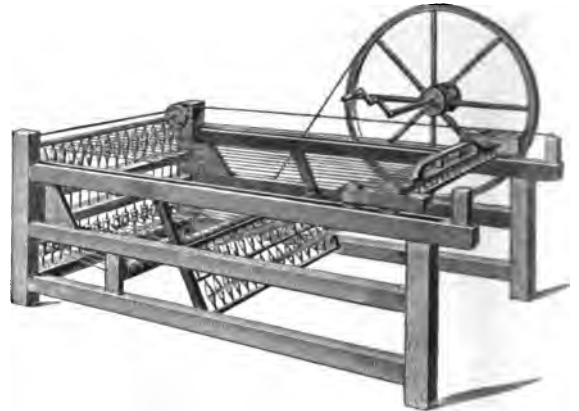
Spinnet: a musical instrument, stringed and provided with a keyboard; one of the forerunners of the piano, but much weaker, and entirely out of fashion.

Spinner, FRANCIS ELIAS: financier; b. at German Flats (now Mohawk), Herkimer co., N. Y., Jan. 21, 1802; son of a German clergyman; was successively apprentice to a confectioner at Albany and to a saddle and harness maker at Amsterdam, N. Y.; became in 1824 a merchant at Herkimer; was deputy sheriff of Herkimer County 1829-34, and sheriff 1835-37; served in the militia and became major-general; was for twenty years connected with a bank at Mohawk, N. Y., and became its president; was auditor and deputy naval officer of the port of New York 1845-49; Democratic member of the Thirty-fourth Congress 1855-57; was an original member of the Republican party, and re-elected by it to Congress by 9,000 majority in 1856, and again by a similar majority in 1858; was chairman of the committee on accounts 1859-61; was appointed by President Lincoln, on the recommendation of Secretary Chase, to the post of treasurer of the U. S. Mar., 1861; and held the office until July, 1875. During this period his name was a synonym for official integrity, and his curious signature on the "greenbacks" became more familiar in the U. S. than the autograph of any other living man. He was defeated in 1875 as Republican candidate for comptroller of the State of New York. D. at Jacksonville, Fla., Dec. 31, 1890.

Spinning: the art of producing from vegetable or animal fibers an even and compact thread suitable for sewing or weaving. It is one of the most ancient of industries, and is still practiced in many parts of the globe by the spindle and distaff in the same manner that the process is pictured on Egyptian monuments. The distaff, held in the left hand, was a simple stick around which the fiber was loosely coiled; the spindle was a species of top which was set in motion by a twirl of the hand, and by combining its rotary motion with a gradual movement away from the spinner, who equalized the size of the fiber by passing it between the finger and thumb of the right hand until the motion of the spindle was exhausted, when the thread was wound around it, and the process was repeated. The first and most obvious improvement consisted in placing the spindle in a frame and making it revolve by mechanical action of the hand or foot in connection with a wheel and treadle. This constituted the spinning-wheel, which, notwithstanding its simplicity, can not be traced further back than 1530. Modern invention has added little to this implement, the chief improvement being a bobbin for winding the yarn by a motion separate from that of the spindle. See COTTON MANUFACTURES.

Spinning-jenny: the earliest form of spinning-machine in which more than one thread was spun at a time. Cotton, in the course of manufacture, is reduced from the state of the fleecy roll called carding into the state of spun thread by repeated though similar operations. The first

draws out the carding and gives it a very slight twist, so as to make it into a loose thread about the thickness of a candle-wick, in which state it is called a roving or slubbin. The subsequent processes draw out the roving much finer, and



The spinning-jenny.

at length reduce it into yarn. The spinning-jenny, invented about 1764 by JAMES HARGREAVES (q. v.), was not, like Arkwright's spinning-frame (1769), capable of being applied to the preparation of the roving itself. In 1779 Samuel Crompton completed his invention of the mule, which combined in one machine the principles of both the jenny and the frame, and by which the jenny was ultimately superseded. See COTTON MANUFACTURES.

The person operating the jenny turned the wheel with the right hand and with the left drew out from the slubbin-box the rovings, which were twisted by the turn of the wheel. Next a piece of wood, lifted up by the toe, let down a wire, which so pressed out the threads that they wound regularly upon bobbins placed in the spindles. The number of spindles in the jenny was at first eight; when the patent was obtained it was sixteen. It soon came to be twenty or thirty, and as many as 120 have been used. The introduction of the spinning-jenny met with great opposition. In 1779 a mob destroyed the jennies for several miles around Blackburn, and with them all the carding-engines, spinning-frames, and every machine turned by water or horses. The spinning industry was driven from Blackburn to Manchester and other places. Nevertheless, the jenny and the frame revolutionized the cotton manufacture. WILLIAM KENT.

Spínola, AMBROSIO, Marquis de: soldier in the service of Spain; b. in Genoa, Italy, about 1571, son of a wealthy Levant merchant and of a princess of Salerno; took service at an early age under his brother, an admiral in the Spanish navy; participated in the war against the Dutch and English 1588; raised and equipped at his own expense in Spain a numerous corps of veterans, at whose head he proceeded to the Spanish Netherlands 1602; was instrumental in rescuing the Archduke Albert from the superior forces of Prince Maurice of Nassau; became chief commander of the Spanish armies in Flanders 1603; and in the fall of that year took command of the forces around Ostend, which had been besieged for two years. The city capitulated in Sept., 1604. He conducted the war with great ability, but varying success, until the truce of twelve years (1609), which he favored; commanded in the interval the Spanish forces in Germany; took Aix-la-Chapelle, Wesel, and Jülich 1622; was repulsed from Bergen-op-Zoom 1623; captured Breda after a protracted siege 1625; was subsequently commander of the Spanish army in Italy, and captured the city of Casale, Piedmont, but died while pressing the siege of the citadel, Sept. 25, 1630. His death is said to have been hastened by his chagrin at the ingratitude of the Spanish Government in disregarding his pecuniary claims.

Spinoylic Acid: See SALICYLIC ACID.

Spino'za, (BARUCH) BENEDICT: philosopher; b. at Amsterdam, Holland, Nov. 24, 1632; a member of the Spanish-Portuguese Jewish community at that place, then the chief seat of European Judaism. His father, who was a trader, noticing the extraordinary faculties of the son, gave him a good education. Accordingly, he entered upon the customary path of a Jewish scholar, passing through all the steps of the ordinary rabbinistic school, from the elements of He-

view to the holy writings of the Old Testament, thence to the Talmud, the Jewish commentaries, and the scholastic writers of the Middle Ages. Jewish literature led him, through the literature of the scholastics, wherein the Catholic doctrine played so prominent a part, gradually to the portals of the then developing modern views of the school of Descartes. In short, the rabbi Spinoza became a skeptic even as Descartes, the scholar of the Jesuits, had become a skeptic before him. Descartes, however, was enabled to fall back upon Christianity for salvation from skepticism. This Spinoza could not do. Cut loose from Judaism, unable or perhaps traditionally so opposed to it that he did not feel any way inclined to accept Christianity, he was left without any support or guidance. The Jewish God, as the cause and creator of the universe, he had discarded; the Christian conception of God, as the moral harmony and order of the universe, was utterly repugnant to his originally Jewish mind; and thus he had no other recourse left than the so-called pantheism of Substantiality. This capture with Jewish theology brought about a dispute between him and his rabbinistic teachers, which finally led to his expulsion from the synagogue at Amsterdam (July, 1656). Spinoza wrote a protest against the anathema pronounced against him, but otherwise paid little attention to it. He simply changed his name from *Benzion* to *Benedict Spinoza*, by which last name he is generally known, and when he discovered that he was still persecuted by both the orthodox Jews and orthodox Christians of Amsterdam, he retired to the country-house of a friend in the vicinity of Amsterdam, a member of one of the persecuted sects of Protestants of that time, with whom he lived in deep seclusion from 1656 to 1669. He subsequently accompanied him to Rensburg, where he remained till 1664, in May of which year he removed to Voorburg, where he remained in the house of the painter Tydeman till 1669. He then, at the entreaty of his friends, removed in 1671 to Scherdingen, near The Hague, where he remained till his death on Feb. 21, 1677. In personal appearance Spinoza was of middle height; his features were regular and well formed, complexion dark, hair curly and black, long black eyelashes, and, as Leibnitz remarks, "with somewhat of the Spanish in his face." To earn his livelihood he learned to grind optical glasses, and also the art of painting. His mode of living was throughout extremely frugal and secluded. He never married.

The ground of the extraordinary interest taken in Spinoza is to be found in the pantheistic view of the universe which he has carried out in the completest of extant forms in his *ETHICS*. Hence none of the other works of Spinoza claim special notice. Interesting as they may be in connection with the *Ethics*, they have no intrinsic merit of their own. All his few published minor works, as well as his published correspondence, have their central point in the *Ethics*. Students of Spinoza are here referred, first, to the remarks of Goethe concerning Spinoza's philosophical system; second, to the remarks of G. E. Lessing; and, in this connection, third, to the essays of Jacobi on Spinoza and Lessing. Fichte's works are also full of references to Spinoza. Spinoza's view of the universe may be very succinctly described as follows: Adopting the category of substantiality, he altogether abandoned the Jewish conception of a First Cause—a self-conscious Jehovah calling the world into existence by his mere word—and adopted in its place the Oriental notion of an unconscious substance of the universe as a whole, of which all the separate phenomena of that universe—stars, heaven, earth, mankind, animals, plants, and minerals—were but so many attributes. In his scheme there was therefore no God, no Freedom, no Immortality. Whenever he uses the word "God," it is to be interpreted as equivalent to the word "nature" or "universal substance"; when he uses the word "freedom," it is to be understood as the equivalent of "necessity"; and his conception of the word "immortality" means simply that the human soul, after death of the body, will merge again into the infinite substance, wherein no self-consciousness can possibly exist. His God is therefore no God, in the ordinary acceptance of the term; his Freedom, no Freedom; his immortality, the very reverse of what men mean when they say claim to be immortal.

To understand thoroughly the style of the *Ethics*, it must always be kept in mind that Spinoza was a Jew, and that the Jewish tendency of mind betrays itself not only in the subject-matter under discussion, but also and equally in its mode of utterance. The style of all Jewish writers is

abrupt, disregarding transition, and losing above everything parallelisms, as every chapter of the Bible shows. This explains, although seemingly in a paradoxical way, why Spinoza chose what he calls the "geometrical or mathematical" method for his chief work. The opening sentences are as disjointed as the opening propositions of Euclid: the first does not involve the second, nor the second the third, etc.; and none are proven, nor is there any attempt in the whole book to prove any of them. Hence the very fundamental principles of philosophy, about which alone there is any dispute, are at the beginning of the work laid down as axioms; and, what is equally objectionable, at the beginning of each new part of the *Ethics*, of which there are four parts, new axioms are introduced in the same arbitrary, abrupt manner. That the word freedom had no significance to him in its current meaning is abundantly evident from the following extracts that occur in his letters, wherein he is usually a little more outspoken than in his very guardedly worded published works. Taking the example of a stone thrown by some hand, and hence impelled by an external cause: "Now conceive, further, that the stone as it proceeds in its motion thinks and knows that it is striving, so far as in it lies, to continue in motion; then, inasmuch as it is conscious only of its endeavor, and in nowise indifferent, it will believe itself to be most free, and to persevere in its motion from no other cause than that it wills to do so. And this is precisely that human freedom of which all men boast themselves possessed, but which consists of this alone—that men are conscious of their desires, and ignorant of the causes by which these are determined." To remove the last objection, that we might be free at least in thinking, Spinoza adds: "Your friend, however, affirms that we can use our reason with perfect freedom. . . . 'Who,' he asks, 'without a contradiction of his proper consciousness, can deny that he is free to think his thoughts, to write what he pleases, or to leave writing alone?' . . . I, for my part, and that I may not contradict my consciousness—that is, that I may not contradict reason and experience, and yield to ignorance and prejudice—deny that I possess any absolute power of thinking, and that at pleasure I can will, or not will, to do this or that—to write, for example." The same criticism applies to his doctrine of immortality. There are numerous Latin and German editions of the *Ethics*, and of most of the other of Spinoza's works. English translations and expositions of his works are as follows: *Benedict de Spinoza, his Life, Correspondence, and Ethics*, by R. Willis, M. D. (London, 1870); *The Ethics of Benedict de Spinoza* (anon.) (New York, 1876); *Spinoza, his Life and Philosophy*, by Frederick Pollock (London, 1899); *A Study of Spinoza*, by James Martineau (London, 1882); *The Chief Works of Benedict de Spinoza* (2 vols., Bohn's Library, London, 1888); *Ethics*, translated by W. H. White and Amelia H. Stirling (1894). It includes all his correspondence, a very valuable feature. In German, Kuno Fischer's *Geschichte der neuen Philosophie* (vol. I, part 2) is devoted entirely to Spinoza and his antecedents, and is the most satisfactory work extant on this subject.

Revised by W. T. HARRIS.

Spiraea [Mod. Lat., from Lat. *spiraea* = Gr. *εσπερία*, evening, deriv. of *σπείω*, sowing, sowing. So called from the shape of its folioid; a genus of herbs and shrubs of the family Rosaceae, including numerous species, such as hardhack (*S. lamentosa*), queen-of-the-prairie (*S. lobata*), and several other American, besides numerous Old World species, many of them very fine in garden-culture. Some species of *Acetia* (family Saxifragaceae), having somewhat the aspect of *Spiraea*, are cultivated under this name, incorrectly bestowed.

Revised by CHARLES E. BERRY.

Spiral [from Lat. *spiralis*, spiral, deriv. of *spira* = Gr. *εσπερία*, coil, spiral; a curve that may be generated by a point moving along a straight line in accordance with a fixed law, while the line revolves uniformly about one of its points, always remaining in the same plane. The portion generated during one revolution of the line is called a *spire*; the fixed point is the *pole*; and the distance from the pole to any point of the curve is the *radius-vector*. If we take any position of the revolving line as the initial radius, and denote the angle through which the line has revolved by θ , and the corresponding value of the radius-vector by r , the equation of any spiral may be written $r = f(\theta)$. The most interesting spirals are the spiral of Archimedes and the logarithmic spiral. The former is determined by the law that the radius-vector increases uniformly as it revolves, so that the successive spirals intersect it at equidistant points along its length.

In the logarithmic spiral the logarithm of the radius-vector increases uniformly, and the radius-vector itself increases by a constant ratio for every equal increment of the angle of revolution. Thus the distances of the points of intersection from the pole form a geometric progression. At every point of this curve the tangent makes a constant angle with the radius-vector. On the inner side the curve continually approaches the pole, which it only reaches after an infinite number of convolutions. The *Rhumb* (*q. v.*) is a similar curve on the surface of a sphere. Revised by S. NEWCOMB.

Spiral Ducts or Spiral Vessels: See HISTOLOGY, VEGETABLE.

Spirants [from Lat. *spīrans*, partic. of *spīra're*, to breathe]: in phonetics, a class of consonants produced by a friction of the current of breath against the walls of the narrowed organs of the mouth. They are also called fricatives (Germ. *Reibelaute*, *Dauerlaute*, *Schleifer*). Such are *s*, *z*, *sh*, *zh*, *f*, *v*, *p*, *ð*, *ch* (in Germ. *ich*, *ach*), *j*, and to some extent *r* and *l*. They are distinguished from explosives or stops, *p*, *t*, *k*, etc., by being continuous and not momentary. See CONSONANT.

BENJ. IDE WHEELER.

Spire, or Spires: English name of SPEYER (*q. v.*).

Spirillum: See BACTERIOLOGY.

Spirit-duck: a common North American duck (*Charitonetta albeola*). The male has the head very puffy and iridescent, hence the name buffhead. It is an expert diver.

Spiritism: See ANIMISM and RELIGION, COMPARATIVE.

Spirit-level: See LEVELS AND LEVELING and HYPSONETRY.

Spirit-plant: the HOLY GHOST FLOWER (*q. v.*).

Spirit-rapping: See SPIRITUALISM.

Spiritualism [from Late Lat. *spiritualis*, spiritual, of a spirit, deriv. of Lat. *spīritus*, breath, life, spirit, soul (in Late Lat.) ghost, deriv. of *spīra're*, breathe]: the creed of those who believe in the communication of the spirits of the dead with the living, usually through the agency of peculiarly constituted persons called mediums, and also in certain physical phenomena, transcending ordinary natural laws, believed to accompany frequently such spiritual communication, and attributed either to the direct action of spirits, or to some force developed by the medium's own personality.

Revival of Spiritualism.—The elements of the spiritualistic creed are not in themselves new, but are traceable severally to a high antiquity among different races and in widely separated localities, and have usually been associated with some form of religion; they have been revived, though not of conscious purpose, and gathered into one body of beliefs by a movement having its origin as the result of certain incidents which took place at Hydesville, a small town in the State of New York, in 1848.

In March of that year rapping sounds were heard, apparently proceeding from the furniture, walls, and ceilings, of a house in Hydesville, belonging to a family of German descent named originally Voss, a name anglicized into Fox. It was found that these sounds were always perceived in the presence of one or both of the young daughters of Mr. Fox, and that a code of communication could be established by which conversation was carried on with the intelligence supposed to produce them. It was said that in this way evidence was obtained concerning a murder believed to have been committed in the house some time before, and the sounds purported to come from the spirit of the murdered man. Many years after, in 1888, Mrs. Kane (Margaretta Fox) came before the public with a confession that she and her sister had made the sounds with their toes; but before her death she repudiated this confession.

Noted Mediums.—The reported phenomena at the time excited widespread attention in the U. S. and led to the formation of numerous circles of experimenters, where rappings of a similar kind were produced, and supposed communication with the spirits of the dead was established. To the spirit-rappings were added other phenomena, such as table-turning, automatic writing, trance-speaking, etc.; and the persons who developed them received the name of mediums. Mediums, according to the spiritualistic view, are endowed with a special faculty enabling them to be the agents of the communications and other manifestations of spirits. Some show evidence of this gift in early youth, and others gradually develop it in later years. The first medium, after the Fox sisters, was Andrew Jackson Davis, who attracted notice in 1845 as a clairvoyant and later as a trance-

speaker. Judge Edmonds, a well-known lawyer of New York, may also be mentioned; he began an investigation of the subject, became convinced that he was himself in communication with spirits, and wrote an elaborate work on spiritualism. Mrs. Hayden, another native of the U. S., went to England in 1852, and her séances there started the spiritualistic movement which eventually spread over all Europe. In 1855 the celebrated Daniel D. Home also went to England, and later to the Continent. With Home spiritualism reached its highest development, and private and professional séances were established in almost every European town.

Home overshadowed all contemporary mediums, and gained adherents to spiritualism from every intellectual and social class. He was, according to numerous witnesses, equally successful in receiving spiritual communications and in producing physical phenomena, which were witnessed and often severely tested by competent observers. Notable experiments in testing Home's powers were made by William Crookes, by means of apparatus of his own construction, with successful results.

Some years later Slade, and also Eglinton, attracted much attention in Europe by their so-called psychography, or spirit-writing (usually produced on slates), which led to interminable discussion in the press occupied with such matters. The spiritualists attributed this psychography to the spirits, and the non-spiritualists asserted it to be due to conjuring. Slade also gave séances for a variety of spiritualistic phenomena, and achieved special notoriety from a series of sittings with Prof. Zöllner, of Leipzig, who, in *Transcendental Physics*, recorded his belief that the phenomena he had witnessed were due to intelligent "fourth-dimensional" beings.

One of the most noted mediums in England was the Rev. William Stainton Moses, who died in 1892. A full account of his experiences has been published in the *Proceedings* of the Society for Psychical Research. He claimed to receive communications from spirits, both of those recently departed and of personages belonging to remote generations. The list of his physical phenomena, according to his own account and the evidence recorded by the witnesses at his séances, comprised most of those produced by Home and other manifestations as remarkable. Mr. Moses was for several years editor of *Light*, a London spiritualistic periodical, and was, besides, a busy clergyman and school-master of high reputation, and in no sense a professional medium.

In 1892 a series of sittings under unusually stringent if not perfect conditions was held by a committee of Italian savants, among others Schiaparelli, director of the Observatory of Milan, Profs. Gerosa and Brofferio, with a Neapolitan medium, Madame Eusapia Palladino, with the result that several of this committee were convinced of the supernatural character of the phenomena observed, while the others, if not quite convinced, were unable to offer any satisfactory explanation of what they had seen. The phenomena consisted in alterations in the weight of the medium, raps, moving of furniture, and materialization of hands. The séances of Madame Palladino have attracted much attention in Italy, and are remarkable for having influenced the thought of numerous persons of high intellectual standing.

Spiritual Communications.—Spiritualistic communications or messages are received through the automatic writing with pencil or planchette, or trance-speaking of the medium when under spirit-control; by direct writing of the spirits on paper or slates with pencil or chalk; by precipitated writing—that is, writing supposed to be produced on paper without visible means; by table-turning, either with or without contact of the medium, and interpreted by a conventional code; and by raps on the furniture or walls of a room, made intelligible by a code as in table-turning. These communications are supposed to have two objects—one is to convey proof of the survival of the dead, the other to instruct in moral and philosophical knowledge. They are acknowledged by spiritualists to vary greatly in character and in value. Some are merely the expression of the ideas and opinions of the medium himself or of the sitters; some are trivial or false, and are attributed to a low order of mischievous spirits; others, however, it is asserted, are genuine and imply a knowledge of events or of facts beyond the range of the medium or of the inquirers, and proving their supernatural origin.

Physical Phenomena.—The principal so-called physical phenomena of spiritualism are lights, musical sounds, as of

invisible instruments played on or playing of real instruments by invisible or materialized hands; moving of furniture and other heavy objects; the passage of matter through matter, as bringing flowers or other material objects into closed rooms; materializations of hands or other parts of the body or of complete human figures; spirit-photography; and, finally, phenomena immediately affecting the medium, such as levitation or floating in the air without visible support, the elongation or shortening of his body, and fire-tests, when the medium handles live coals and gives them to others to handle without injury, phenomena for which Home was especially renowned.

The object of these phenomena is considered by spiritualists to be the attestation of the genuineness of the communication, and they bear to spiritualistic belief much the same relation that miracles do to revealed religion. Phenomena of undoubted character, like the corresponding communications, are attributed to the lower orders of spiritual beings. All these phenomena do not occur at all sittings or with all mediums, and the latter are often classified according to the predominant character of their special "development." Thus there are writing mediums, trance mediums, materializing mediums, etc. A few, such as Home and Stainton Moses, seem to have been equally successful in every variety of manifestation.

Non-spiritualistic Evidence for "Phenomena."—Count Agénor de Gasparin carried out an elaborate series of experiments in moving tables without contact, a full account of which he published under the title *Des Tables Tournantes*. His circle consisted of himself and his family and a few skeptical witnesses whom he admitted to his sittings. The experiments were made in full light, the members of the circle joining hands and concentrating their will upon the object to be moved, a condition considered by de Gasparin to be essential to success. De Gasparin, evaded the idea of the intervention of spirits in the movements he describes, and attributed them to a mental force capable of acting upon matter without the agency of muscular action. *Des Tables Tournantes* is a body of evidence very carefully recorded, and deserves attentive consideration in connection with the study of these obscure and disputed phenomena. Prof. Barrett and others have also played on record experiments in various phenomena usually called spiritualistic, but in their case not produced in the presence of professional mediums, where, too, the hypothesis of fraud seemed to be a difficult one.

Theories of Apparitions and Materialized Spirits.—A typical belief is that of Allan Kardec, who asserts that the human personality consists of the body, the soul or spirit, and a spiritual body ("périsprit") of a rarefied material, and that after death the spirit can manifest itself to the senses through the périsprit, which by some force of the will or through the agency of the medium becomes visible like vapor condensed under certain atmospheric conditions.

Another theory of the materialization of spirits is that the spirit draws from the medium certain emanations by which it can make itself wholly or in part visible in a temporary reduplication of the medium's body. While materialized the spirit remains in close rapport with the medium, and at the end of the séance or on any sudden disturbance regression takes place—that is, the materialized body at once withdraws into the organism of the medium.

Exposure of Fraud.—Spiritualists acknowledge that many exposures of fraud in mediums have been made. They assert, however, that such fraud is to be expected occasionally in professional mediums, since their living depends upon the production of phenomena and the necessary power is very uncertain. They also say that the trickery is generally of a rather simple kind, and that the genuine phenomena are unmistakable and not to be so explained, and that therefore occasional trickery does not necessarily prove habitual bad faith on the part of a medium.

Spiritualists further contend that numerous exposures have been only apparent, and that much injustice has been done. This view is founded on the theory of repercussion, namely, that the materialized form when disturbed disappears, thus leaving the medium in the exposé's grasp and creating the impression that the medium has himself impersonated the spirit-form.

Relation of Spiritualism to Religion.—Spiritualism is not an independent religion, but its manifestations are regarded by spiritualists as corroborating those ethical teachings of Christ in which all the sects of the Christian religion substantially agree. It does not modify in any specific man-

ner the creeds or dogmas of Christian sects, and among spiritualists are to be found persons of every shade of belief from Roman Catholic to Unitarian. To this general statement one important exception may be made. There is in France a large class of spiritualists who believe that the existence of the soul is one of alternates spiritualism and reincarnation.

The main points of spiritualistic belief, then, as it touches religion are that at death the character undergoes no sudden change, but retains the impress of the actions and thoughts of the earthly life; that the soul values upon a course of steady progress toward improvement; that there are in the other life occupations and interests as in this world; that all work together for the attainment of the perfect life; and that happiness depends upon the degree of moral advancement.

In 1891 there were 364 spiritualistic organizations in the U. S., with 45,050 members.

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THOMAS C. FELTON.

Spirocha'ete: See BACTERIOLOGY.

Spir'ula (Mod. Lat., dimin. of Lat. *spira*, coil): a genus of ten-armed dibranchiate cephalopods, of which there are three species, found in most warm seas. They constitute a family, *Spirulidae*, which has interesting relations to the nautilus and the ammonites. The extremely delicate, nautilus-shaped shell is especially common on the New Zealand shores, but the animal itself is very rarely seen in a perfect condition.

Revised by D. S. JOHNSON.

Spit'head: a headland off Portsmouth, England, being the eastern portion of the sea-channel separating the Isle of Wight from the English mainland. (See PORTSMOUTH.) Its security as an anchorage, being protected from all winds except those from the S. E., its contiguity to the great naval establishment at Portsmouth, and its proximity to the coasts of the Continent make it a favorite rendezvous of the British navy. Spithead has been strongly fortified since 1864. Besides the works on the Isle of Wight and on the mainland there are five iron-plated works, built from the bottom, which are among the most remarkable specimens of modern iron-plated fortification.

Spitzberg'en: Arctic archipelago; 400 miles N. of North Cape of Norway; between 76° 30' and 80° 30' N. lat., and 10° and 30° E. lon.; consisting of West Spitzbergen, Northeast Land, Stens Foreland, King Charles Land, Prince Charles Foreland, and many smaller islands. Area, 27,000 sq. miles, with no permanent inhabitants. The islands are mountainous, the peaks often rising between 4,000 and 5,000 feet, and mostly covered with perpetual snow and ice. Only along the shore between the ocean and the mountains are in some places found patches of land, where during the two summer months, when the thermometer rises 10° F. above the freezing-point, the snow melts and a few herbs appear. The mountains contain granite, marble, and coal. Bears, reindeer, and foxes are found, and innumerable whales, seals, and sea-fowl gather along the shores. The islands were discovered in 1523, and visited in 1590 by the Dutch navigator Barentz while seeking a northeast passage to India. The group forms occasionally the base of operations for Arctic expeditions.

Revised by M. W. HANCOCK.

Spitz Dog [used as transl. of Germ. *spitzhund*]: the Pomeranian dog, a small variety which is thought to be a cross between some of the Arctic wolf-dogs and the Arctic fox, like the Esquimaux, Siberian, Lapland, and Iceland dogs, to which, though much smaller, it has a marked resemblance. It is characterized by short and erect ears, a pointed muzzle, a curved bushy tail, and long hair, usually pure white, but sometimes cream-color or even deep black. It is brisk in its movements, useful as a watch-dog, somewhat snappish, handsome, quick of apprehension, and a favorite lapdog in Europe and the U. S.

Spitzka, EDWARD CHARLES, M. D.: neurologist; b. in New York Nov. 10, 1852; M. D., University of City of New York, 1873; studied University of Leipzig 1873; University of Vienna 1874; Assistant Professor of Embryology at Vienna 1874-75; Professor of Medical Jurisprudence, New York Post Graduate Medical School, 1881-82; Professor of Neurology there 1882-84; consulting neurologist St. Mark's Hospital and Northeastern Dispensary; vice-president International Medical Congress at Washington 1887; honorary president Pan-American Medical Congress 1893; author of *Insanity, its Classification, Diagnosis, and Treatment*; articles on *Organic Brain and Spinal Cord Diseases* in Pepper's *System of Medicine*; *The Architecture and Mechanism of the Brain* in Wood's *Handbook of Medicine*; *Insanity in Children* in Keating's *Cyclopaedia*; and numerous professional essays. C. H. THURBER.

Spleen [from Lat. *splen* = Gr. *σπλήν*; cf. Lat. *lien*; Sanskr. *plhān*, spleen]: the largest of the ductless glands of the body. In man, it is situated in the left hypochondriac region, its outer convex surface corresponding with the ninth, tenth, and eleventh ribs, from which it is separated by the descending muscular attachments of the diaphragm; its inner concave surface adjoins the great pouch of the stomach. It also comes near to the pancreas, left kidney, left lobe of the liver, and arch of the colon. It is held in position by a peritoneal reflection from the diaphragm, called the suspensory ligament. It is even more directly related to these adjacent viscera by its blood-supply, the splenic artery being the largest branch of the coeliac axis, the trunk which gives off the nutrient vessels of the stomach, liver, and parts of the small intestine. The variable size and gross and minute structure of the spleen indicate that it is a great vascular reservoir. In health it is 5 inches long, 3 to 4 thick, and 1 to 1½ in breadth, and weighs 7 oz.; it is larger immediately after eating, and in malarial and certain other diseases may weigh 15 or 20 lb., and occupy the abdomen down to the pelvic bones. The fibrous capsule of the spleen is very elastic; it is reflected inward on the vessels as they subdivide, thus forming a system of ramifying partitions, which constitutes the fibrous framework of the spleen. The interspaces of this structure are occupied by the substance of the spleen, a soft, pulpy mass of dark, reddish-brown color, consisting of granular matter, red and white blood-cells, and the Malpighian corpuscles—masses of lymphoid cells closely packed about the terminal arterioles.

The functions of the spleen are not definitely known, but it is certainly the birthplace of both white and red blood-corpuscles. It is active also in the destruction of red corpuscles, but less so than was formerly supposed. It is not an indispensable organ, for it has been removed in animals and men with no serious or marked result. The spleen is frequently congested in the course of infectious diseases, such as typhoid fever, malaria, typhus fever, and the like, and is often permanently enlarged by repeated congestions, infiltration, and hypertrophy of its tissue. There may be supernumerary spleens. The spleen is liable to rupture and fissure from external violence. See HISTOLOGY.

Revised by W. PEPPER.

Splint: a bony growth, generally upon the inside of the fore leg of the horse, below the knee. In young horses it is usually caused by overwork. Rest, poulticing, and packing with cold wet compresses are recommended for the early stages. At a later stage, iodine, mercurial ointment, blisters, and the actual cautery may be usefully employed, but not till the inflammation is gone. If the tendons are interfered with, veterinary surgeons sometimes remove the splint.

Splint: in surgery, a piece of wood, leather, pasteboard, gutta-percha, metal, or other material employed to prevent displacement of the fractured ends of bones or for other analogous purposes. In many cases surgeons use bandages

stiffened with gypsum, starch, dextrine, or gum-arabic in the place, and a very great number of splints have been devised for special purposes in surgery. See FRACTURE.

Splügen: a mountain-pass of the Alps leading from the Swiss canton of the Grisons into Italy over an elevation of 6,946 feet. On the Italian side it is covered at many places with galleries of solid masonry to protect travelers from avalanches. These galleries were built by the Austrian Government, and finished in 1834.

Spofford, AINSWORTH RAND, LL. D.: librarian; b. at Gilmanton, N. H., Sept. 12, 1825; received a classical education by private tuition; became principal librarian of Congress 1865, after having been previously employed in publishing and editing; is member of many historical and philosophical societies; has written much for the press on historical topics. He has published *Catalogues of the Library of Congress: The American Almanac and Treasury of Facts* (1878-89); *The Library of Choice Literature* (1881); *Library of Historic Characters and Famous Events* (1894); and other works. During his tenure of the office of librarian the national collection has grown from 90,000 to about 700,000 volumes, and the change in the law of copyright has been effected by which all copyrights are entered and all facts regarding literary property verified at one central office at the Library of Congress, Washington, D. C., instead of being scattered, as was the case prior to 1870, in the offices of the district clerks throughout the country.

Spofford, HARRIET ELIZABETH (*Prescott*): poet and story-writer; b. at Calais, Me., Apr. 3, 1835; removed at the age of fourteen to Newburyport, Mass.; attended school at Derry, N. H., and early began writing stories for the magazines; married in 1865 Richard S. Spofford, a lawyer of Boston, and subsequently resided at Amesbury, Mass. Among her publications are *Sir Rohan's Ghost* (1859); *The Amber Gods, and other Stories* (1863); *Azarian* (1864); *New England Legends* (1871); *A Thief in the Night* (1872); *Art Decoration applied to Furniture* (1881); *The Marquis of Carabas* (1882); *Poems* (1882); *Hester Stanley at St. Mark's* (1883); *Ballads about Authors* (1887); and *A Scarlet Poppy* (1894). Revised by H. A. BEERS.

Spohr, LUDWIG: composer; b. at Brunswick, Germany, Apr. 5, 1784. His father was a physician. He was early noticed by the Duke of Brunswick, placed on the civil list, and furnished with means for study and travel. His masters on the violin were Maurer and Eck; visited Russia; in 1804 began his professional career in Germany; was concert conductor under the Duke of Saxe-Coburg-Gotha; in 1813 was in Vienna, in 1816 in Italy, in 1817 in Frankfurt and London. A residence of some years in Dresden followed, and continued till he was called to the office of chapel-master at Cassel. D. Oct. 22, 1859. Spohr was possessed of fine sensibility and immense activity. Skillful in construction, elaborate in finish, a master of harmony and instrumentation, poetic in sentiment, imaginative, sympathetic, he ranks with the great, although not the greatest, composers. He was the violinist *par excellence* of his day. His book of instruction for the violin is a standard work. He composed in nearly every style—duos, quartettes, quintettes, sonatas, variations, overtures, cantatas, nine symphonies, five or six operas, several oratorios, songs with pianoforte accompaniments. His most famous pieces are the symphony *The consecration of Tones* and the oratorio *The Last Judgment*, which is rather a collection of musical gems than an evenly developed structure. A vein of mournful tenderness pervading his compositions suggests monotony and mannerism. A critic has said that "if all the works of Spohr could be destroyed except one specimen in each class of composition, it would be of advantage to his reputation."

Revised by DUDLEY BUCK.

Spoils System: in politics, the system of bestowing public offices upon members of the party in power as rewards for political services. See CIVIL SERVICE AND CIVIL SERVICE REFORM.

Spokane: city; capital of Spokane co., Wash.; on the Spokane river, and the Gt. Northern, the N. Pac., the Gr. Railway and Nav. Co., and the Spok. Falls and N. railways; about 15 miles W. of the boundary-line between Washington and Idaho (for location, see map of Washington, ref. 3-J). It is at the falls of Spokane river, and has a very picturesque location. The business portion is built about the falls, with broad streets running N. and S. and E. and W., and some of the residence districts are on higher ground.

The streets are lighted by electricity, and the view from the hill S. of the city is at night particularly striking. Spokane has several public buildings of importance. The city hall is an attractive building of brick and granite, unfortunately located on low ground; the opera-house has a beautiful interior, and capacity of 1,500; the county courthouse is of cream-colored pressed brick, on a slight eminence, and cost \$250,000; and the *Beebe* newspaper building is noteworthy for its symmetrical proportions and beautiful design. The city has an excellent system of drainage, and is now constructing an elaborate system of water-works for 1904.

Churches and Schools.—Spokane is the seat of a bishopric in the Protestant Episcopal Church, and the Jesuits have two or three church buildings, several parochial schools, and a college. The Jesuit missionaries came to Spokane when it was a mere village, and acquired an extensive tract of land, now within the city limits, by which their college has become well endowed. The city has eleven public-school buildings, including a high-school building, ranging in cost from \$15,000 to \$100,000. More than fifty teachers are employed, and there is a daily attendance of about 8,000 pupils. The Sisters of the Sacred Heart maintain a hospital and an orphan home, and the Protestant women have established a House of the Friendless.

Finance and Banking.—In 1894 the city had a property valuation of \$15,500,000 and a bonded debt of \$1,320,000. The receipts from all sources are about \$300,000 per annum and expenditures something less. The tax levy is 11 mills. There are three national banks with combined capital of \$700,000 and surplus of \$75,000.

Business Interests.—The river is not only a source of abundant and superior water-supply, but it has a series of falls over a distance of half a mile as it passes through the city, from which power is obtained to operate about 30 miles of electric street-railway, many mills and factories, an electric-lighting plant, printing-presses, elevators, and small machinery generally. This admirable water-power has made Spokane an important center for the manufacture of flour. The output of the mills is about 2,000 barrels a day, mostly exported to Japan and China.

History.—In 1879 the site of Spokane was occupied by an Indian trading-store and a sawmill. The Northern Pacific Railroad was completed as far as Spokane in 1884, and from that time the place had a rapid growth. It became the chief supply-point for numerous mines of gold and silver in Eastern Washington and Northern Idaho, and a very rich agricultural region to the S. When at the height of its prosperity, in Aug. 1890, it was almost wholly destroyed by fire, the burnt area covering about 60 acres. More than \$6,000,000 was invested in business blocks within two years. During the same period there was a rapid concentration of railways here. The Union Pacific was the second transcontinental line to arrive, and the Great Northern came in 1892. The main lines built numerous branches in all directions from the city, and the Spokane and Northern, an independent road, was built into British Columbia. The result was that at the close of 1892 Spokane had eight railways, and had become one of the most important railway centers of the Pacific coast. In the winter of 1894-95 its citizens gave 1,000 acres of land adjoining the city to the U. S. Government in consideration of the establishment thereon of a large military post, and Congress passed a law in Jan., 1895, creating the post. Pop. (1880) 350; (1890) 19,992; (1895) estimated, 24,000.

JOHN R. KEATY.

Spoleto (anc. *Speltium*): town, in the province of Perugia, Italy; about 60 miles S. N. E. of Rome, on a slight elevation, the crater of an extinct volcano (see map of Italy, ref. 5-K). The old castle, whose foundations date from the time of Theodoric, stands on a height above the town, from which it is separated by a chasm-like ravine spanned by a bridge 640 feet long and 250 feet high, originally Roman, but rebuilt, probably in the tenth century, and now serving as an aqueduct as well as bridge. The old Roman arched gateway, known as the *Porta della Fuga*, is, according to legend, a monument of Hannibal's time. The grand Palazzo Consolare has a tower of the eleventh century. Pop. 7,600.

Spondias: See *HOWERY*.

Sponge-fisheries. These industries which consist in gathering the sponges of commerce, which is the fibrous, spongy framework remaining when the fleshy matter has been washed away from one of the *Ceratopungia*. The softness, and consequent value, of a sponge depends on the

firmness and elasticity of the fibre, and this varies, even in the same species, according to the conditions under which the sponge has lived. The best sponges grow in clear, quiet water from 150 to 200 feet deep, those found where the water is shallow or rather being covered in texture. The principal commercial sponges are *Spongia officinalis*, which includes the toilet-sponges and Turkey sponges of the Mediterranean and the glove-sponges of Florida and the Bahamas; *Spongia* system, containing the horse-sponge of the Mediterranean and the sheep's-walke-sponge, velvet-sponge, and the grass-sponge of American waters; *Spongia asperina*, comprising the *Ammonia* of the Mediterranean and the yellow and hard-head sponges of America. There are numerous varieties of these species, while commercially from fifteen to twenty-five grades are recognized. These range in value from twenty-five cents to \$40 per pound, the fine Turkey sponges being the most expensive. The greater portion of the sponges of commerce, as well as the best qualities, come from the Mediterranean and Adriatic, along the line of coast extending from Genoa, on the northern coast of Africa, to Trieste. Some sponges are also taken in the Red Sea, and large quantities, mostly of the coarser varieties, in Florida and the Bahamas. Good sponges also occur off the Australian coast and at other points in the Pacific, but as yet they have been gathered only for local use.

Methods of Gathering Sponges.—Sponge-fisheries are usually carried on from small rowboats, and where larger craft—ranging from 5 to 50 tons—are employed they are used to transport the boats to the fishing-grounds and to market the catch. The greater portion of the sponges are wrenched from the bottom by a spear with four or five prongs; but, owing to the weight of the handle, this implement can be used only in water under 40 feet deep; beyond that depth divers are employed, or in some localities a dredge. In connection with the spear a water-glass is commonly used, this being a tube of wood or metal 3 or 4 feet long, with an end of plain glass. When this is lowered into the water the bottom can be seen through it plainly. In some localities in the Mediterranean the primitive method is followed of tossing a stone dipped in oil ahead of the boat. There are some variations in the process of preparing sponges for market, but in the main it is as follows: After the sponge has been taken from the sea it is exposed to the air until decomposition sets in, and is then beaten with a stick or trodden under foot in water till the soft parts are removed. In Florida the practice is to place the sponges in pans, where the animal matter decomposes, and is washed out by the tide. After cleansing the sponges are bleached, dried, and baled. The annual import of sponges into Great Britain is about \$1,000,000. The Florida sponge-fishery for 1890 amounted to 366,772 lb., worth \$448,652. Successful experiments have been made in cultivating sponges, but as yet the work has not been carried on on a large scale. Fresh sponges are cut into pieces about an inch square, care being taken to injure the outer skin as little as possible. The cuttings are skewered on bamboo rods, each rod bearing three pieces, and these are attached to boards and sunk in favorable localities. The drawback to sponge-culture is the fact that it requires from three to seven years for a sponge to attain a marketable size; on the other hand, small or ill-shaped sponges, which would otherwise be of little or no use, can be used in this way. F. A. LUCAS.

Sponges [from O. Fr. *sponge* > Fr. *éponge*; Ital. *spongia*; Span. *esponja* < Lat. *spongia* = Gr. *σπγγή*, *σπγγος*]; the members of the group *Spongia* or *Porifera* of zoologists. The sponges are animals of remarkably uniform structure, although varying greatly in appearance. In all forms three layers may be distinguished: (1) a flattened layer of epithelial cells (ectoderm) covering the outer surface; (2) a digestive layer (entoderm) of columnar cells, each with its free end surrounded by a delicate collar, from which projects a whip-like flagellum; and (3) between these two a third layer (mesoderm), in which the skeletal elements and the reproductive cells arise. In the simplest sponges these layers are arranged in the form of a cup, the hollow or cloaca being lined with entoderm, the outer surface covered by ectoderm, the mesoderm being between the two. In other forms the arrangement becomes more complicated. All over the outer surface are minute openings or pores which communicate with canals, and through these water enters the mass of the sponge. In this the canals branch and supply large numbers of chambers (*ampullae*) lined with entoderm, and from these ampullae the water is collected into excurrent

canals and transported through the cloaca to the exterior. In any common sponge the general course of these canals

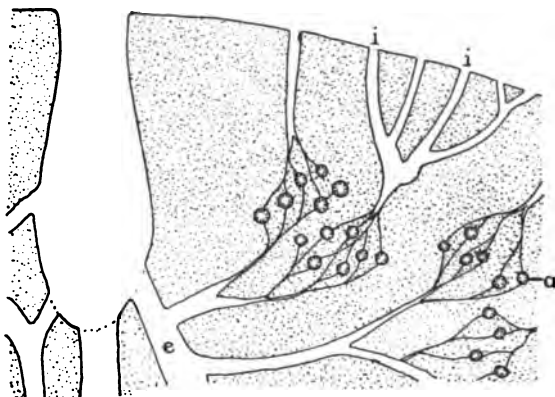


FIG. 1.—Diagram of a part of a sponge showing the pores and incurrent canals, *i*, communicating with the ampullae, *a*; and the excurrent canals, *e*, leading from the ampullae to the cloaca.

can be traced among the fibers. (See Fig. 2.) In these forms the digestive layer is restricted to the ampullae, while the ectoderm lines all the canals. Nourishment is obtained from minute particles drawn in with the water which is constantly passing through the body.



FIG. 2.—Section of a sponge (*Tethya*) showing the cloaca and the canal system in outline.

greatly among different sponges. Each spicule is the product of a single cell, and is formed on the outer surface of the secreting body. These spicules are of two kinds; in the one they are composed of calcium carbonate, in the other

in the same sponge. The fibers form a continuous network, and are the result of secretion from the ends of numerous cells. Chemically they consist of a peculiar organic sub-

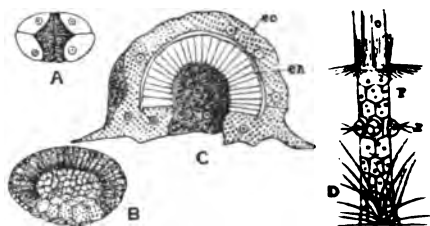


FIG. 4.—Development of a calcareous sponge (after F. E. Schulze): A, early segmentation of egg; B, blastosphere stage (close of segmentation); C, gastrula after fixation; D, young sponge after formation of spicules; *ec*, ectoderm; *en*, endoderm; *p*, incurrent pores; *o*, ostiole; *r*, radial tubes.

stance known as spongin. When spicules and fibers occur in the same sponge the spicules are imbedded in the fibers.

In the mesoderm (the layer which forms the skeletal elements) are the reproductive elements. These consist of eggs and sperm-cells, and it is only after the union of these two that the egg will develop. In the process of development the egg segments (see EMBRYOLOGY), and then, in the forms most studied, one side of the egg pushes into the other, thus giving rise to the embryo known as a gastrula, in which ectoderm and endoderm are differentiated. The gastrula becomes fixed to some solid body, and pores break through the wall, forming the beginning of the incurrent-canal system. Later the excurrent opening or ostiole is formed, and all subsequent changes are the result of partial division or budding from this larva. The skeleton arises early, and in its future growth keeps pace with the general growth of the sponge.



FIG. 5.—*Leucosolenia*, one of the calcareous sponges, and three of its spicules, enlarged.

Various systems of classification of sponges have been advanced. The best seems to be that which divides the group or branch into two classes, *Calcarea* and *Silicea*.

The *Calcarea* (those with calcareous spicules) are all small, marine, and without any economic importance. According to the complication of structure they are subdivided into three orders. Fig. 5 is an illustration of one of the simplest forms.

The great majority of sponges belong to the *Silicea*, in which spicules, when present, are siliceous in character. Some forms, however, are degenerate, and have lost the spicules, while in a few, which form their encrusting sheets, all skeletal structures are absent. Three orders of *Silicea* may be recognized. In the first, or *Hexactinellida*, the spicules are six-rayed, and the resulting skeleton is extremely regular. These forms occur as fossils and in the deeper parts of the ocean, and include the "glass-rose sponges" and that beautiful form termed the "Venus's flower-

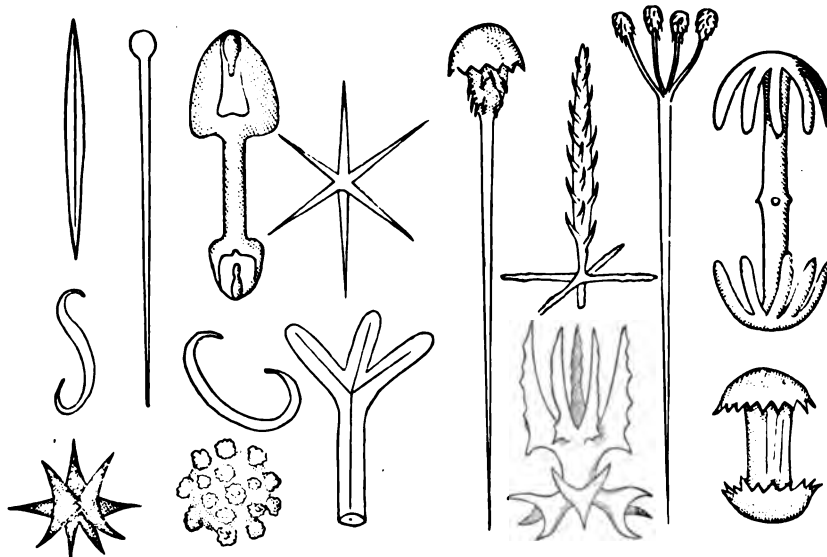


FIG. 3.—Different kinds of sponge spicules, enlarged.

of silica; and upon this chemical basis sponges are divided into two classes. Fibers and siliceous spicules may occur

deeper parts of the ocean, and include the "glass-rose sponges" and that beautiful form termed the "Venus's flower-

hakest sponge." In the second order, *Lithospongia*, the sponges are more united by heavy fibers. Here belong the large sponges known as "Nepitum's-cup," and from this group have apparently come those forms without skeleton. The last division, the *Cinnamospungia*, have heavy fibers, while spicules may or may not be present. In this group belong the only fresh-water sponges, several species of which inhabit the rivers and ponds of the U. S. The decay of these frequently injures the water-supply of cities. To this same group also belong the sponges of commerce. For the preparation, etc., see *SPONGE CULTURE*. The literature of the sponges embraces nearly 3,000 titles. The list in 1890 can be found in Lendenfeld, *Systematic Faunas and Classification of Sponges in Proc. Zool. Soc. London* (1890). Important later papers are Vossmer, *Papier*, in *Bronn's Klassen und Ordnungen des Thierreichs* (1887); Schulze, *Hemistellidae*, in vol. xxi. of *Reptology of Challenger voyage*. J. S. KIRKLAND.

SPONSORS [from Lat. *sponsor*, promisor, surety, (in Latin Lat.) *sponsus*, deriv. of *spondere*, *sponsus*, promise solemnly; cf. Gr. *σπονδή*, make a libation to the gods]; in general, those who in any way become surety for another; specifically, one who at the baptism of an infant promises in its name that it shall lead a Christian life; a godfather or godmother. The sponsors also bind themselves to see to it that the child shall receive Christian training. Usually, in the Roman Church, there are two sponsors, a man and a woman, and the relation of godfather or godmother and godchild is held to be a real one, precisely as though it were one of consanguinity. The rule of the Church of England calls for three sponsors, two of whom are of the same sex as the godchild, and no impediment to marriage is created by this relation; the present Anglican rule also permits parents to act as sponsors.

Spontaneity [Mediæv. Lat. *spontaneitas*]: a term used in philosophy to express self-origination. It is sometimes confounded with freedom. Freedom involves not only spontaneity, but also conformity to law or consistency with itself. Mere spontaneity may contradict each act by its successor, and thus its entire series may reduce to zero, thus preventing its realization by external acts. The existence of spontaneity is denied by strict necessitarians, who think all events under the form of causality, making each effect to flow from an external cause; but an examination of the presuppositions of necessity discovers that the ultimate cause—the "intality of conditions"—must be self-determining or spontaneous. Everything that happens must ultimately flow from a spontaneous activity. This spontaneity—all spontaneity—likewise can be shown to be personal will or else dependent on it in the last analysis. Cousin laid much stress in his philosophy upon the spontaneity of reason as contradistinguished from its reflective activity. While reflection depends on the arbitrary will of the individual, and is subject to error, the spontaneous original activity of reason is above reflection and arbitrariness, and not liable to error. Such a theory of reason was applied to the support of a priori ideas upon which the entire system was built. Schelling's "intellectual intuition" and Hegel's "common sense" were used much in the same way; also, "intuition of the reason," which cognizes a priori ideas, according to many contemporary philosophers, corresponds to Cousin's "spontaneity." It is noteworthy that Fichte regarded the philosophic perception of the principles of the true science of knowledge to be a higher order of reflection—as it were, a third intention of the mind (see *Pantheism*), whereas Cousin would make it a first intention. WILLIAM T. HARRIS.

Spontaneous Combustion: combustion which takes place without the application of heat or other means specially designed to promote that end. Lucifer matches have ignited when exposed to the sun's rays, and phosphorus, when in a dry state, has often taken fire at the touch of the hand, on account of its affinity for oxygen. In fact, it is this same readiness to combine with oxygen which causes spontaneous combustion in the case of other bodies, so that anything which will increase it will increase the tendency to such combustion. Mechanical division increases it greatly, by affording a larger surface to the action of oxygen, and by lessening the conducting powers of the bodies acted on. If the oxides of nickel, cobalt, or iron are reduced by hydrogen below a red heat, the resulting finely divided metals take fire when poured into the air; but if heated too highly, they become agglomerated and lose the property, unless

some finely divided powder is present to keep them porous, such as alumina precipitated with the metallic oxides. Freshly burned charcoal is liable to take fire, owing probably to condensation of oxygen in its pores; on this account it is not ground for making gunpowder until it has been kept for a time. Recently expressed fixed oils absorb oxygen and give out carbon and hydrogen; the temperature of heaps of rags, tow, sawdust, and similar bodies soaked with oil, grease, turpentine, varnish, etc., will rise on this account, and the low conducting power of such materials helps the process, until very often the mass takes fire. Serious conflagrations have resulted from this cause. Bituminous coal, especially when containing much pyrites, is liable to spontaneous combustion, when moistened with water. Moisture aids spontaneous combustion also in the case where piles of damp hay or freshly mown grass have taken fire. Barres have probably been burned in this way. Strong nitric acid will not set straw, hay, and such bodies so as to render them spontaneously combustible. Some gases ignite spontaneously, as phosphoretted hydrogen. The illuminating oil distilled from petroleum sometimes gives off gases that inflame spontaneously before it is refined in the "agitator." There are also spontaneously combustible liquids, of which woodyl is an example. (See *PETROLEUM*.) There are a number of alleged cases of spontaneous combustion of the human body, but there is hardly an instance which admits of no other explanation. Liebig considered that the dead body of a fat man, who had been saturated with alcohol, might possibly burn, but that in no circumstances could a body, in which the blood is circulating, take fire.

Revised by H. A. ROBERTS.

Spontaneous Generation: See *GENERATION, SPONTANEOUS*.

Spoonbill: any one of five or six species of wading birds closely related to the ibises, and remarkable for their spoon-shaped bills. The family *Platidae* to which they belong has been divided into two genera: *Alpe*, in which the lower portion of the tarsus is simple, and *Platula* in which it is convoluted. The roseate spoonbill (*Alpe rosea*) of tropical and sub-tropical America, the sole representative of the first-named genus, is from 30 to 36 inches long; the back, wings, and under parts are of a delicate rose color; the lower neck, smaller wing-coverts, and tail-coverts of a rich carmine blue; legs darker. The bill and bald head are varied with tints of green, yellow, and black. This bird occurs in the southern parts of the U. S., but is yearly growing scarcer as it is much sought after. The birds of the genus *Platula*



European spoonbill (*Platula leucorodia*).

are mostly white, and are found in Europe, Asia, and Australia. *Platula leucorodia*, the only species found in Europe, was formerly in some demand for the table. In the U. S. the name spoonbill is often applied to the Stovellian (*q. v.*). The spoonbill sandpiper is *Euryrhynchus pygmaeus*, of Northeastern Asia, occurring occasionally in Alaska. F. A. LAMAR.

Spooner, SORABASHUB, M.D.: author (b. at Brandon, Vt., in 1809; graduated at Middlebury College 1830, and at New York College of Physicians and Surgeons 1835; was a dentist in New York. He was the author of several professional treatises, of *Anecdotes of Painters, Engravers, etc.* (3 vols., 1853), and of a *Biographical and Critical Dictionary*

of *Painters, Engravers, Sculptors, and Architects* (1853; new ed., 2 vols., 1865), containing notices of 12,000 artists. D. at Plainfield, N. J., in Mar., 1859.

Sporades, spor-ă-deez [= Lat. = Gr. *σπορᾶδες* (sc. *νησοι*, islands), liter., fem. plur. of adj. *σποράς*, *σποράδης*, scattered, deriv. of *σπείρειν*, scatter]: those islands in the Grecian Archipelago which are not included in the group of the Cyclades. In a restricted and more accurate sense it includes only the islands near the west coast of Asia Minor between Samos and Rhodes. The more important are Samos, Nicaria, Patmos, Kalymno, Cos, Syme, Telos, Scarpanto, and Rhodes. All belong to the Ottoman empire and are comprised in the vilayet of the Archipelago. The cluster of islands N. of Negropont is sometimes called the Northern Sporades. Seyros, Scopelos, Sciathos, and Halonnesos are the chief. They belong to Greece. E. A. GROSVENOR.

Spore [from Gr. *σπόρος*, sowing, seed, deriv. of *σπείρειν*, scatter, sow]: in botany, a "single cell which becomes free and is capable of developing into a new plant" (*de Bary*). Sachs attempted to limit the term by defining a spore as "a reproductive cell produced directly or indirectly by an act of fertilization," reserving the term *gonidium* for those reproductive cells which are produced without any previous act of fertilization. Bennett and Murray, on the contrary, apply the term to "any cell produced by ordinary processes of vegetation, and not directly by a union of sexual elements, which becomes detached for the purpose of direct vegetative propagation." Adopting *de Bary's* definition, spores in Sachs's sense are sexually produced, or briefly sexual spores, while those of Bennett and Murray are asexual spores.

Many kinds of spores are distinguished by botanists, only the more common of which are noticed here. *Ecidiospores* are cells formed by abstriction in the "cluster-cup" stage of a rust. (See RUSTS.) *Ascospores* are spores formed by internal division of the protoplasm of a cell, termed an ascus. (See ASCOMYCETES.) *Auxospores* are the larger cells occurring in the life-history of diatoms, each the starting-point of a new series of divisions. *Basidiospores* are cells formed by pullulation and abstriction from a cell termed a basidium. (See BASIDIOMYCETES.) *Carpospores* are spores formed in a sporocarp, e.g. in liverworts and mosses. *Chlamydospores* are thick-walled spores formed singly and asexually in the cells of various simple algae and moulds. *Conidiospores*, *conidia*, or *gonidia* are cells formed asexually, usually by abstriction of a little-modified hypha. *Macrospores*, in pteridophytes, are the large spores which upon germination form prothallia-bearing female organs. In anthophytes the embryo-sac is the homologue of the macrospore. *Microspores*, in pteridophytes, are the small spores which upon germination form minute prothallia-bearing antherids. In anthophytes the pollen-cell (pollen-spore) is the homologue of the microspore. *Oöspores* are cells produced by the fertilization of oöspores by antherids. When thick-walled they are often called *resting-spores*. A *sporidium* is a compound spore, or a spore-cluster; each spore in such a structure is known as a *merispore*. A *sporidium* is a small spore abjoined on a promycelium. *Stylospores* are stalked spores; the term is sometimes restricted to those formed in pycnidia. *Teleutospores* are the spores, one to many, formed in the tightly fitting asci of the *Uredineæ*; the term is commonly applied to the asci with their contents. *Tetraspores*, in the red seaweeds (*Florideæ*), are the spores formed in tetrads by the fission of a mother-cell. *Uredospores* are the stylospores of the *Uredineæ*. *Zoöspores* are motile spores, always aquatic. *Zygospores* are cells produced by the union of similar cells; known also as *resting-spores*. See FUNGI. CHARLES E. BESSEY.

Sporezo'a [from Gr. *σπόρος*, seed + (*ζῷον*, animal)]: a class of protozoans the members of which are parasitic in all stages of their existence. They lack all special organs of locomotion, and reproduce by the conversion of the protoplasm of the cell into minute particles or spores, which, frequently passing through an amoeba-like stage, develop into the adults. Four sub-classes are recognized: GREGARINIDA (q. v.), *Amöbosporida*, *Sarcosporida*, and *Myxosporida*, of which only the first contains many species. By many writers the disease known as cancer (*carcinoma*) is regarded as the result of parasitism of sporezoans in the body. J. S. K.

Sports: in general, diversions of the field or of the turf; in a special sense, contests between athletes. Apparently the earliest competitive athletic sports were those of Greece and Rome, from 1,000 to 2,000 years B. C., though the name

athletic is of recent application and in its Greek origin referred only to those who competed for prizes in public games, thus separating into a distinct class the *dymanoi*, who exercised and competed with each other for pleasure or improvement. In earliest times the best citizens competed at the Olympian, Pythian, Nemean, Isthmian, and Panathenæan games, and highest honors were paid to the winners, but a professionalism very similar to that of these times appeared, and the dignity given to the contests was lost. The events open to competition were foot-racing, leaping, throwing the discus, wrestling, boxing, and the pancratium, a combination of boxing and wrestling, and, separate from these, chariot-racing.

When the Romans invaded Britain they brought with them the games of the soldiery, such as jumping, running, hunting, swimming, and combats on horseback. With the advent of the Saxons came skating, hawking, and wrestling, and in the Norman era were introduced the more accomplished arts of the tourney and joust. In the seventeenth century cards, dice, hawking, following the hounds in chase, football, bowling, quoits, wrestling, fencing, shovelboard, shuttlecock, and billiards were of prevalent interest. Bull and bear baiting and cock-fighting came in the eighteenth century, and were popular with people of both sexes. It is interesting to note the revival of football in the eighteenth century, it having been a sport of so much prominence in the early part of the fourteenth century. It was prohibited in England in 1349 because it interfered with the other sports. Falconry, or hawking, has almost disappeared from England, its place being largely taken by fox-hunting. Fox-hunting, so called, is popular in some parts of the U. S., where often the presence of a fox is made unnecessary by dragging a bag of anise seed, which leaves a scent in its trail, over the ground where the hunt (♂) is to take place. The hounds follow this scent readily.

Wrestling, boxing, and pedestrianism have been popular for centuries, but it was not until well along into the nineteenth century that the interest in athletic sports developed into a passion.

The schools and colleges of Great Britain early took active part in organizing athletic clubs. In 1837 the Rugby Crick Run was founded, and Mar. 27, 1858, an annual steeplechase was inaugurated, both at Rugby, and the School Hunt was started at Shrewsbury in 1842.

Oxford and Cambridge met at Christ Church Cricket-grounds, Oxford, Mar. 5, 1864, for the first inter-varsity athletic competition. The events were running 100 yards, 440 yards, and 1 mile; jumping, both for height and distance; hurdling, 120 and 200 yards, and steeplechasing. Each of the competing teams won four of the events.

The first important athletic meeting held in London was that of the Civil Service Athletic Sports at Walham Green, on Apr. 22 and 23, 1864. In 1863 the Mincing Lane Athletic Club was formed, which in 1866 became the now famous London Athletic Club.

From about 1861 the development and spread of athletics all over the civilized world has been prodigious. Since the civil war the U. S. has kept pace with Great Britain, and scarcely a city of 20,000 inhabitants can be found in North America or Great Britain which has not at least one flourishing club for the promotion of general athletics. In Germany and France the same interest is noticeable, and it has developed in a large degree all over Europe, Australia, and the British colonies.

Since 1880 athletics has become a most important feature of scholastic life throughout the U. S., and seems to be substituting itself for the lawlessness exhibited by students in class rushes and hazing affairs. In many institutions of learning the encroachment of organized sports upon purely scholastic occupations has caused some of the governing bodies to place practically prohibitory restrictions on some of the games, most notably upon football.

Professionalism has played a most important part in general athletics, and that part has not in all respects been good, so that very carefully prepared definitions of an amateur have been adopted by practically all amateur clubs in the U. S., Great Britain, Canada, and France, and competitors at the amateur meets are obliged to qualify in accordance with their terms.

In the eastern part of the U. S. the definition of an amateur, as adopted by the Amateur Athletic Union, is generally accepted, and is as follows:

"One who has not entered in an open competition; or for either a stake, public or admission money or entrance-

lose; or under a fictitious name; or has not competed with or against a professional for any prize, or whose admission has been charged; or who has not instructed, pursued, or assisted in the pursuit of athletic exercises as a means of livelihood, or for gain or any emolument; or whose membership of any athletic club of any kind was not brought about or done, and continue because of any mutual understanding, express or implied, whereby his becoming or continuing a member of such club would be of any pecuniary benefit to him; whatever direct or indirect, and who shall in other and all respects conform to the rules and regulations of this organization.

Defection of a Novice.—The sports over which the A. A. U. claims jurisdiction shall be divided into the following classes: Baseball, billiards, bowling, boxing, fencing, football, gymnastics, hurdle-racing, jumping, lacrosse, lawn-tennis, pole-leaping, putting shot, quoits, racquets, rowing, running, sailing, skating, swimming, throwing the hammer, tug of war, walking, and wrestling. An athlete shall be held to be a novice in each of these twenty-four classes until he shall have won a prize in competition in that class open to the members of two or more clubs. The winning of such a prize shall prevent his future competition as a novice in that class, although his entry may have been made before he lost his standing as a novice.

The English Amateur Association has adopted the following definition:

An amateur is any person who has never engaged in, nor assisted in, nor taught any recognized athletic exercise for money, or who has never, either in public or in private, raced or exhibited his skill for a public or for a private stake, or other remuneration, or for a purse or for gate-money, and never backed or allowed himself to be backed either in a public or private race.

A novice is one who has never won a prize in a similar class of competition—i. e. winning a prize for walking would not disqualify for running, and vice versa; but winning a prize for running any distance would disqualify for running. This rule does not apply to school and boys' games.

The Pacific Coast Association is somewhat more liberal in its definition, as are the associations of Canada and France.

Professionals are found in nearly all branches of sport, and while they undoubtedly raise the standard of the sports in that they make the records high, it is a fair question if it would not be better if amateur effort alone set the mark for amateur competitors. Pederstrianism, which was popular with professionals a few years ago, is fast disappearing from all competitions. Walking-matches are no longer popular, and largely because of the difficulty of differentiating a walk from a run. Archery, which was and still is popular in Great Britain, has never been very popular in the U. S. The same may be said of the game of cricket, its place being largely taken by baseball.

Meets of Scottish and Irish clubs are held annually wherever Scotchmen or Irishmen are to be found. The Irish games are very similar to those held throughout the U. S., but the Scotch offer variety in tossing the caber—a log 16 feet long with a diameter of 11 inches at one end and 5 at the other—quoit-putting, and a sword and herring dance. A Scottish winter game called curling is becoming deservedly popular in North America, especially in Canada.

Most of the popular interest in general athletics in the U. S. gathers about the annual meets of the metropolitan and intercollegiate clubs. The records of these meets are annually published in the principal newspapers, and in several almanacs and sporting annuals.

Fishing and hunting will always be popular with sportsmen, and nowhere are better opportunities afforded than in the U. S. and Canada. Stringent game-laws have been passed in most of the States, so that the wanton destruction of game—as evidenced by the entire destruction of the buffalo, and of the pigeon-rocks in Ohio, and of the salmon in many of the Eastern rivers—is no longer possible. The U. S. Fish Commission is restocking lakes and rivers with game fish, and game protective associations are seeing that game-laws are enforced.

For extended accounts of various sports, see BASEBALL, CRICKET, CHAIRING, FOOTBALL, GOLF, LACROSSE, LAWN-TENNIS, RACING, etc.

Illustrations.—Stolz, *Sports and Pastimes of the English People*; The Bodleian Library; Bell's *Handbook of Athletic Sports*.
EDWARD HYTHCOCK, Jr.

Sports, Book of: a proclamation by James I. of Great Britain, issued in 1616, setting forth certain games which might lawfully be indulged in on Sundays after church services. Among the sports allowed were "dancing, archery, leaping, vaulting, May-games, Whitsun-ales, morris-dances, and the setting up of May-poles." It was designed to prevent molestful interferences by Puritanical magistrates with popular recreations. Bear-baiting, bull-baiting, bowling, and "interludes" were forbidden on Sundays. Charles I. renewed the proclamation in 1623. In 1644 the Long Parliament directed that all copies of the *Book of Sports* be burned by the common hangman. In both instances the publication of the *Book of Sports* gave rise to intense excitement, and aroused the strongest opposition among the Puritans. See GOVET, *The King's Book of Sports* (1630).

Spots, Solar: See SUN.

Spotswood, ALEXANDER: governor of Virginia; b. at Tangier, Africa, 1676; was deputy quartermaster-general under the Duke of Marlborough; went to Virginia as governor 1719, and held office until removed in 1739; deputy postmaster-general 1730-39; was the pioneer of iron-manufacturing in Virginia; was originator of an act improving the staple of tobacco, and making tobacco-rotas a medium of common exchange; lent great aid to William and Mary College; was made major-general 1740 and placed in command of an expedition to the West Indies; died at Annapolis, Md., June 7, 1740, before the embarkation took place.

Spotswood, or Spottiswood, JOHN: prelate and historical writer; b. in Scotland in 1597; was educated at Glasgow, and in 1601 went to France as chaplain to the Scottish ambassador. He accompanied James VI. to London in 1604, and in the same year was made Archbishop of Glasgow and a member of the privy council for Scotland; in 1615 was made Archbishop of St. Andrews and Primate of Scotland. Through his influence the Perth Assembly sanctioned the Five Articles (1619). In 1639 he crowned Charles I. at Holyrood, and in 1625 became chancellor of Scotland. He drew great obloquy on himself for the part he took in the examination of John Ogilvie, a Jesuit priest who was apprehended at Glasgow and hanged for refusing to disown the temporal power of the pope, and in the prosecution of Lord Balmerino, who was condemned to death for the crime of "Jesuitism" (verbal sedition), and pardoned only after a long imprisonment. Spotswood, his personal enemy, taking an active part in the proceedings. In 1637 he endeavored to introduce the new liturgy and book of canons into Scotland, urged on by the king and Laud, and, as is said, contrary to his own wish. Removed from the chancellorship by King Charles, deposed from his bishopric by the assembly convened at Glasgow in Nov., 1638, excommunicated, and declared infamous, he fled to London, where he died Nov. 26, 1639. He wrote a *History of the Church of Scotland* (published in 1635), the greater part of which treats of the history of his own times. Among his other writings is a Latin treatise (*Refutatio Libelli de Negamine Ecclesie Scotice*), written in answer to a tract of Calderwood's, published in 1620. His *Life* was written by Bishop Duplex and by Bishop Russell, the latter prefixed to the Spotswood Society edition of his *History of the Church of Scotland*.

Spottsylvania Court-house, Battles at: See WILDERNESS.

Sprague: town; capital of Lincoln co., Wash.; on the Northern Pac. Railroad; 42 miles S. W. of Spokane (for location, see map of Washington, ref. 4-J). It is in an agricultural and stock-raising region, is the trade-center of the Big Bend country, and contains railway machine-shops and car-works that cost \$250,000, a national bank with capital of \$50,000, and a daily and three weekly newspapers. Pop. (1890) 1,280; (1894) estimated, 2,000.

Sprague, CHARLES: poet; b. in Boston, Mass., Oct. 26, 1791; educated at the Franklin School, Boston. He entered mercantile life at the age of thirteen and was cashier of the Globe Bank from 1825 to 1865. He wrote prose prologues for the opening of theaters and delivered 4. B. R. poems, centennial and anniversary odes, and other occasional pieces, the best known of which is his *Shakespeare Ode*, recited at the Boston theater in 1823. A collected edition of his writings in verse and prose was published in Boston in 1841 (revised editions in 1850, 1855, and 1876). D. in Boston, Jan. 14, 1875.
H. A. BEANS.

Sprague, WILLIAM BURELL, D. D., LL. D.: geographer and annalist; b. at Andover, Conn., Oct. 10, 1795; graduated

at Yale College 1815; studied at Princeton Theological Seminary 1816-19; was colleague with Dr. Lathrop over the Congregational church of West Springfield, Mass., 1819-21, and pastor 1821-29; pastor of the Second Presbyterian church of Albany, N. Y., 1829-69; visited Europe in 1828 and 1836; engaged exclusively in literary work at Flushing, L. I., 1869-76. D. at Flushing, L. I., May 7, 1876. Dr. Sprague was a preacher and public speaker of special eminence; made a collection of autographs (nearly 100,000 in number) and religious pamphlets, presenting the latter to the New York State Library; won the title biographer of the Church by his most important publication, begun in his fifty-seventh year, *Annals of the American Pulpit*, sketches of the most prominent clergymen of all denominations from the earliest dates to 1855 (10 vols., New York, 1857-76); and among other works *Letters to a Daughter* (New York, 1822; republished under the title *The Daughter's Own Book*); *Letters from Europe* (1828); *Lectures on Revivals* (1832); *True Christianity and other Systems* (1837); *Life of Rev. Edward Dorr Griffin, D. D.* (1838); *Letters to Young Men* (1845); *Women of the Bible* (1850); *Visits to European Celebrities* (1855); and *Life of Rev. Jedidah Morse* (1874). C. K. HORT.

Sprain, or **Subluxation** [*sprain* is deriv. of *sprain* (verb), from O. Fr. *espreindre* > Fr. *épreindre*, press, wring < Lat. *exprimere*, press out; *ex*, out + *primere*, press. *Subluxation* is from *sub-*, partially + *luxation*, from Lat. *luxare*, dislocate]: a stretching or wrenching of the non-osseous parts of a joint, without displacement of the bones, and either with or without lesion of ligaments or tendons. Severe sprains are sometimes as serious and lasting in their effects as dislocations, especially on account of the liability of the patient to attempt to use the part before the inflammation has wholly subsided. Perfect rest, cold or sometimes hot lotions (if the latter be more agreeable to the patient), accompanied by the use of splints for mechanical support and of opiates for the relief of pain, are required in the treatment. Revised by W. PEPPER.

Sprat, or **Garvie**: the *Harengulus sprattus*, a little herring of the European seas. Sprats are spiced, salted, dried, and potted in many ways, and are very good when fresh, but are generally eaten by the poorer classes. The French preserve great quantities of small sprats and sell them for sardines. Great quantities are also used for fertilizing land. The sprat is seldom over 6 inches long.

Sprecher, SAMUEL, D. D., LL. D.: theologian; b. near Williamsport, Md., Dec. 28, 1810; studied in Pennsylvania College and Theological Seminary, Gettysburg, Pa.; pastor at Harrisburg, Pa., 1836-39; principal of Emmaus Institute, Middletown, Pa., 1839-42; pastor Martinsburg, Va., 1842-43, and Chambersburg, Pa., 1843-49; president of Wittenberg Theological Seminary Springfield, O., 1849-74. He combined with it until 1884 the chair of Systematic Theology. Removing to the Pacific coast, he filled for a time the presidency of the college at San Diego, Cal. Dr. Sprecher's chief book is his *Groundwork of a System of Lutheran Theology* (Philadelphia, 1879). H. E. JACOBS.

Sprée, *sprā*: a river of Prussia; rises in the kingdom of Saxony, passes through Berlin, and joins the Havel at Spandau, after a course of 220 miles. At Leibsch it becomes navigable for small craft, and considerable traffic is carried on along its whole course.

Sprengel, HERMANN JOHANN PHILIPP, Ph. D., F. R. S.: chemist; b. at Schillerslage, Hanover, Germany, in 1834; studied at the Universities of Göttingen and Heidelberg, from the latter of which he took his degree in 1858 with the highest honor; moved to England 1859; discovered and described in *The Journal of the Chemical Society*, 1865, the method of producing vacua by the fall of water or mercury in tubes. He first drew attention to picric acid, which he suggested as a detonating charge for shells; and was the first who described and patented in England a number of so-called safety-explosives, among which are hellhoffite, oxonite, panclastite, rackarock, etc. Hellhoffite and rackarock were used by Gen. John Newton in blowing up Flood Rock at Hell Gate. C. H. THURBER.

Sprengel's Air-pump: See PNEUMATICS.

Sprenger, ALOYS: Orientalist; b. at Nassereut, Tyrol, Sept. 3, 1813; educated at Innsbruck and Vienna (1832); went to London (1836) to assist the Earl of Munster in his work, *The Military Sciences of the Mohammedan Nations*; then to Calcutta (1843) and became (1845) president of the College of Delhi, where he introduced European methods

of teaching, established a lithographic press, and issued a penny magazine, *Kiran Aladain*; was assistant resident at Lucknow (1848), where he catalogued the royal library; examiner at the College of Fort William (1850); head of the Calcutta and Hugli Mohammedan Schools; Government interpreter and secretary of the Asiatic Society of Bengal. He was pensioned in 1857, returned to Europe, and became Professor of Oriental Languages at Berne. D. Dec. 19, 1893, at Heidelberg, to which place he had retired. His most important work is *Das Leben und die Lehre des Mohammed* (Berlin, 1861-65, 3 vols.), the most comprehensive life of the prophet by a European, but written too much from the point of view of a physician. Of his *Bibliotheca Indica*, which he published in conjunction with other scholars, may be mentioned: *Dictionary of the Technical Terms used in the Sciences of the Mussulmans* (Calcutta, 1854); *Ibn Hajar's Dictionary of Persons who knew Mohammed* (1856); *Soyuti's Itkân* (1856), etc. He also published *Otby's History of Mahmud of Ghaznah* (Delhi, 1847); *Masudi's Meadows of Gold* (London, 1849); *Die Alte Geographie Arabiens* (Bern, 1875). RICHARD GOTTHEIL.

Spring [liter., origin, source, beginning, time of beginning (cf. *dayspring*), deriv. of *spring*, to arise, take birth, rise, or origin]: the season of the year which follows winter and precedes summer. In the temperate regions of the northern hemisphere it includes, in a vague and indefinite way, the months of February, March, and April (as in Great Britain), or March, April, and May (as in North America); astronomically, it would extend from Mar. 21 to June 21. In the temperate regions of the southern hemisphere the spring months are September, October, and November. In the tropical regions there is strictly neither spring nor autumn, but only two seasons, the wet and the dry; in the polar regions, only two seasons, summer and winter.

Spring, GARDINER, D. D., LL. D.: clergyman; b. at Newburyport, Mass., Feb. 24, 1785; was valedictorian at Yale College 1805; studied law and taught in New Haven 1805-06; established an English school and taught in Bermuda 1806-08; admitted to the bar 1808; studied theology at Andover Theological Seminary 1809-10; and was pastor of the Brick church (Presbyterian), New York, 1810-73. D. in New York, Aug. 18, 1873. Many of his publications have passed through several editions, and have been reprinted and translated in Europe. They include *Essays on the Distinguishing Traits of Christian Character* (New York, 1813); *Memoir of Rev. Samuel J. Mills* (1820); *Fragments from the Study of a Pastor* (1838); *Obligations of the World to the Bible* (1839); *The Attractions of the Cross* (1846); *The Bible not of Man* (1847); *Discourses to Seamen* (1847); *The Power of the Pulpit* (1848); *The Mercy-seat* (1850); *First Things* (2 vols., 1851); *Contrast between Good and Bad Men* (2 vols., 1855); *Pulpit Ministration* (2 vols., 1864); and his autobiography, *Personal Reminiscences of the Life and Times of Gardiner Spring* (2 vols., 1866). The *Memorial Discourse*, by Rev. John O. Murray, D. D., has been published (New York, 1873). C. K. HORT.

Spring, LEVERETT WILSON, A. M., D. D.: teacher and author; b. at Grafton, Vt., Jan. 5, 1840; graduated at Williams College 1863, at Hartford Theological Seminary 1866; pastor of Rollstone Congregational church, Fitchburg, Mass., 1868-75; pastor of Plymouth church, Lawrence, Kan., 1876-81; Professor of English Literature, University of Kansas, 1881-86; Morris Professor of Rhetoric at Williams College since 1886; author of *Kansas* (in the American Commonwealth Series); *Mark Hopkins, Teacher* (1885). C. H. T.

Spring-bok [Dutch for spring-buck, so called from its habit of leaping when alarmed]: a very beautiful, active, and graceful antelope of South Africa, the *Gazella eucorpe*. It goes in immense herds upon the plains. Its flesh is in some estimation as food, and the hides are much sought for by tanners. This timid creature, when taken in hand young, becomes very tame and sportive.

Spring City: borough; Chester co., Pa.; on the Schuylkill river, the Schuylkill Canal, and the Penn. Railroad; opposite Rogersford, 32 miles N. of Philadelphia (for location, see map of Pennsylvania, ref. 6-1). It has manufacturing of wood-pulp, stoves, glass, stove-moulders' facing, fire-brick, tile, paper, sash, and lumber, a national bank with capital of \$200,000, and a weekly newspaper. Pop. (1880) 1,112; (1890) 1,797.

Springer: a name given by sportsmen to several varieties of the hunting spaniel, used for starting birds from

hazily reverts. The Clumber, Snow, and Norfolk breeds are the best. The springer should weigh from 34 to 40 lb., and should have a good coat, a bushy tail, carried low, and an active, graceful style of work. The Clumber is especially liked, because it gives no tongue while at its duty.

Springfield, city; capital of the State of Illinois and of Sangamon County; on the Balt. and Ohio R. W., the Chi. and Al., the C. & P., Peoria and St. L., the Ill. Cent., the St. L., C. & N. W., and the Wabash railways; 3 miles S. of the Sangamon river, and 185 miles S. W. of Chicago (for location, see map of Illinois, ref. 5-11). It lies on the western border of an undulating prairie stretching from near the river to the timbered lands that line its tributaries on the E. The city proper is 3 miles square, and surrounded by an avenue 80 feet wide. It is laid out on a simple plan, the streets and avenues intersecting each other at right angles, and the residence portions being ornamented with shade-trees; it contains two public parks (Reservoir and Forest) and several fine squares. The city is lighted by gas and electricity, and its street-railway system is operated by electricity. It has excellent water-works, a complete system of sewerage, a paid fire department, and is one of the best-paved cities in the State.

Public Buildings.—The most conspicuous of the public buildings are the new State house, the U. S. court-house and post-office, the county court-house, the Governor's mansion,



State house, Springfield, Ill.

the State arsenal, and the city-hall. The new Capitol, completed in 1857, stands in a park of about 8 acres, at the southwest corner of Second and Monroe Streets. The ground-plan is in the form of a large cross, and the superstructure is of the modern classic style of architecture. The extreme length from N. to S., including the northern portico, is 379 feet, and the extreme width from E. to W., including the eastern portico, is 286 feet. The exterior walls are of dressed Julius limestone, and the large and lofty porticoes of sandstone, supported by columns of polished gray granite. The edifice is three full stories in height, with a mansard roof and two towers. Over the center rises a stately dome, surmounted by a lantern and iron flagstaff, reaching a total altitude of 964 feet. The whole cost of the building was over \$4,000,000. The county court-house (formerly the old State house), the corner-stone of which was laid July 4, 1837, occupies the center of the public square in the heart of the city. It is a massive structure, built of solid limestone in the form of a rectangle, being longest from E. to W. This edifice is two stories high, with a basement, and is surmounted by a handsome dome. The total cost was \$240,000. The U. S. court-house and post-office stands on the Government block at the intersection of Sixth and Monroe Streets. It is built of Knoxville stone, three stories high, and was completed in 1895 at a cost of \$320,000. The Governor's mansion and grounds occupy an entire block in the southern part of the city. The mansion is a fine and imposing brick structure. The city-hall is built of cream-colored brick with stone trimmings, four stories high, and is a conveniently

arranged and stately building. Here is located the public library, containing 35,464 volumes.

The Lincoln Monument.—Among the chief historical attractions of Springfield are the Lincoln residence and the Lincoln national monument. The latter stands in Oak Ridge Cemetery, about 14 miles S. of the new city-house. This monument contains the remains of President Lincoln, his wife, two of his children, and one grandson. It was designed by Larkin H. Mead, of Vermont, and was built by William D. Richardson, of Springfield, Ill. The exterior



The Lincoln residence, Springfield, Ill. (belongs to the State.)

walls of the terrace, pedestal, and shaft are faced with Massachusetts gray granite, and the total height of the monument is 98 ft. 5 in. It was dedicated Oct. 10, 1874. The whole cost, including the statue of Lincoln and four groups of bronze statuary, was about \$225,000.

Churches and Schools.—The churches and mission chapels of the city and suburbs number 38, classified as follows: 4 Protestant Episcopal, 5 Roman Catholic, 4 Lutheran, 5 Baptist, 5 Methodist Episcopal, 6 Presbyterian, 11 Congregational, 1 Cumberland Presbyterian, 1 Christian, 1 Hebrew, 1 United Brethren, 1 Seventh-day Advent, and 1 Salvation Army barracks. The public schools consist of a central high school and 10 large ward-schools. The money expended for public-school purposes for the fiscal year ending Feb. 28, 1894, was \$56,351. Besides the public schools there are Gamardin College (Lutheran), the Rutledge Institute, St. Agatha's School, the Ursuline Convent, the Convent of Our Lady of the Sacred Heart, and half a dozen parochial schools. Among the



National Lincoln Monument, Springfield, Ill.

charitable institutions are the Home of the Friendless and the Orphanage; also three hospitals—St. John's, the Wabash Railway, and the Prince Sanitarium.

Finance and Banking.—The gross receipts of the corporation for city purposes for the fiscal year ending Feb. 28,

1894, were \$314,799; the bonded debt on Mar. 1, 1894, was \$902,350; and the estimated value of all property belonging to the city \$925,000. In 1895 there were 5 national banks with combined capital of \$1,050,000, 1 State bank with capital of \$100,000, and 1 loan and trust company with capital of \$100,000. There are also 10 building and loan associations, all serial, 1 national, 9 local, with 4,088 shareholders and 41,659 shares in force.

Business Interests.—The census of 1890 showed 374 manufacturing establishments (representing 63 industries), with a combined capital of \$3,641,415, employing 3,269 persons, paying \$1,746,228 for wages and \$3,789,139 for materials, and turning out products valued at \$6,562,070. The principal industries, according to the amount of capital invested, were those connected with the building trades, 102 establishments, \$558,573 capital; printing and publishing, 12 establishments, \$261,031 capital; textiles, \$257,215 capital; foundry and machine-shop products, \$202,837; planing-mills, \$58,500 capital. The city is also an important coal-mining center.

History.—Springfield was settled in 1819 and platted in 1823, when it became the county-seat. It was incorporated as a town Apr. 2, 1832, and as a city Apr. 6, 1840. By acts of 1837 it was made the permanent seat of the State government, and the first session of the Legislature held here was convened Dec. 9, 1839. Pop. (1880) 19,743; (1890) 24,963; (1895) estimated, 30,000. JOSEPH WALLACE.

Springfield: city; port of entry; capital of Hampden co., Mass.; on the Connecticut river, and the Boston and Albany, the N. Y. and New Eng., and the N. Y., N. H. and Hart. railways; 98 miles W. by S. of Boston, and 138 miles N. N. E. of New York (for location, see map of Massachusetts, ref. 3-E). The city is beautifully situated, is laid out with wide streets, adorned with fine shade-trees, and is noted for the variety and taste of its private dwellings and the beauty of its churches and public buildings. There are two parks—Forest, comprising over 500 acres, laid out with ponds, carriage roads, and promenades, and Hampden, containing about 60 acres, famous for its horse-races and cycling tournaments. The steam-railways entering the city use a union dépôt erected in 1889 at a cost of \$500,000. A street-railway connects the extreme sections of the city and also extends to Chicopee, West Springfield, and Holyoke.

Churches and Schools.—Springfield has 39 churches, of which 11 are Congregational, 7 Methodist Episcopal, 3 Roman Catholic (also a mission), 5 Baptist, 3 Union, 2 Protestant Episcopal, and 1 each Unitarian, Universalist, Advent, Swedenborgian, Presbyterian, Lutheran, Jewish, and Spiritualist. The public-school system comprises a high school and 11 grammar, 12 primary, 7 ungraded, 3 evening, 3 kindergarten, 1 manual-training, and cooking and drawing schools, located in 31 buildings, and having 231 teachers and over 7,000 pupils. Various parochial schools have over 1,200 pupils, and private schools over 100. The city also contains a French-American (Protestant) college, the School for Christian Workers, and the International Y. M. C. A. School. The Public Library building is one of the finest in the city, and besides a library of about 89,000 volumes contains a free reading-room and a museum of natural history and ethnology.

Finances and Banking.—The city has an assessed property valuation of over \$56,000,000 and a funded debt of \$1,930,000, of which \$1,650,000 is water debt; deducting assets, including sinking funds, there is a net debt (1895) of \$1,577,562. The receipts and expenditures are nearly equal, over \$1,600,000 in each case. In 1895 there were 10 national banks with combined capital of \$3,500,000, 3 savings-banks with aggregate deposits of \$18,667,430, a co-operative bank with a capital of \$333,000, 2 safe deposit companies, one with a capital of \$300,000, a bank clearing-house, which in 1894 cleared \$65,033,128, and 5 insurance companies.

Business Interests.—The census returns of 1890 showed 681 manufacturing establishments (representing 107 industries), with a combined capital of \$10,524,457, employing 9,510 persons, paying \$5,391,005 for wages and \$7,583,487 for materials, and turning out products valued at \$16,191,456. The city has a great variety of skilled industries, extensive manufactories of railway-cars, pistols, sporting-arms, cotton and woolen goods, paper, envelopes, paper boxes, and collars, toys, needles, watches, buttons, skates, machinery, knit goods, confectionery, corrugated iron, paints and chemicals, sewing-machines, etc. The U. S. armory is located here and gives employment to about 530 men. Large additions

have been made to the shops and machinery, and the output of rifles is 100 a week. The arsenal is 200 by 70 feet, and accommodates 300,000 stand of arms. The U. S. Government building, completed in 1891 at a cost of about \$150,000, contains the post-office and the customs-office. The value of the imports in 1893 was \$107,718, and for the first quarter of 1895 nearly \$50,000, and the duty collected in 1893 \$47,710. The city has a flourishing board of trade. There are 4 daily, 8 weekly, 8 monthly, 2 semi-monthly, and 2 Sunday periodicals.

History.—Springfield was settled in 1636 by emigrants from Roxbury under the leadership of William Pynchon, and was first called Agawam, the Indian name for a portion of the territory occupied. West Springfield, Chicopee, and several of the neighboring towns were then included in its boundaries. In 1640 the name of the settlement was changed to Springfield in compliment to Mr. Pynchon, whose country residence in England bore that name. In 1675, during King Philip's war, the town was burned by the Indians. During Shays's rebellion in 1787 the U. S. arsenal was attacked, but the insurgents were dispersed by the State militia. Pop. (1880) 33,340; (1890) 44,179; (1894) 51,851. ERNEST M. LONG.

Springfield: city; capital of Greene co., Mo.; on the St. L. and San Fran., and the Kan. City, Ft. Scott and Memphis railways; 130 miles S. of Jefferson City, the State capital, and 240 miles W. S. W. of St. Louis (for location, see map of Missouri, ref. 7-F). It is on one of the highest plateaus of the Ozark Mountains, 1,450 feet above sea-level, is built in a grove of forest-trees with prairies on three sides, and is in an agricultural and lead and zinc mining region. The streets cross at right angles and are from 60 to 80 feet in width; many are macadamized or paved with brick. The city is lighted by gas and electricity, and has electric street-railways, improved water works and sewerage, and two public parks. There is a U. S. Government building which cost with grounds \$150,000, and contains the post-office, land-office, Federal courts, internal-revenue office, and signal-service quarters. Immediately S. of the city is a National Cemetery, containing the remains of 1,600 Union soldiers, and adjoining it is another cemetery with the graves of about 500 Confederate soldiers.

Churches and Schools.—Springfield contains 9 Methodist Episcopal churches, 7 Baptist, 6 Presbyterian, 5 Congregational, 4 Christian, 3 Roman Catholic, 2 Protestant Episcopal, and a German Evangelical. The public-school system comprises a high school with building and ground that cost \$50,000, a commodious central building, and 9 ward schools, with 65 teachers and nearly 6,000 enrolled pupils. A normal school with accommodations for 2,000 pupils was opened in 1893. There are also 3 Roman Catholic parochial schools and 2 private kindergartens. For higher instruction there are Drury College (Congregational, chartered in 1873), which in 1894 had grounds and buildings valued at \$115,800, an endowment of \$210,000, 265 students, a faculty of 12, and classical and scientific courses; a Roman Catholic college; and several academies. Springfield has a circulating library, and 3 daily and 6 weekly newspapers.

Finance and Banking.—In 1894 the city revenue was \$89,753; expenditures, \$80,962; bonded debt, \$188,800; and assessed property valuation, \$7,790,923. There were 5 State banks, a national bank, a private bank, with aggregate capital of \$725,000 and deposits of \$1,890,000, and 4 loan and trust companies.

Business Interests.—The city has a large jobbing trade, embracing the chief lines of merchandise, and covering principally Southwestern Missouri and Northwestern Arkansas. The industrial establishments comprise railway-car and repair shops, the largest wagon-factory in the State, 4 candy-factories, 4 roller flour-mills, 3 tobacco-factories, 2 iron-foundries, a furniture factory, a cooperage, and a stove-factory.

Pop. (1880) 6,522; (1890) 21,850; (1894) estimated, over 25,000. JOHN B. WADDILL.

Springfield: city; capital of Clarke co., O.; on the Mad river, Lagonda creek, and the Cleve., Cin., Chi. and St. L., the Erie, the Ohio S., and the Pitts., Cin., Chi. and St. L. railways; 40 miles W. of Columbus, and 80 miles N. E. of Cincinnati (for location, see map of Ohio, ref. 5-D). It is in an agricultural region, but is best known for its extensive manufacture of agricultural implements. The city has gas and electric-light plants, water-works, sewers, and street-railways, and obtains excellent power for manufacturing pur-

passing from the river. Water for domestic use is supplied from springs. The public buildings include a new city-hall (cost \$225,000), new U. S. Government building (cost \$115,000), and a free public library presented to the city by B. H. Warner (cost \$100,000).

There are nearly 50 churches and other places of worship, 36 public-school buildings, public-school property valued at over \$250,000, high school, Springfield Seminary, a business college, and 5 daily, 10 weekly, 2 semi-monthly, and 7 monthly periodicals. Springfield is the seat of Wittenberg College (Hathorn, chartered in 1845), which in 1895 had 18 instructors, 302 students of both sexes, and 10,000 volumes in its general and society libraries, and had graduated 600 students since its opening.

The manufactures include mowers and reapers, grain-drills, grain-separators, mowers and reaper knives, reaper-guards, portable and stationary steam-engines, steam-haulers, sewing-machines, turbines, water-wheels, flour-mills and wind-mills, spring beds, kerosene oil, carriages, galvanized iron-work, lime, brick, whisky, and flour. In 1890 the census showed 75 industries with 372 establishments. Over \$14,000,000 capital and nearly 7,000 persons were employed. The payments for wages aggregated \$3,195,441 and for materials \$4,751,994. The total value of articles manufactured was \$10,760,965, of which \$5,251,008 represented the output of agricultural implements.

The city had in 1898 an assessed valuation of \$17,114,332 and a net debt of \$839,790. There are 5 national banks with combined capital of \$1,300,000; a savings-bank, and 3 building and loan associations, local and permanent, with 1,664 shareholders and 6,472 shares in force. Pop. (1890) 59,790; (1896) 61,805.

Springfield: town; capital of Robertson co., Tenn.; on the Louisville and Nashv. Railroad; 80 miles N. W. of Nashville (for location, see map of Tennessee, ref. 5-E). It is in an agricultural and stock-raising region; is engaged in growing tobacco, corn, wheat, and grass; and contains flour-mills, sawmills, brick-works, a tannery, a national bank with capital of \$60,000, a State bank with capital of \$30,000, and 2 weekly papers. Pop. (1890) not in census; (1896) 1,372.

Springs: fountains or streams of water flowing out of the earth and fed by rains on higher lands, frequently at some distance. As the water of springs often flows through subterranean channels which are beyond the reach of changes in surface temperature, it is little affected by the seasons, and is often maintained at about the average annual temperature of the locality. When it emanates from a deeper source it is sometimes highly heated, producing **THERMAL SPRINGS** (q. v.). When, as is often the case, the water is impregnated with chemical substances, such springs are called **MINERAL SPRINGS**. See **WATER** and **MINERAL WATERS**.

Spring Valley: city; Bureau co., Ill.; on the Burlington Route, the Chi. and N. W., and the Chi., Rock Is. and Pac. railways; 100 miles S. W. of Chicago (for location of county, see map of Illinois, ref. 5-E). It is in a coal-mining region, has important manufacturing interests, and contains a national bank with capital of \$50,000 and two weekly newspapers. Pop. (1890) 3,847.

Springville: village; Erie co., N. Y.; on the Buffalo, Rochester and Pitts. Railway; 80 miles S. of Buffalo (for location, see map of New York, ref. 5-C). It contains the headquarters of the Springville cheese-factory combination, which uses the milk of 5,000 cows daily and produces 2,000,000 lb. of cheese annually. There are 9 churches, an endowed academy and union free school, public library, 3 parks, soldier's monument, natural gas-supply for fuel, electric-light and power plant, excellent water-system, numerous manufacturing, a national bank with capital of \$50,000, a private bank, and 2 weekly newspapers. Pop. (1890) 1,227; (1896) 1,389; (1895) estimated, 2,100.

EDITOR OF "JOURNAL AND HERALD."

Springville: city (founded in 1850); Utah co., Utah; on the Rio Grande W. and the U. Pac. railways; 6 miles S. of Provo, the county-seat, and 50 S. by E. of Salt Lake City (for location, see map of Utah, ref. 4-M). It is in a beautiful valley near the east end of Utah Lake; has abundant water-power, and is engaged in farming, stock-raising, and manufacturing. There are 5 district schoolhouses, an academy, a Mormon and a Presbyterian church, a State bank with capital of \$50,000, and a weekly newspaper. Pop. (1890) 2,812; (1896) 2,540; (1895) estimated, 3,000.

EDITOR OF "INDEPENDENT."

Spruce [*Frax. M. Eng. spruce*, variant of *Frax. Prunus*, the tree being first known as a native of Prussia]; any one of several trees of the genus *Prunus*, in the U. S., especially *P. nigra*, black or double spruce, and *P. alba*, white or single spruce. Both of these afford much useful timber, superior to that of hemlock, but inferior to the best pine. There are also several trees called spruce on the Pacific coast. (See also *Fir* and *Pine*.) The so-called Norway spruce, *P. norvegica*, very widely planted, is a noble forest tree of the north of Europe. The native spruces of the U. S. afford a resinous substance called spruce-gum, much used as a masticatory. The tops are often brewed to make a pleasant drink called spruce-beer. It is made by adding the essence of spruce to water in which sugar or treacle has been dissolved, in the proportion of about 4 oz. of essence to 10 lb. of sugar or three parts of treacle, and 10 or 11 gal. of water, with about half a pint of yeast.

Revised by L. H. HARRIS.

Speller, esp. Mr. Louis: publicist and politician; b. at Saurre, Côte-d'Or, France, Dec. 8, 1835; studied law, and was admitted to the bar in Paris, but abandoned the legal profession to devote himself to journalism and politics. An intimate friend of Gambetta, he took part in the formation of the latter's journal, *La République Française*, and afterward became its editor-in-chief, but resigned this position after his election to the Chamber in 1876. In the Chamber he was active on several important commissions, concerning himself especially with questions relating to education and foreign affairs. He was Under-Secretary for Foreign Affairs in the short-lived cabinet of Gambetta, 1881-82; Minister of Public Instruction in the cabinet of Rouvier, 1887; and Minister of Foreign Affairs in that of Tirard, 1890-91. He was elected to the Senate Apr. 24, 1892. Among his writings are *Petite histoire du second Empire, utile à lire avant le Pétrole* (1870); *Ignace de Loyola et la Compagnie de Jésus* (1870); *Michel, sa vie et ses œuvres* (1876); *Confessions populaires* (1876 and 1881); *Figures disparues* (1886); and *Les ministres de l'instruction publique* (1890). P. M. C.

Spur: See **Razor**.

Spurge: See **EUPHORBIA**.

Spurgeon, Charles Haddon: preacher and writer; b. at Kelvedon, Essex, England, June 13, 1834, the son of an Independent preacher; was educated at Colchester; became usher of a school at Newmarket, but, embracing Baptist views, joined a congregation of that denomination in Cambridge; became a tract-distributor and village preacher, and at the age of eighteen minister of a small chapel at Waterbeach, where he soon became noted for his zeal and eloquence. He went to London in 1853, where he at once attracted audiences so numerous that the congregation was compelled to remove first to Rector Hall, and thence to the still larger Surrey Hall. In 1861 an immense chapel, called the Tabernacle, was built for him in Newington Butts, London, where he afterward preached. Nearly 30,000 persons were admitted to his church, and thirty-six other chapels were opened in London, the ministers of which were trained at a college founded and directed by him. His sermons were printed weekly, and from them thirty-seven volumes were made up. He also published *The Saint and his Saviour* (1857); a *Commentary on the Psalms* (7 vols., 1865-80); *Gleanings among the Sheaves* (1868); *John Bunyan's Pilgrim* (1868); *Evening by Evening and Readings for the Church* (1869); *Parables for Arrows* (1870); *Types and Emblems and Lectures to my Students* (1875); *Storm Signals* (1886); *Messengers to the Multitude* (1892); and other works. In 1897 he laid the foundation of an orphanage at Stockwell established by his congregation, and in 1895 became editor of a journal, *The Sower and the Seed*. D. at Menton, France, Jan. 31, 1892. See the *Life* by Shindler (1892).—His son, THOMAS SPURGEON, was elected pastor of the Tabernacle in 1894.

Revised by W. H. WHITNEY.

Spurgesworth: the *Euphorbia*; a family of about 3,000 species of dicotyledonous herbs, shrubs, and trees, for the most part natives of the tropics, but with many representatives in all regions. The flowers are often monocious or dioecious, and the perianth is generally small. The ovary is usually tri- or tetra-lobed, with one or two anthers on each side. The stamens are generally numerous, and are commonly clustered and branched. Nearly all species have well-developed latexiferous tubes in their stems and leaves containing a milky fluid (latex). They are much-modified relatives of the mallows, with which they should be associated in spite of their usually apetalous structure.

More than 200 are North American, fully one-half belonging to the genus *Euphorbia*, commonly represented by *E. maculata*, *E. nutans*, both prostrate spreading species, and *E. corollata*, an erect, white-flowered, weedy herb.

Economically the family is of great importance; medicines are supplied by species of *Croton*, *Euphorbia*, *Jatropha*, *Joannestia*, *Mercurialis*, *Ricinus*, *Stillingia*, etc.; caoutchouc by the latex of *Hevea*, *Mabea*, *Manihot*, and *Sapium*; food by species of *Manihot*, slender plants of the tropics, with large starchy roots, the product being known as tapioca and cassava. The box-tree (*Buxus sempervirens*) is ornamental, and its wood (box-wood) is most useful, especially for engravers' purposes. Many species are grown in conservatories, some of them resembling cactuses in their succulent, leafless stems.

CHARLES E. BESSEY.

Spurrey: any plant of either of the genera *Spergula* and *Tissa* (*Spergularia*), belonging to the family *Caryophyllaceae*. *Spergula arvensis*, well known to farmers of Europe and North America as a weed, is profitably cultivated in the Low Countries and Germany as a forage-plant, and its seeds yield a valuable oil and oil-cake. *S. pilifera*, a dwarf alpine plant, has been recommended as a lawn-plant in proper climates, being handsomer than grass and requiring much less care.

Revised by CHARLES E. BESSEY.

Spur-winged Goose: the *Plectropterus gambensis*; a goose deriving its popular name from the strong tubercle, or blunt spur, on the bend of the wing, formed by the projecting wrist-bone (radiale). The body is slender, neck and legs long; there is an excrescence at the base of the beak. The bird is about 3 feet long; chin, throat, center of breast, under side, and scapulars white, rest of plumage greenish black. It is found in Central and South Africa. F. A. L.

Spurzheim, spoorts'him, KASPAR: phrenologist; b. at Longwich, near Treves, Rhenish Prussia, Dec. 31, 1776; studied medicine at Treves and Vienna, and became a zealous disciple of Dr. Gall, whom he accompanied on his travels in Germany and France, and assisted in popularizing his phrenological doctrines by lecturing, newspaper articles, etc. In 1813 he separated from Gall, and undertook the introduction of the new doctrines in England, where he resided from 1814 to 1817, and from 1825 to 1828, and gave very popular lectures. From 1817 to 1825 he lived in Paris. In 1832 he removed to the U. S., and had just begun to excite interest when he died in Boston, Nov. 10, 1832. Among his writings are *The Physiognomical System of Drs. Gall and Spurzheim* (London, 1815); *Outlines of the Physiognomical System* (1815); *Sur la Folie* (Paris, 1818); *Essai philosophique sur la Nature morale et intellectuelle de l'Homme* (1820); *A View of the Elementary Principles of Education* (1821). See the memoir by Carmichael (1833).

Sputum: in pathology, the substance expectorated from the lungs. See EXPECTORATION.

Spuyten Duyvil (spī ten-dī'vil) Creek [probably from the Dutch *Spuyt den Duyvil*, in spite of the devil]: the channel connecting the Hudson river with the Harlem river, and thence with the East river, on Long Island Sound. The creek forms the northern boundary of Manhattan Island.

Spy [deriv. of *spy* (verb), from O. Fr. *espier* (> Fr. *épier*), from O. H. Gerin. *spehōn* > Mod. Germ. *spähen* < Teuton. *speh-*: Lat. *spēcere*, look at, view]: in the laws of war, a person who goes in disguise or under false pretenses within the lines or territory of a belligerent to observe his strength and obtain information concerning his works and movements for the purpose of communicating the same to the enemy. The rules of warfare among all modern civilized nations permit the infliction of the death penalty upon spies taken in disguise within the enemy's lines. The employment of spies, however, is considered a kind of deceit allowable by the rules of war, and, notwithstanding the ignominious method of inflicting death (usually by hanging), it has not infrequently happened that men of high honor have undertaken the office. Two of the most notable instances in all history are those of Capt. Nathan Hale and Maj. André during the Revolutionary war.

Because of the treachery involved in acting as a spy all authorities are agreed that although a sovereign may hold out an inducement or the temptation of a reward to persons to engage in such service, yet the service can not be required of subjects, except, perhaps, in some singular case of the last importance. In Great Britain by the Naval Discipline Act (29 and 30 Vict., c. 109, § 6) spies can be tried by a naval court martial, and shall suffer death or other punishment.

In the U. S. the instructions for the government of the armies of the U. S. in the field provides (General Orders No. 100, sec. v., § 88) that "the spy is punishable with death by hanging by the neck, whether or not he succeed in obtaining the information or in conveying it to the enemy."

Exactly what acts shall bring a person within the definition of a spy is not definitely determined, nor when he ceases to be a spy after once having had that character. In the Franco-German war of 1870 the Germans claimed that persons crossing their lines in balloons were spies; but this is not in accordance with the treatment of the subject of spies in the rules proposed at the Conference of Brussels in 1874 (Project of an International Declaration concerning the Law and Custom of War, Arts. 19-22), which expresses the opinion generally accepted among the nations of Europe. See Vattel's *Law of Nations*; Kent's *Commentaries*; and Halleck's *International Law*.

F. STURGES ALLEN.

Squall [Mod. Lat., from plur. of Lat. *squālus*, a kind of sea-fish]: See SHARK.

Squalls: bursts of wind, usually of brief duration, and when accompanied with the proper precipitation called rain-squalls or snow-squalls. They are of many varieties as to origin. One of the commonest is the falling wind which descends on the water from mountainous coasts. On the northwest coast of Lake Superior they descend from the bluffs and low mountains only a few hundred feet high, yet with such violence and suddenness in calm, warm weather, and in the heat of the day, that they are very dangerous to sailing-vessels. In the Aleutian islands they often descend the mountains behind a head of white wool-like fog, and are therefore called "woollies." The papagayos of Lakes Nicaragua and Managua, and of the Papagayo Bight on the west coast of Nicaragua and Costa Rica, are of the same character, but of longer duration. They usually fall on the ocean at from 10 to 20 miles from land, and the navigator must keep within 10 or beyond 40 miles from shore if he wishes to escape them. Of the same character also are the neevados, a falling diurnal wind in Ecuador and Peru, when the air descends on the plains from the snow-fields of the higher mountains. Of another type is the derecho of the western parts of the U. S., an occasional non-vortical wind which spreads in a fan shape as it advances from the N. W. These squalls are often mistaken for tornadoes, which are vortical local storms. The white squalls of the tropical seas on the west coast of Africa are sudden and furious bursts, whose approach is indicated by an advancing but harmless-looking white cloud. MARK W. HARRINGTON.

Squarclione, squār-chō'nd, FRANCESCO: painter; b. at Padua, Italy, 1394. His love of art led him to travel much in Greece and Italy, where he became acquainted with the masterpieces of ancient sculpture. He then formed a collection of busts, torsos, and bas-reliefs, with which he adorned his studio, and opened a school which became very popular, and in which Andrea Mantegna studied. He employed the help of his assistants to such an extent that only one picture exists in Padua which is supposed to be entirely his work, viz., the *St. Jerome and other Saints*, painted for the Lazzare family and placed in the Carmelite church. D. at Venice, 1474.

Square Root: See ROOR.

Squares, Method of Least [*square* is from O. Fr. *esquarre* > Fr. *équerre*, carpenter's square, deriv. of *équarrer*, as Ital. *squadra* of *squadrare* < Lat. **exquadra're*, make square; *ex* + *quadra*, a square]: a process used for the purpose of obtaining the most probable value of a quantity from a series of observations. In all measures, from the ordinary rude weighings and measurements of agriculture and commerce up to the most refined astronomical work, there is a liability to error which can not be avoided. An ordinary scale, for instance, can be used to measure down to a sixteenth of an inch; that is, if carefully used, its results will be correct to that limit. The level of a transit-instrument can make its measures, when used with care, to a ten-thousandth of an inch or even less; but in this case the hundred-thousandths will be uncertain. An ordinary observer notes his time to minutes only, and is likely to state the time incorrectly to the extent of at least half a minute: the man who is trying a fine watch will note its errors to seconds, or even half seconds; the astronomer uses tenths of seconds in his rough data and hundredths or thousandths in his calculations, but even here there is always uncertainty in the fractions of a second.

Observations or measures of the same thing never agree perfectly—that is, in the minutest fractions; how shall the true result be ascertained from discordant evidence? The ordinary experience of mankind has shown that it is best to "strike an average." When, for instance, two equally good surveyors measure a field a little differently, the half sum of their results is taken. The average prices of commodities are taken for their real prices, or at least for a better estimate of their real value than the extreme prices either way are affected by temporary fluctuations. The whole business of insurance rests upon this law of averages.

The "method of least squares" is the application of this law to the results of physical measurements, especially in astronomy and geodesy. The mathematicians whose names are most prominently connected with it are Legendre, Gauss, Bessel, and Kueske; Legendre and Gauss seem to have discovered it independently. A short sketch of the history of the method will help in its explanation. Before the method of least squares, as we now have it, was discovered, the method of averages, or of the arithmetical mean, was applied to all physical measures which give a direct result. But in astronomy the things to be found out can not always be directly measured, but must be indirectly inferred from measurements of other things. The observations upon the transit of Venus afford an instance. Here the main thing to be found out is the solar parallax; the thing directly observed is the planet's ingress upon or egress from the sun. The time of this depends upon several unknown quantities, of which the solar parallax is one, and also the unknown time of conjunction, and the unknown distance of the planet's and sun's center at that time, as well as the apparent angular diameter of planet and sun. Each observation, then, gives an equation of condition between these five unknown quantities, and at any one place four observations of contacts are made. At thirty stations there would be 120 equations for five unknown quantities; if the best five of these were selected, a good value of the solar parallax might be obtained; but many thousand good combinations can be made, each of which gives a different result, owing to the errors of the observations. How, then, can such a combination be made as to answer to the average in more direct measures? or, to express it mathematically, how can the superfluous equations of condition be combined so as to give the best possible result? The mathematical problem here treated is analogous to the combination of ordinarily discordant evidence in a perplexed case in the courts of law: when the result here needed is one capable of numerical expression, as in the assessment of damages, the average is taken; but where not, the evidence is reconciled as well as possible. Gauss has shown that in simple cases the ordinary law of averages is justified, and that in complex work, like the transit-of-Venus reductions, the following rule is to be used, which is the more general form of the same law: "In treating observations of equal precision the unknown quantities are to be so determined that, after allowing for constant error, the sum of squares of the remaining errors shall be the least possible." This is the "method of least squares." Its practical working is easy after the data are put into proper shape, and its advantages are so great that it is very largely used. It affords a thorough criticism upon one's own work and that of others, and for this reason is in great favor where the observers are most delicate, keen, and courageous, especially in Russia, Germany, and the U. S. Revised by S. NEWCOMB.

Squaring of the Circle: See QUADRATURE OF THE CIRCLE.

Squash [from Massachusetts Ind. *asquash*, plur. of *asquash*, green, raw]: a name applied in North America to fruits and plants of *Cucurbita maxima*, to the bush or summer varieties of *C. pepo*, and also sometimes to varieties of *C. melonensis*. Usage varies as to the application of the name, but it belongs to *C. maxima* rather than to the others. (See *POPPING*.) The fruits of *C. maxima* have soft, cylindrical stems which are not inflated at their insertion, the flesh is dry and orange-yellow, and the seeds are large and not thin-margined. Varieties of this species are Hubbard, Boston Marrow, the Turban, Marblehead, and the like. J. H. B.

Squash-bug: the *Anasa tristis*, a hemipterous insect, well known for its ravages upon squash and pumpkin vines. It belongs to the *Coccinea*. It is six-tenths of an inch long, about three-tenths of an inch in breadth, and of a dirty brown. It emits a powerful and offensive odor. The striped squash-bug is *Diabrotica vittata*, a beetle of the family

Chrysomelidae, a much smaller but even more destructive insect, which infests cucurbitaceous vines of almost all kinds in the U. S. As a rule, these insects are most destructive while the plants are young; and the squashes should be protected by a spray composed with molasses, or powdered gypsum and shell-lime may be freely sprinkled upon the plants, and will be found to impede the destructive work, particularly that of the striped bug. The use of salt in the manure is no avail with respect to the bug, and is injurious to the plant. Revised by J. S. KENNEDY.

Squash Family: the *Cucurbitaceae*. See the article on the Gourd Family.

Squalter Sovereignty: a term used in the political history of the U. S. to denote the principle of leaving to the settlers within the Territories of the U. S. the decision of the question whether slavery should be permitted by the constitutions to be adopted when the Territories become States. See KANSAS (History) and UNITED STATES (History).

Squelague: See WLAGH.

Squid: a popular name for many decapod cephalopods, particularly those of the family *Teuthidae* (calamaries), but also extended to the *Sepiidae* or true cuttlefishes, and even to the *Polydora* or *Octopodidae*. The squids proper are found in nearly all seas; they form an important part of the food of many fishes and crustaceans, are extensively used as fish-bait, and in many countries are much used as food. (See CEPHALOPODA, CUTTLEFISH, FLYING SQUID, INK-SQUID, etc.) There are several true squids which are common on the U. S. coast. Revised by D. S. JENNIS.

Squier, FERRIS GERRARD: archaeologist; b. at Bethel, Me., June 17, 1821. He received the ordinary education of a farmer's son, was a school-teacher, and subsequently editor of country papers in New York and Ohio, and studied engineering. He was early interested in Indian antiquities, and in 1842-48 made, with Dr. E. H. Davis, an investigation of the mounds of Ohio and the neighboring States; the results were published in the *Smithsonian Contributions to Knowledge* (1848) as *Ancient Monuments of the Mississippi Valley*. Similar investigations in his native State resulted in the *Antiquities of the State of New York* (1851). In 1849-50 he was *special chargé d'affaires* to Central America, arranging treaties with several of the states; and in 1850 he was engaged to examine the line for a proposed interoceanic railway in the same region. He published *Nicaragua, its People, Monuments, etc.* (1852); *Waukena, or Adventures on the Mosquito Coast* (first published with the pseudonym *Samuel A. Bord*, 1856); *The States of Central America* (1857); and several other books and reports in English and French. His work on *The Serpent Symbol* (1852) attracted wide attention. In 1853-65 he was U. S. commissioner to Peru, and his investigations of the Incarian antiquities were the most important and exact that had been made up to the time. Returning, he took up his residence at New York, where from 1868 he was consul-general of Honduras. He was prominent in organizing the American Anthropological Society, and was its first president in 1871. The French Geographical Society voted him its gold medal, and he was a member of many other foreign and American learned societies. Several years were spent in the preparation of a work on Peru, and it was nearly ready for the press when, in 1874, a severe illness incapacitated him for continuous mental labor. The work was published in 1876, and is one of the most important contributions to our knowledge of Peru. D. in Brooklyn, Apr. 17, 1888. Besides the works mentioned, he was the author of numerous scientific papers and magazine articles. Many of his books were translated into Spanish and French. HENRIET H. SMITH.

Squill [via O. Fr. from Lat. *squilla*, scilla = Gr. *σκόλλα*]: a drug made from the bulb of *Urginea maritima* (sea-onion), a perennial plant of the family *Liliaceae*, growing on the Mediterranean coast. The bulb is pear-shaped, of the size of a man's fist, or even larger. It is made up of concentric scales, like other tunicated bulbs, of which the outer are dry and dark colored, but the inner fleshy and juicy, and either colorless or of a pale roseate tint. For use in medicine the bulbs are dried and sliced, and after the varieties known as white and red squill, according to the tint of the bulb. Squill has little smell, but an acrid, nauseous, bitter taste. It contains a good deal of mucus, but there is still much uncertainty concerning the nature of the active principles. A resin and a bitter principle probably have to do with the medicinal effects. Squill has been known as a

medicine from a very remote period. It is an acrid irritant, affecting the mucous membranes and glands, and in large dose causes vomiting, purging, strangury, and may even prove fatally poisonous. Its medicinal use is from its producing, in small dose, an increased flow of urine, and also modifying in some unknown way the morbid condition of a mucous membrane affected with catarrh, and especially of the bronchiæ.

Revised by H. A. HARE.

Squilla: one of the stomapod crustaceans. See the article on the STOMAPODA.

Squinting, technically termed *Strabismus* [Mod. Lat. from Gr. *στραβισμός*, a squinting, deriv. of *στραβός*, distorted, squinting]: the condition of vision when the visual axis of one eye is deviated from the point of fixation. The eye whose visual axis is directed to the object fixed is termed the *fixing eye*; the other is called the *squinting or deviating eye*. The deviation may be inward, *convergent strabismus*, outward, *divergent strabismus*, upward or downward, *vertical strabismus*. In convergent squint the visual line of the squinting eye is deviated inward, and intersects that of the sound eye at some point nearer than the object fixed; in divergent squint it lacks the necessary movement inward to intersect that of its fellow at the point of fixation, and hence it deviates outward. Strabismus may be paralytic, or concomitant.

(1) In *paralytic squint* the deviation is caused by a paralysis of one of the muscles of the eyeball. The normal position of the eye and the correct direction of its visual line depend upon the tonicity of the four straight muscles, attached one above, one beneath, and one on each side of the eyeball. If one muscle is paralyzed, the eye is deflected to the opposite side by the stronger or intact muscle. Generally with paralytic squint, in addition to the deviation, there is loss of movement in the direction of the action of the affected muscle. Thus, if the outer straight muscle of the right eye were paralyzed, the affected eye could not move toward the temple on that side, and would be turned inward by the action of the inner straight muscle which is unaffected—that is, there would be a convergent squint. There is also generally double vision, because the images from an object do not fall upon identical points in the two retinas, and hence are no longer fused, as is the case when the eyes are normally moved by the muscles. Paralytic squint is caused by diseases of the brain, meningitis, and spinal cord, especially locomotor ataxia, certain general diseases like syphilis, rheumatism, diphtheria, diabetes, etc.; poisons, e. g. lead, and injuries.

(2) In *concomitant squint* the deviating eye is able to follow the movements of the other in all directions. The squint may be either periodic or permanent, and it may affect one eye or it may alternate. The average age for the appearance of concomitant squint is about four years, being usually first noticed when the child is beginning to learn to spell or read with small letters. There are a number of causes for concomitant squint, but the most important is a disturbance in the relation of the power of accommodation in an eye to the power of convergence, i. e. of bringing the eyes closer together. When the eye is far-sighted (hypermetropic) to a given degree, i. e. when it has a low refractive power, a short antero-posterior diameter, and the rays of light are not focused on the retina, it requires an accommodation, i. e. power to adjust itself for different distances and objects, of an equivalent degree to neutralize it, the visual lines being parallel. Generally, however, some convergence will accompany the effort of accommodation. The point of convergence is then nearer than the point for which the eye is accommodated, or, in other words, there is a convergent squint. Far-sightedness is consequently often accompanied by convergent squint. In near-sightedness, on the other hand, or in that condition in which there is a high refractive power and a long antero-posterior diameter, the visual lines often intersect at a greater distance than the point for which they are accommodated, and there is divergent squint. In a great majority of the cases of permanent squint there is amblyopia or imperfect vision of the squinting eye. Two views have been held in regard to this amblyopia, one being that it is due to lack of use on the part of the squinting eye, i. e. that the squint causes the amblyopia; the other that it is congenital and depends upon an imperfect development of the centers of vision in the brain, i. e. that the amblyopia causes the squint. The double vision, which is so marked a feature in squint when it is caused by paralysis, is usually absent in concomitant squint, because the eye involuntarily

suppresses the false image, or else has learned to disregard it. In rare cases squint is due to spasm of the internal straight muscle. In paralytic squint the treatment consists in finding the cause and applying the proper remedies. In the low degrees, especially of the periodic varieties of concomitant squint, the eyes may often be straightened by prescribing the proper spectacles to correct the error or refraction which is at the bottom of the trouble. When the squint is marked and persistent it calls for operation: Incision of the ocular conjunctiva or mucous membrane, hooking up the tendon close to the cornea, and severing it. Very young children should not be operated upon. It is better to wait until the sixth or seventh year. G. E. DE SCHWEINITZ.

Squirrel [from O. Fr. *esquirel* > Fr. *écureuil*: Span. *esquirol* < Lat. **scurius* for *sciurus* = Gr. *σκίουρος*, squirrel]: any one of certain species of the family *Sciuridae*. The name is more properly applicable to the slender arboreal forms constituting the genus *Sciurus*. These are of moderate size or small, have a rather slender head, no cheek-pouches, rather long ears, no lateral wing-like extension of the skin, a large bushy tail, and the teeth are, as in all the other genera of the family, 24—viz., M. $\frac{3}{1}$, I. $\frac{1}{1}$ × 2—but the foremost upper molars are often early deciduous, and when present very small. The genus grades into *Tamias*, or the chipmunks, and *Spermophilus*, or the ground-squirrels. There are about 150 species, and representatives are found in almost every region, Australasia and Polynesia, the southern extremity of South America, and the West Indies being the only considerable bodies of land in the temperate or tropical zones destitute of them. Eighteen species, with sixteen geographical races, or sub-species, are found in North America N. of Mexico. In time they existed, according to some authors, as early as the Eocene Tertiary, but the affinities of those early forms are doubtful. In habits the living species are all essentially similar. Most of their life is spent among the trees, and they exhibit great agility in running up the trunks and leaping from branch to branch. Their principal food consists of the nuts of trees, and in nut-bearing forests they are especially to be found; they also eat to some extent the larvæ of insects, and attack the nests of birds for their eggs, and even for their young. Their favorite attitude in eating is to sit on their haunches, with their tail thrown upward on the back, and holding the eatables in their paws. In the colder countries they lay up stores of provisions in holes and nooks in or near the trees in which they live. They are mostly readily tamed, and are generally kept in cages with revolving wheels or treadmills, wherein they exercise.

Revised by F. A. LUCAS.

Squirrel-corn: See DICENTRA.

Squirrel, Flying: See FLYING SQUIRREL.

Srinagar, or **Serlinagur**: capital of Kashmir, situated in a broad, marvelously beautiful valley at an elevation of 5,276 feet, and with a mean temperature of 56° 8' F. (see map of N. India, ref. 3-D). It is built on both sides of the navigable river Jhilam, from which numerous canals, spanned with light wooden bridges, branch off, the lively traffic by boat reminding one of Venice. The most remarkable building is the palace of the maharajah; it is called the Shergarh (citadel), and a large, beautiful flight of stairs leads from it down to the river. Close by the city is Lake Dal, which boasts of the far-famed isle Chinars (*Platanus orientalis*). Vegetables are raised here on floating rafts called gardens. About 21 miles N. W. of the city is Wular Lake, which covers 103 sq. miles. A small steamboat plies between the two lakes. Pop. (1891) 118,960, mostly Mohammedans.

Revised by M. W. HARRINGTON.

Staal, MARGUERITE JEANNE CORDIER DE LAUNAY, BARONESS de: memoir writer; b. in Paris in 1684, the daughter of a poor painter; was educated in a convent at Rouen; became maid to the Duchess of Maine; took part in Cellamare's conspiracy for depriving the Duke of Orleans of the regency, and was imprisoned in the Bastille 1718-20; married afterward a Baron de Staal, who held a company in the guard of the Duke of Maine, and spent the rest of her life at the ducal court at Sceaux. D. in Paris, June 15, 1750. Her *Mémoires* were published in 1755, and republished in 1848 and 1878; her letters appeared in 1806, her *Œuvres complètes* (2 vols.) in 1821. Her *Mémoires* and letters have considerable interest to the student of history. See Sainte-Beuve, *Portraits Littéraires*.

Stabat Mater [Lat., *stabat*, was standing, third sing. imperf. indic. of *sta're*, stand + *ma'ter*, the mother]: the first

woods, and hence the name, of a Latin hymn ranked among the seven great hymns of the mediæval Church (*The Celestial Country* [from *The De Contemplatione Mundi*], *Dixi Ite*, *Miserere*, *Miserere*, *Veni Sanctus Spiritus*, *Veni Creator Spiritus*, *Yezus Rex*, *Contemplatione Sancti Michaelis* name, *Alleluia*, also known as *The Afflictive Sequence*). It begins—

*Stabat Mater dolens, By the cross, and right weeping,
Juxta crucem lacryans, Joined the sorrowful mother weeping.*

As the *Dixi Ite* (y. c.) has been pronounced the greatest, so the *Miserere* is deemed the most pathetic of hymns. Its author is unknown, but it is customarily assigned either to Pope Innocent III. (d. 1216) or Jacopone da Todi (d. 1306). This hymn is still in constant use in the Roman Catholic Church, being sung during the Holy Week and on the festival of the Seven Dolours of the Virgin Mary, and it is well known in a musical sense to all through the very beautiful and sympathetic music of Rossini. It has been the theme of several of the world's great composers of different eras. Prior to Rossini, Pergolesi perhaps produced the most famous and masterly, if not the most popular, work upon it.

Revised by S. M. JACOBS.

Stadrock, *staal-rook*: See *GRONINGEN*, British Guiana.

Stachys, *sták's* (Gr. *stachys*, an ear of grain; name of a plant, woundwort): a genus of labiate plants, with a few species cultivated for ornament, and one, *S. arvensis* (but generally known as *S. tuberosa* and *S. affinis*), now somewhat grown for its edible tubers. See *COMBENT*. L. H. B.

Stade, *stade*: an old fortified town of Prussia, province of Hanover, on the Sobbing, near its influx in the Elbe (see map of German Empire, ref. 2-E). The so-called Stade dues, a toll which Hanover levied on all merchandise carried up the Elbe, but which was abolished in 1804, were paid here. Its manufactures are, wools, linen, and cotton stuffs, tobacco, and beer. Pop. (1890) 10,180.

Stadia Measurement: in surveying, a method of determining distances by graduated rods and the cross-hairs in the telescope of a transit instrument. The principle of the



Stadia measurement.

method is that of similar triangles, shown in the figure, the two hairs *a* and *b* seeming to be projected on the rod at *A* and *B*. Let *c* be the distance from the hairs to the object-glass and *d* the distance from the object-glass to the rod, then

$$d = \frac{AB}{ab} c = \frac{c}{ab} AB,$$

or $d = AB$ if the rod be graduated so that $c \div ab$ represents the unit of distance. This principle is slightly modified by the optical theory of the lens, since *c* varies for different distances, so that the expression for *d* becomes

$$d = \frac{f}{ab} AB + f,$$

in which *f* is the principal focal length of the lens, and in reality the lengths indicated by the intercept *AB* do not begin at the object-glass, but at a distance *f* in front of it. As, however, *f* is small in comparison with *d*, it is generally neglected in topographic work.

When the telescope and line of sight are not horizontal the angle of inclination is read, and the rod held vertical. Then the reading on the rod is to be multiplied by the square of the cosine of the inclination to give the horizontal distance, and by one-half the sine of twice the inclination to give the vertical distance. By the help of tables these computations are readily made in the field, and thus both the horizontal distance and the elevations of points with respect to a given station are quickly obtained.

The precision of stadia-work is fully equal to that of ordinary chaining on rough ground, the uncertainty being about 1/10th of the length of the line. Stadia measurements were introduced by Berni, an Italian engineer, about 1840; soon after used in topographical work in Switzerland, and introduced into the U. S. by J. R. Mayer about 1850. The word *telescope* is generally employed instead of *stadia* on the U. S. Coast and Geodetic Survey, which seems to be alone in this usage. Most text-books on surveying give the prin-

ciples and practice of the method. A small work with tables is Winston's *Stadia Surveying* (New York, 1894).

MANUEL HERRIMAN.

Stadium [*stai* = Gr. *stadion*]: the principal Greek measure of length for journeys, used in later times also for other linear measurements, especially by the Romans. Its length was fixed by that of the foot-race course (*stadeion*) at Olympia, and was 600 Greek = 600 Roman = 600 English feet, or one-eighth of the Roman mile. Stadium was originally the name of the foot-race course in which running and other athletic exercises took place. Stadia existed at many Greek cities, but the most famous was that of Olympia. The stadium was laid out in two parallel oblong areas, connected at one end by a semicircular track. The whole was surrounded by seats for spectators.

Revised by J. H. S. STERRETT.

Stadtholder [Dutch *Stadhouder*, town-holder]: a governor of a country or province. In the course of the revolt of the Netherlands against Spain the seven United Provinces chose William, Prince of Orange, as their stadtholder. The title was intentionally a modest one, intimating that the revolt was not against the sovereign, but against the tyranny of his viceroy, the Duke of Alva. It involved the chief civil and military command, was given to Maurice, son of William, in 1607, and was held with some interruptions by the head of the state until the annexation of Holland to the French empire in 1802. On the restoration of the house of Orange in 1814 the title of king was assumed.

Stael-Holstein, Fr. pron. *stäl'holstén*, Anne Louise Germaine (Necker), Baronne de: historian, essayist, and novelist; b. in Paris, Apr. 22, 1766; daughter of Jacques Necker, the famous finance-minister of Louis XVI. She showed a precocious intelligence, and grew up in the brilliant salon of her mother, where she imbibed the intellectual curiosity and scientific spirit of the men who frequented it. In 1786 she married Baron de Stael-Holstein, Swedish ambassador at Paris, to whom she bore two sons and a daughter. Her marriage was not happy, and she was later separated from her husband, and mainly lived apart from him. Possessing remarkable gifts for conversation, she drew about her a circle of literary and public men, whom she charmed and dazzled. She greeted the beginning of the Revolution with sympathy, and her salon was the gathering-place of the admirers of the English Constitution. In 1792 she fled from the growing violence to her estate at Coppet, near Geneva, and then for a time to England; but in 1796 she returned to Paris and sought to re-establish her salon. In the same year she fell under the suspicion of the Directory, and withdrew again to Coppet, but returned once more in 1797, and her salon attained to new brilliancy and power. Among its assiduous visitors were Mme. Récamier, Mme. de Beaumont, C. Jordan, Parnet, and especially Benjamin Constant, with whom she fell in love and from whose capricious and unhappy character she had much to suffer. Her salon was decidedly hostile to Napoleon, who in Oct., 1800, sent her away from Paris. She traveled then in Germany and Italy, and in 1806 established herself again in Coppet, where her old friends and many new ones flocked about her, and where she held a kind of intellectual court. She traveled again in Germany in 1807, and upon her return announced her religious conversion. The appearance of her book on Germany was the signal for still severer measures by Napoleon. The French edition was destroyed, and she was ordered to retire to Coppet, where she was kept under surveillance, a virtual prisoner, and forbidden to receive her friends. She escaped in 1812 and took refuge successively in St. Petersburg, Sweden, and England. On the fall of Napoleon she returned to Paris in 1815, but she was disappointed at the tendencies of the restored monarchy. On July 14, 1817, in 1811 she had secretly married Alfred de Rocca, an officer but twenty-three years old, to whom she bore a son. Though her conspicuous influence upon her contemporaries was wielded by personal contact and her written works were considered to fall far behind the power and brilliancy of her improvisation in the excitement of conversation, her books are among the most important of the post-revolutionary period, and furnished a great stimulus to the new currents of French literature that were preparing romanticism. They are marked by fervid and sometimes hysterical sentiment, that often appears to protest against social conventions, especially in the essay *De l'Influence des passions sur le bonheur des individus et des nations* (1796), and the novels *Delphine* (1802) and *Corinne*

(1807); and by a wide range of intellectual view and just and profound ideas, which some have denied her the credit of originating, but which she at least grasped, communicated, and made available. These are exhibited especially in *De la Littérature considérée dans ses rapports avec les institutions sociales* (1800); *De l'Allemagne* (1810); and *Considérations sur la Révolution française*, her last work, published by her son in 1818. *De l'Allemagne* was of great importance in stimulating the influence of German thought and literature in France by giving the French public a more complete and sympathetic revelation of Germany than it had ever had. Other works are *Lettres sur les écrits et le caractère de J. J. Rousseau* (1788) and *Dix années d'exil* (posthumous). Her son published her *Œuvres complètes* (17 vols., 1821). See Lady Blennerhasset, *Frau von Staël* (3 vols., 1888-89); A. Sorel, *Madame de Staël* (Paris, 1890).

A. G. CANFIELD.

Staff: an exterior covering for buildings, resembling plaster or stucco, first used at the Paris Exposition of 1889, and employed for most of the buildings and exterior decorative work of the Columbian Exposition at Chicago in 1893. It is made of hydraulic cement, sand, and a binding material of jute fiber.

M. M.

Staffa: a small, uninhabited island of Argyllshire, Scotland; 6 miles W. of Mull; celebrated for its curious caverns, among which that called FINGAL'S CAVE (*q. v.*) is the most remarkable. Among the other caves are the Cormorant and the Clam-shell. The greater part of the coast is girt with cliffs from 84 to 112 feet high. In the N. E., however, in the lee of the prevailing winds, is a tract of low shore stretching out in beaches and forming a landing-place, and the interior table-land is covered with rich soil and luxuriant grass, which feeds a number of black cattle.

Revised by M. W. HARRINGTON.

Staff and Staff Schools: the assistants of the general-in-chief of an army and of his generals, and the institutions in which they are trained for service on the staff. The term staff as commonly used includes (1) the heads of departments (such as artillery and engineers, military law, medical, quartermaster, pay, etc.), (2) the personal staff (including aides, orderly officers, etc.), (3) adjutants, and (4) a special body of officers, intrusted with duties connected directly with military operations, entitled the *general staff*.

The general staff has been universally recognized as an essential part of modern army organization. Its purpose is to convert the ideas of the general commanding into orders, not only by conveying them to the troops, but far more by working out all the necessary matters of detail (Clausewitz); and to watch over and preserve the fighting condition and material welfare of the troops (Schellendorf).

Germany.—All European states since the great success of the Prussian armies in their contests with Denmark, with Austria, and with France, in the campaigns of 1864, 1866, 1870-71, have made the Prussian staff system in some degree their exemplar. The origin of a general staff is probably to be found in the Swedish organization of the seventeenth century (then regarded as a model), and traces of it (no doubt taken therefrom) are found in the army of the great Elector of Brandenburg, who had, in 1655, two quartermaster-generals, officers doing special duty other than the direct command of troops—the germ of the German general staff of to-day. In 1657 were added to the general staff a field-marshal, a commissary-general and his assistant, 2 adjutant-generals, a judge-advocate, a provision-master, a quartermaster, a paymaster, a chaplain, a surgeon and an apothecary, a wagon-master, a provost-marshal with 3 assistants, and 11 clerks.

Frederick the Great had few staff officers. This great captain was not only his own chief of general staff, but he often assumed the functions of a staff officer of an inferior grade. The staff of the quartermaster-general then had merely a nominal existence. In 1741 there were 5 colonels, 4 adjutant-generals, 1 brigade-major, 5 majors (wing-adjutants), 1 quartermaster-general with 1 colonel and 2 majors as assistants, and 9 colonels and lieutenant-colonels of the army on general staff-duty. The king's instructions to his quartermaster-general, dated 1757, contain the principles of the construction, attack, and defense of fortresses and fortified camps; reconnaissance duty was performed by his engineers; the captain of the guides conducted columns of route, as no maps then existed, while the brigade majors regulated the guard duties in camp. In 1796 the survey of the kingdom was intrusted to the quartermaster-general's staff.

These were the beginnings of the general staff, but it was not until 1806 that Col. von Massenbach gave it a definite organization, and had assigned to its officers their proper duties, which, in general outlines, are still retained.

After the destruction of the Prussian army by Napoleon in the campaign of 1806, Col. von Scharnhorst in 1808 became lieutenant quartermaster-general of the Prussian army, with rank of major-general. His staff consisted of thirty-four officers in all; one officer was attached to each brigade, and one (sometimes two) to each corps. After 1815 the organization of the staff, which had rendered distinguished and important services during the closing campaigns against Napoleon, was seriously studied. A part of its officers, placed under a special chief as the *great general staff*, was assembled at Berlin, while its other officers, doing staff duty in the general and divisional commands, were in direct contact with the troops. The general staff was under the Minister of War till 1821, when the king named Lieut.-Gen. von Mueffling chief of the general staff, which then acquired an independent position, taking its orders directly from the chief of the state and commander-in-chief of the army—a position it retains. To this independence of all subordinate authority the Prussian staff attributes its ability to render the services in its later campaigns which have placed it as first among military organizations. Lieut.-Gen. von Mueffling was succeeded in 1829 by Lieut.-Gen. von Krauseneck, who was followed in 1848 by Lieut.-Gen. von Reyer, on whose death, in 1857, Gen. von Moltke became chief of the general staff. The part played by this general staff in changing the map of Europe makes its history one of great interest.

The campaign of 1866 showed the necessity of having ready at the moment of mobilization of the army a great general staff, capable of being doubled, and of leaving behind it when the army takes the field a sufficient number of trained staff officers to make sure of the means and measures of military transportation, and to insure the continuance of the supplies necessary for the army of operations. In 1867 a royal order established the staff on the following footing: *Principal list:* chief of general staff of the army; chiefs of division at the offices of the great general staff; chiefs of staff of the army-corps, etc.; total, 88 officers. *Scientific list:* 21 officers at the office of the great general staff. Total, 109 officers, 46 belonging to the great general staff.

At the breaking out of the war of 1870 the German army contained 200 staff officers, which number was considerably increased in the course of the campaign. In 1891 the general staff proper consisted of 186 officers—127 attached to the staff of the corps, divisions, etc., 49 to the great general staff of Berlin, 10 to that of Munich; the auxiliary staff (*scientific list*), officers simply detached from their regiments and doing duty under the great general staff, consists of 68 officers. Besides these, the general staff comprises military *attachés* (about 10), directors of military schools (about 20), commissaries of railroads residing at important railway centers (25), and officers undergoing probation as staff officers (80). Moreover, there are some 400 adjutants, selected and assigned to duty by the chief of the general staff, so that there are about 800 officers employed on general staff duty.

The work of the great general staff is distributed to separate divisions. The chief of the general staff directs the whole. In his office, under direction of his aide-de-camp, questions relating to the personnel of the staff, to its organization and administration, are considered. The work of collecting military information, domestic and foreign, the use of railways, the pursuit of military science, preparation of maps, etc., are distributed to various sections, grouped according to their work or the countries to whose study they are devoted. The staff is divided into three sections, whose duty is to study attentively all military events, domestic and foreign; to keep themselves acquainted with the changes affecting the organization, recruiting, arming, and equipment of armies; to study the military geography of different countries, the establishment or demolition of fortresses, the development of the network of roads, railways, canals, etc. Each is directed by a chief. Several staff officers, and a number of officers ordered on staff duty and charged with the special study of military questions in different countries, are under the orders of each chief.

The fourth section is that of railways. This section is charged with all that relates to military transportation. It should know the connections of the railways at home and abroad, the equipment and rolling stock; and it elaborates

the great schemes for army transportation by railway. In consequence of the great number of officers needed to manage the movement of a great army by railway, as many officers as possible are from time to time attached to this section with a view to their instruction in these duties.

In the scientific corps of the staff are the officers who have charge of the section of military history, of the archives, and of the library. In this scientific corps belong also the section of geography and statistics and the preparation of military maps of foreign countries. The general service of charts belongs, under a chief of the trigonometric survey, to another part of the great general staff.

The officers of the general staff are selected from the ablest graduates of the military schools after a certain term of service in the line. They serve on the staff in greater number than can possibly become permanent staff officers. They return to the line and serve a term with their regiments. As vacancies occur in the permanent staff, they are filled by selection, at the discretion of the chief of the general staff, from those officers who have, while under his eye, given proof of greatest capacity and devotion.*

France.—In the French army, previous to 1880, the general staff was a separate corps of officers, but since that year it has been merely a service to which officers of the line are detailed for a term of years, these officers still belonging to their respective arms and being regularly promoted therein. By the law of June 24, 1880, the number of officers in the general staff was limited to 640, comprising 30 colonels, 40 lieutenant-colonels, 170 majors, and 400 captains, under whose orders are placed 180 archivists, constituting a special corps of officers, employed in clerical work and in keeping the records.

In time of peace the general staff comprises (1) the military household of the president; (2) the special staff of the Minister of War; (3) the general staff of the army; (4) the staffs of the military governors of Paris and of Lyons; (5) the staffs of army-corps, divisions, and brigades; (6) the staffs of territorial divisions and subdivisions; (7) the staffs attached to fortified places; (8) the staffs of marshals of France and general officers specially employed; (9) military *attachés* abroad; (10) the staff of the commanders of the artillery and the engineers.

The supply of officers for the staff comes mainly from the superior war school (see MILITARY ACADEMIES), but officers who have not gone through this school are allowed to compete for a staff certificate at examinations held concurrently with the final examination at this school. The officers who pass serve a probationary term of two years in the staff, after which the best are selected as required.

The personnel of the staff is brought up to the war footing by calling in all officers possessing the staff certificate who are in the active army, and by recalling all certified officers and archivists belonging to the reserve or the territorial army.

The general staff of an army-corps is composed of (1) 1 chief of staff (general or colonel), 1 colonel or lieutenant-colonel, 2 majors (sometimes 3), 3 captains, 2 orderly officers, 2 archivists and 8 secretaries in time of peace; in time of war, of 14 officers and 66 men; (2) the staff of the artillery, 8 officers and 19 men; (3) the staff of the engineers, 4 officers and 8 men.

A division has, in time of peace, 1 chief (lieutenant-colonel or major) and 1 orderly officer (captain or lieutenant); in time of war, 1 captain or lieutenant, and 30 men in addition.

A brigade has, in time of peace, 1 orderly officer (lieutenant or captain possessing the staff certificate), and 1 corporal or private as secretary; in time of war, 1 lieutenant of the reserve as orderly officer, and 9 men in addition.

The artillery and engineers have also a special staff, that of the former comprising 310 colonels, lieutenant-colonels, majors, and captains, also the second lieutenants of the school of application; that of the latter comprising 486 officers. The duties of the former consist in superintending the various establishments of that arm and supplying the troops with ammunition; those of the latter in constructing and repairing fortifications and military buildings, directing the engineer schools, military telegraphy, and the military pigeon-houses.

Russia.—The officers of the general staff in Russia form a special corps, and are exclusively graduates of the general staff school (Nicolas Academy) at St. Petersburg. Entrance to this school is by competitive examination, open to officers

of all arms who have served at least three years; the course is two and a half years, the last six months being devoted entirely to practical work in the field; about 80 students enter every year and about 60 graduate. Upon graduation the 30 best enter the general staff. There is also a geodetic subdivision of 20 officers, who, after a two and a quarter years' course here, have a two years' course at the observatory at Pulkowa and then enter the general staff. The general staff comprises about 480 colonels, lieutenant-colonels, and captains, who do duty in the different bureaus of the great general staff at the office of the Minister of War, or in the military schools, or in the general staff of the generals exercising command. Before being promoted they are always required to have served with troops, exercising certain commands, so that a number is always detached on such duty. The corps also comprises about 80 general officers doing general staff duty and about 170 on special duties of various kinds. Topographical work is not done by the general staff, as in other armies, but by a special corps of military topographers, about 450 officers; and there is still another corps, doing duty related to that of the general staff, viz., the *Feldjaeger*, about 45 officers, selected from various arms, for reconnaissance work, carrying important orders to a distance, etc. General officers also have their aides-de-camp, selected from the officers of their commands, and simply detached, but not considered part of the general staff.

Austria-Hungary.—The general staff of Austria-Hungary, suppressed as a special corps in 1871, but re-established as such by the law of Dec. 28, 1875, comprises on the peace footing 260 officers, besides a number attached for temporary duty. The corps proper is a closed corps, and an officer once admitted remains a part of it, whether he afterward does duty with troops or continues on general staff duty, but it is open for admission to all officers up to the rank of major.

Before entrance lieutenants are generally required to pass at the staff school (*Kriegsschule*),* located in Vienna. Admission to this school is by competitive examination, open to first or second lieutenants of at least three years' service, who are under thirty years of age and unmarried; each year about 45 enter. The course is two years, terminated by an examination, at which other officers who have not taken the course may also compete. Those who pass are assigned to the staff for a probationary tour of duty as required; they number usually about 135. If acceptable they become captains of the general staff; if not, they return to their regiments. Majors may come directly from the line, either by passing a special examination or by selection of the chief of the general staff. Promotion in the corps is by seniority.

Employed in the bureaus of the general staff of the army are about 30 officers, taken either from the retired list or from a special body of officers, not fit for active service, but who can be utilized for sedentary duties, called the *Armeestand*, who have their own uniform and are promoted among themselves. Besides these about 100 officers, detached from their regiments, are detailed on topographical work. The total on general staff duty is about 700.

Italy.—General staff duty in Italy is performed by a special corps of about 150 officers, drawn from the captains, graduates of the general staff school, who have commanded a company, squadron, or battery for at least one year. Upon promotion they generally return to the line, and are not again recalled to the general staff as majors until after serving another year with troops; but captains who served two years before admission may be promoted in the corps.

There are also about 120 officers temporarily attached to the general staff, including those graduates of the staff school (usually about 24) who are making their trial tour. Generals in command, besides their general staffs, have also orderly officers, selected from among the troops of their command and detailed for a term not exceeding three years; brigade commanders have neither general staffs nor orderly officers, but aides-de-camp are detailed to the brigade (not to its commander) by the Minister of War. The number of orderly officers and aides-de-camp is about 100. There are, therefore, about 370 officers on general staff duty.

* Austria-Hungary also has a military orphan asylum at Fischau, 4 lower military realschools at St. Pölten, Gläns, Eisenstadt, and Koscchau, a higher military realschool at Mährisch-Welaskirchen, 12 infantry cadet schools, 1 cavalry, 1 artillery, 1 engineer, and 1 pioneer school, the military academy (for cavalry and infantry) at Wiener-Neustadt, the technical military academy (for artillery, engineers, and pioneers) at Vienna, the higher artillery and engineer course, and the field officers' course, besides regimental and other schools for soldiers and schools of practice and application for officers.

* Saxony has its own cadet corps, and Bavaria has its own cadet corps, war school, artillery and engineer school, and war academy.

Great Britain.—It can scarcely be said that there is any British military staff as a separate and distinct corps of officers. The British War Department is dual, embracing both political and military officers. Command and administration are separate. The War Office and the Horse Guards, long distinct, were united into one department by act of Parliament in 1870. The general commanding-in-chief was thus brought into the War Office, which is under the Secretary of State for War. The latter is alone responsible to Parliament, while the former is subordinate, and can exercise his authority only under approval of the secretary; in practice, however, the secretary concerns himself with the army estimates only, and exercises merely a general control over the general-in-chief, who has immediate direction of all military affairs; two Under-Secretaries of State are placed immediately under the Secretary of State for War—the parliamentary secretary and the permanent under-secretary. The first retires at a change of ministry, and assists his chief in Parliament; the second does not sit in Parliament; he has the real direction of business, and does not go out with the ministry.

The military affairs come under the military department of the secretary, and are arranged under several bureaus: (1) That of the military secretary, dealing with matters relating to officers personally, such as orders, leaves of absence, detail to staff-duty, etc.; (2) that of the adjutant-general of the army, concerned with all questions of recruitment, organization, mobilization, instruction, and discipline; (3) that of the quartermaster-general, comprising clothing, equipment, quartering, food, forage, and transportation; the quartermaster-general has control of the commissariat and transport corps and the pay department; (4) that of the inspector-general of engineers and fortifications; (5) that of the director-general of artillery; (6) that of the director of military intelligence; (7) the director of military education, surgeon-general, chaplain-general, and principal veterinary surgeon.

The yearly army estimates and administrative matters are under the financial department, at the head of which is the financial secretary (a civil officer), under whom are four bureaus: (1) The accountant-general (specially charged with the army estimates); (2) the director of contracts; (3) the director of clothing; (4) the director of ordnance-factories.

There are two branches of general staff service in England, viz., the staff of the commands and the personal staff. The former comprises those officers who form the staff proper of general officers, those on topographical work, and those sent on special missions. The staff of a general officer is divided into two distinct bureaus, the adjutant-general's and the quartermaster-general's. In brigades a single officer, called brigade-major, combines the duties of both.

The personal staffs of generals comprise aides-de-camp and military secretaries.

The officers of the staff are taken exclusively from the regular army, and should have spent two years at the staff college or passed the final examination for graduation at that college. A condition of eligibility to examination for admission to the staff college is five years' service in the army. Every officer who presents himself for the graduating examination at Sandhurst Staff College (see MILITARY ACADEMIES) must have had seven years' service.

Officers on staff duty generally serve but five years, after which they return to their regiments and are not again available for at least two years.

United States.—In the U. S. there is no general staff properly so called, but (as in Great Britain) some of the duties of this body are performed by officers of certain departments or by officers of the line temporarily detailed. The so-called staff departments are (1) the adjutant-general's, comprising 1 brigadier-general, 4 colonels, 6 lieutenant-colonels, and 6 majors, their principal duties being the ordinary routine of office-work, the wording and issue of the orders of commanding generals, and in the war department all matters relating to recruitment; (2) the inspector-general's (1 brigadier-general, 2 colonels, 2 lieutenant-colonels, and 2 majors), their duties consisting in inspecting the various posts, garrisons, military schools, and military departments of colleges to which officers are detailed, and the money accounts of disbursing officers; (3) the quartermaster's department (1 brigadier-general, 4 colonels, 8 lieutenant-colonels, 14 majors, and 30 captains), whose duties consist in constructing and repairing quarters and other public buildings, roads, etc., furnishing transportation and supplying fuel, forage, clothing, and material; (4) the subsistence department (1 briga-

dier-general, 4 colonels, 3 lieutenant-colonels, 8 majors, 12 captains), furnishing supplies of food (principally the ration), and certain other articles; (5) the judge advocate-general's department (1 brigadier-general, 1 colonel, 3 lieutenant-colonels, and 3 majors), who attend to questions of law and assist in revising charges and court-martial proceedings; (6) the medical department; (7) the pay department; (8) the Corps of Engineers, part of the line in European armies, but forming a closed corps in the U. S., recruited exclusively from the highest graduates of the military academy, mainly employed in time of peace on river and harbor work, a few in charge of repairs to forts or serving with the battalion of engineers, and one on the staff of the commander of each military department in the country; (9) the ordnance department (corresponding to the construction branch of European artilleries), employed in the various arsenals, work-shops, and gun-foundries, one on the staff of each department commander; (10) the signal corps; (11) the post chaplains. The chiefs of these departments, together with a certain number of officers of each, constitute a kind of staff to the Secretary of War and the general of the army. An intelligence bureau has been organized at the War Department. Each military department commander usually has one officer of each staff department on his staff: quartermasters, commissaries, and surgeons are also located in the large cities in charge of dépôts, etc. Each department commander has also his personal aides—a major-general 3, a brigadier-general 2.

Each regiment has also a regimental staff, comprising the adjutant and quartermaster of the regiment, detailed from the lieutenants for four years. Each post, moreover, has a post adjutant and a post quartermaster and commissary, detailed by the commanding officer from the lieutenants of the post.

For further information consult von Schellendorf, *Duties of the General Staff*; Rau, *L'état militaire des puissances étrangères* (1891); von Löbell, *Jahresberichte über die Veränderungen und Fortschritte im Militärwesen*; and L. Beaugé, *Manuel de législation, d'administration et de comptabilité militaires* (1892).

Revised by JOHN P. WISSE.

Staffeldt. ADOLF WILHELM SHACK, von; poet; b. on the island of Rügen, Germany, 1769; studied in the military academy at Copenhagen, and entered the Danish army. In 1791 resigned, and studied law, archaeology, and the history of art at Göttingen, after which he spent several years in travel. In 1800 he returned to Denmark, and held important Government positions there until his death in 1826. His earliest collections of poems (1803 and 1808) attracted little attention at the time of their appearance, and on account of their depth of thought and frequent obscurity of language they have never won general popularity. Unlike Oehlenschläger, Staffeldt continued to be strongly influenced by German romanticism. Among his later works are the romances *Troubadouren*; *Trende Nætter* (Three Nights); *Roserne* (The Roses); and *Indvielsen* (The Consecration). See his *Collected Poems* (2 vols., Copenhagen, 1843). D. K. D.

Stafford: county town of Staffordshire, England; on the Sow; 29 miles N. N. W. of Birmingham, and 133 N. W. of London (see map of England, ref. 9-G). Among the churches are St. Mary's, restored by Sir G. Scott in 1845, and St. Chad, originally of Saxon origin, restored 1855-58. Shoemaking is carried on. Stafford returns one member to Parliament. Pop. (1891) 20,270.

Stafford, WILLIAM HOWARD, Viscount: statesman; b. in England, Nov. 20, 1612; was brought up a Roman Catholic; married a sister of Baron Stafford, to whose title Howard succeeded. During the civil war Stafford adhered to the royal cause, but after the Restoration often opposed in the House of Peers the measures of the court; was intimate with Shaftesbury, and was, on account of his religion, selected by the infamous Titus Oates as one of his victims. Accused of participation in the "Popish plot" by Oates in his first examination before the House of Commons, Stafford surrendered himself on the following day, and was committed to the Tower with four other accused noblemen Oct. 30, 1678. On Nov. 30, 1680, his trial for high treason was begun before the House of Lords, Sir Heneage Finch (afterward Earl of Nottingham) presiding as lord high steward. Stephen Dugdale and one Turberville, the chief witnesses, swore that Stafford had offered them rewards to participate in a conspiracy against the life of the king, and Bedloe, Dangerfield, and Denis offered confirmatory testimony.

Stafford defended himself with spirit, but he was convicted Dec. 7, by 25 votes against 31, four of the Howard family being of the majority. Stafford was executed on Tower Hill, Dec. 29, 1695, protesting his innocence in terms which carried great weight with the spectators. His widow was committed to prison, and his eldest son, Earl of Stafford, by James II. (1688), but the title became extinct on the death of his fourth son in 1792. The attainder was reversed by act of Parliament in 1694, and Sir George William Jennings was recognized as Baron Stafford in 1825.

Revised by F. M. COZBY.

Staffordshire: a west midland county of England; area, 1,160 sq. miles. The central part of the county is low and undulating, but in the north and the south the ground rises and the surface becomes hilly. The soil is generally cold, clayey, and not very productive. The coal-fields are very rich in the northern and eastern parts of the county; iron, copper, and lead are found, together with marble, freestone, and an excellent potter's clay. With respect to its manufactures, chiefly china, earthenware, and iron, this county is the third in rank in England. Seven members are returned to Parliament. Pop. (1891) 1,083,273.

Stafford Springs: borough; Talbotton, Conn.; on the W. H. Hartford river, and the Central Vt. Railroad; 30 miles N. by W. of Williamstown, 30 miles N. of New London (for location, see map of Connecticut, ref. 7-1). It contains manufactures of wooden and iron goods, Congregational, Methodist Episcopal, Protestant Episcopal, and Roman Catholic churches, high and graded schools, public library (founded in 1874), a national bank with capital of \$30,000, a savings-bank, and a weekly paper. Mineral springs add to the attractions of the place as a summer resort for invalids and pleasure-seekers. Pop. (1880) 1,081; (1890) 2,323.

Known as "Papa."

Staff-iron Family: See SPINULE-FREE FAMILY.

Stag, or Red Deer: the largest deer of Europe, the *Cervus elaphus*, a species much resembling the American wapiti. The male is called the *hart*, the female the *hind*, and the young the *calf*; the male under three years is called a *brocket*; under four, a *spotted*; under five, a *staggyrd*; and under six, a *stag*; so that strictly in sporting parlance, a stag is a red deer five years old. At six years he is a *hart of ten*, and when seven years old he is a *hart crowned*, and is considered fair game. The stag is distributed over the greater part of Europe, and is found in Northern Asia as far as the Lena and Lake Baikal. It inhabits Kaimoor, in England, and the Highlands of Scotland. Its horns are lofty and branching. In summer it is yellowish-brown; in winter, reddish-brown; the color deepens much with age, and in winter the old stags are nearly black. The flesh is inferior to that of the fallow deer. Revised by F. A. Lucas.

Stag-beetle, or Horn-bug: any one of several large beetles of the family *Lucanidae*, remarkable for the great size of the head and for the large horn-like mandibles. *Lucanus dama* of the U. S. is a well-known inhabitant of decaying wood, piles of chips, etc., and is capable of inflicting a severe bite. *L. cervus* is European.

Stage: See THEATER.

Stage-coach: See CARRIAGES.

Staggers: a popular name for several diseases of horses and sheep. Blind staggers in horses is a sort of epilepsy; mad staggers, an inflammation of the brain; grass staggers, an acute and dangerous gastritis. The treatment of the first is by setons about the head, but the disease is incurable. The second usually resolves treatment by means of blisters, cathartics, and thorough bleeding. The last-mentioned disease calls for active emetics and good-sized doses of calomel and opium. Staggers in sheep is caused by larvae of *Oedraea* in the nostrils; they may sometimes be removed by blowing into the nostrils snuff mixed with whisky.

Staghound: a large, rough-haired dog, much like the greyhound in general build, although somewhat heavier. It is strong, swift, and fearless, and the rival of the bloodhound in powers of scent. It is supposed to be a cross-breed of the bloodhound and the greyhound, and is used in Europe for hunting the stag, and, to some extent, in the western parts of the U. S. for hunting antelope. F. A. L.

Stagira [= Lat. = Gr. *Σταγίρα*]: town of Chalcidice, in Macedonia. It was a colony from Athens, but fell into decay during the Peloponnesian war. It was the birthplace of Aristotle, and in honor of his great tutor Alexander restored the city, but its prosperity was merely temporary.

Stagelle, Aristotle the: See ARISTOTLE.

Stagnellius, Jan. JAMES: poet; b. in Glesdina, Sweden, Oct. 14, 1738. Although at first strongly influenced by Phosphorism (see SWEDISH LAYMANS) and never entirely freeing himself from its obscurity, Stagnellius developed a style and view of life quite his own. All his works are treatises, in one form or another, of the different aspects of mysticism, and in these speculations he goes to the furthest extreme. In some of his aspects he has not happily been compared to Shelley. Among his works are *Walden den store* (1817); *Lilje i Svanen* (Lilies of Swans, 1821), his most characteristic collection of poems; *Martyrerna* (The Martyrs, 1821), his best drama; and *Durchskärningen* (The Sacrament, 1822). D. Apr. 13, 1823. His collected works were published in 1867-68 (11 vols., Stockholm).

D. K. DOOK.

Stahl, FRIEDRICH JULIUS: jurist; b. in Munich, Jan. 18, 1802, of Jewish parents; embraced Christianity in 1839; studied law at Würzburg, Heidelberg, and Erlangen; was appointed Professor of Jurisprudence in 1832 at Ratisbon, and in 1840 at Berlin. His specialty was the philosophy of law, and in his system he was a disciple of Schelling. Assuming that human reason is incapable of arriving at a positive conception of truth by itself, he deduced the ideas of state, government, etc., from the doctrines of Christian revelation, and bases the authority of officials and the obedience of citizens on a divine ordinance. As a member of the upper house of the Prussian Diet he became the leader of the feudal and aristocratic party during the period of reaction which followed the abortive revolution of 1848 in Berlin. D. at Brückmann, Bavaria, Aug. 10, 1881. His principal works are *Philosophie des Rechts* (4 vols., 1830); *Entwurf des Christlichen Staats* (1847); *Was ist Revolution?* (1833).

Stahl, GEBR. KASER: chemist and physician; b. at Ansbach, Bavaria, Oct. 31, 1800; studied medicine at Jena; was appointed physician to the Duke of Weimar in 1837, Professor of Medicine at the University of Halle in 1864, and physician to the King of Prussia in 1878. D. in Berlin, May 14, 1874. He invented a theory of phlogiston which was generally adopted, and considered valid up to the time of Lavoisier. (See CHEMISTRY.) His principal works are *Experimenta et Observationes Chemicae* (1731) and *Theoria Medica Vera* (1707).

Stahr, ADOLF WILHELM THOMAS: author; b. at Prenzlau, Brandenburg, Prussia, Oct. 22, 1805; studied classical languages and literature at Halle; was appointed professor at the gymnasium of Oldenburg in 1836; settled in 1832 at Berlin, where he married the authoress Emily Lewald in 1855. He was a very prolific writer; his numerous books and articles for periodicals treat subjects of antiquity and modern times, history and art, critically and in a descriptive manner. Some of his works have been translated into English, as, for instance, *Troja, oder Kunst, Künstler, und Kunstwerke der Alten* (2 vols., 1854-55), in *The Crayon* (New York, 1858-59); and his somewhat superficial but cleverly written biography of Lessing, *G. E. Lessing, sein Leben und seine Werke* (2 vols., 1850), by Prof. E. F. Evans, of Michigan University (Boston, 1866). He wrote the text to Kaulbach's *Goethe's Gallerie* (part I, Goethe's *Frauenthalten*). His *Oldenburgische Theaterschau* (2 vols., 1845) drew great attention to the stage of Oldenburg. D. at Wiesbaden, Oct. 9, 1876.

Revised by JULIUS GORDON.

Staigg, RICHARD MURRELL: painter; b. in Leeds, England, Sept. 17, 1817; removed to the U. S. in 1841; became a mechanic at Newport, R. I., where he took lessons in painting from Washington Allston and Jane Stuart; became eminent as a miniature-painter, a branch of art which he subsequently relinquished for genre-pictures and compositions. Among his best productions are *The Crayon-scraper*, *Cat's Cradle*, *Knitting*, *The Love-letter*, *The Soldier's Grimoire*, and *News from the War*. D. at Newport, R. I., Oct. 11, 1881.

Stained Glass: See GLASS.

Stainer, Sir JOHN: composer and organist; b. in London, June 6, 1840; studied entirely in England; entered the choir of St. Paul's Cathedral when seven years of age, remaining until his voice broke in 1856, playing the organ on occasion. He occupied several positions as organist till 1872, when, on the resignation of Sir John Goss, he was appointed organist of St. Paul's, and remained until 1888, when he was obliged to resign on account of failing eyesight. In that year he was knighted, and on the death of

Sir F. A. Gore Ouseley in 1889 was appointed to succeed him as Professor of Music in Oxford University. His degrees and honors are as follows: Mus. Bac. Oxon. 1859; B. A. 1863; Mus. Doc. Oxon. 1865; M. A. 1866; Hon. Mus. Doc., Durham, 1885; Chevalier of the Legion of Honor 1878. He is also honorary member of the Royal Academy of Music and honorary fellow of the Tonic Sol-Fa College. His compositions are chiefly sacred and include three sacred cantatas, *The Daughter of Jairus*, Worcester festival, 1878; *St. Mary Magdalene*, Gloucester festival, 1883; *The Crucifixion*, 1887; the oratorio *Gideon*, an early work; and many church anthems and services. He has also written several theoretical works, a treatise on the *Music of the Bible*, and a *Dictionary of Musical Terms*. D. E. HERVEY.

Stair, JAMES DALRYMPLE, Seventh Baron and First Viscount: jurist; b. at Drummurichie, Ayrshire, Scotland, in May, 1619; graduated M. A. at the University of Glasgow 1637; obtained a commission as captain in the Scottish army, but at the age of twenty-two accepted the professorship of philosophy at Glasgow, which he held till 1647; was admitted an advocate at the Scottish bar Feb., 1648; was secretary to the commissioners sent to treat with Charles II. at Breda 1649-50; became a lord of session July 1, 1657; was knighted by Charles II. 1660, and confirmed as lord of session Feb. 13, 1661; resigned office 1663 from unwillingness to subscribe the declaration against the Covenants of 1638 and 1643 appended to the oath of allegiance, but his resignation was declined, and he was made a baronet June, 1664; became lord president of the court of session Jan., 1671; refused to take the new test oath, and was removed from his offices 1681; published in that year his *Modus Litigandi* and *The Institutions of the Law of Scotland*—a work which has been called the Scottish Blackstone; becoming involved in a dispute with Claverhouse he was forced to flee to Holland Oct., 1684; prepared there his *Decisions of the Lord of Council and Sessions 1661-81* (Edinburgh, 2 vols. folio, 1683-87); published at Leyden his Latin treatises *Physiologia Nova Experimentalis* (1686); received a pardon 1686; accompanied the Prince of Orange to England 1688; was reinstated in the presidency of the court of session, and made Viscount Stair Apr. 21, 1690; published an *Apology* for his political course (1690) and a *Vindication of the Divine Perfections* (1695). D. in Edinburgh, Nov. 29, 1695.

Stair, JOHN DALRYMPLE, First Earl of, better known as the Master of Stair, son of Viscount Stair: b. in Scotland about 1648; was admitted as advocate in the court of session Feb., 1672; was one of the council for the Earl of Argyll on his trial for treason 1681; was twice imprisoned between 1681 and 1685; was received into favor on the accession of James II., by whom he was made lord advocate 1685 and lord of session and lord justice clerk 1686; supported the Revolution 1688; was a leading Scottish member of the Convention Parliament Mar., 1689; was one of the three commissioners sent to London to offer the crown of Scotland to William and Mary May, 1689; was reappointed lord advocate 1690; became one of the Secretaries of State for Scotland 1691; plotted the massacre of GLENCOE (q. v.), Jan., 1692, for which act he was dismissed from office 1695 and censured by a parliamentary committee of inquiry, but was never subjected to prosecution; succeeded his father as Viscount Stair in 1695; was sworn of the privy council on the accession of Anne 1702; was created Earl of Stair Apr. 8, 1703; was one of the commissioners who negotiated the treaty of union between Scotland and England 1706, and was mainly instrumental in passing that measure through the Scottish Parliament. D. Jan. 8, 1707. See *Graham, Stair Annals* (1875).

Stair, JOHN DALRYMPLE, Second Earl of: soldier; b. in Edinburgh, July 20, 1673; had the misfortune in boyhood to kill his elder brother by the accidental discharge of a pistol; educated at the University of Leyden, where he was distinguished for scholarship; entered the army as a volunteer under the Earl of Angus, and commanded the Cameronian Regiment at the battle of Steinkirk 1692; was aide-de-camp to the Duke of Marlborough at Venloo and Liège 1702; succeeded to the earldom 1707; obtained command of the Scots Greys; was commissioned general; distinguished himself at Ramillies and Oudenarde 1706, and at Malplaquet 1709; withdrew from the army in 1711; became privy counselor and representative peer for Scotland 1714; was appointed commander-in-chief of the forces in Scotland on the accession of George I. (1715); was ambassa-

dor to France 1715-20; resided on his estate at New Liston, Scotland, and devoted himself to scientific agriculture 1720-40; was made field-marshal commander-in-chief of British forces in Flanders and ambassador extraordinary to the States-General of Holland 1741; won the battle of Dettingen June 27, 1743, and subsequently filled several important public posts under the Walpole administration. D. in Edinburgh, May 9, 1747. The *Memoirs of the House of Dalrymple*, published from family papers (1876), contains important historical data.

Stalactites [from Gr. *σταλακτός*, dropping, oozing out in drops, deriv. of *σταλάω*, to drop]: icicle-like masses of lime, limonite, chalcidony, pyrites, etc., attached to the roofs of caverns; they are formed by the evaporation of water holding these substances in solution. Stalactites sometimes form columns reaching from floor to roof of high chambers; sometimes they imitate curtains, waterfalls, etc., and constitute notable features in some of the most famous caves. The name *stalagmite* (Gr. *στάλαγμα*, a drop) is given to accumulations of material of the same nature as stalactites, but deposited on the floors of caverns. This sometimes forms continuous sheets over the surface, sometimes rises into columns, which meet and blend with the stalactites above. Stalactites are often tubular, and, indeed, generally begin to form as tubes, since the solid matter held in solution by a drop of water when precipitated by evaporation forms a ring at the base and outside of the drop.

Revised by ISRAEL C. RUSSELL.

Staley, Cady, Ph. D., LL. D.: civil engineer and educator; b. at Scotch Bush, Montgomery co., N. Y., Dec. 12, 1840; educated at Union College. He has been in engineering work on the Central Pacific Railroad, Professor of Civil Engineering in Union College 1867-86, and dean of the faculty, and since 1884 president of the Case School of Applied Science in Cleveland, O. He is the editor of recent editions of Gillespie's *Surveys and Roads and Railroads*, and (with G. S. Pierson) author of *The Separate System of Sewerage* (1886).

Stalker, JAMES, D. D.: minister; b. at Crieff, Perthshire, Scotland, Feb. 21, 1848; was educated at the University and New College of Edinburgh, Universities of Berlin and Halle; minister of St. Brycedale Free church, Kirkcaldy, 1874-87; since 1887 of St. Matthew's, Glasgow. He was Cunningham fellow at New College 1874, and Lyman Beecher lecturer at Yale Theological Seminary 1891. Dr. Stalker has published *The Life of Jesus Christ* (Edinburgh and New York, 1879; many later editions; translated into several foreign languages); *The New Song: Sermons for Children* (1883); *Life of St. Paul* (1884; several later editions); *Imago Christi* (1889; 7th edition, 1894; translated into Norwegian, German, Japanese, and other languages); *The Preacher and his Models*, Lyman Beecher lectures (New York, 1891; 2d ed. 1892); *Men and Morals* (1892); *The Four Men and Other Chapters* (1892); *The Trial and Death of Jesus Christ* (1894). C. K. HORT.

Stalwarts: a name applied to the section of the Republican party that in 1881 opposed the administration of President Garfield. The quarrel arose from the latter's appointment of a collector of the port of New York in opposition to the wishes of Conkling and Platt, the Senators from that State. The party was divided between the Stalwarts and "Half-breeds," as the friends of the administration were called, and this dissension helped the Democrats to win in the election of 1884. See *REPUBLICAN PARTY*.

Stamboul, *staam-bool*: the wealthiest, most populous, and important of the territorial divisions forming the city of CONSTANTINOPLE (q. v.), called Istamboul by the Ottomans. Stamboul is a triangular-shaped promontory, projecting eastward toward the Bosphorus from the mainland, and included between the Golden Horn and Marmora. It comprises thirteen of the fourteen *regions* or *climata* of the Nova Roma of Constantine. E. A. G.

Stamen [= Lat., liter., warp in an upright loom, thread, fiber, deriv. of *sta're*, stand; cf. Gr. *στήμων*, warp (in an upright loom), deriv. of *στήνω*, stand]: the pollen-bearing organ in plants. Morphologically it is a leaf, upon which one or more pollen-sacs (spore-sacs or sporangia) are produced. On account of its special function it is rarely an expanded structure, although it is so in water-lilies, cannas, and some other cases (Fig. 1, a). In its usual form (Fig. 1, b) the slender stalk (*filament*) is surmounted by the pollen-sac (*anther*), which at maturity contains many loose cells, the

POLLIN. (g, h). In *Thalictrum* (g) several pollen-sacs are attached to the under side of the petiole stamen, while in *Gentiana* (h)



FIG. 1.—Stamen: a, waterlily; b, anemone; c, *Thalictrum*; d, *Gentiana*; e, *Pinks*; f, *Allium*; g, *Tradescantia*; h, *Thalictrum*; i, *Thalictrum*; j, *Anemone*; k, *Anemone*.

the two sacs are attached by the tips only. In *Pinks* (e) and the pinks the sacs are attached at the back of the leaf-like stamen. Other forms are shown in f to k, the most curious being found in *Anemone* (j), where the sacs are long and spirally twisted.

When young, the pollen-sacs are composed of uniform tissue, but soon certain cells in vertical rows become differentiated (Fig. 2, b, c), and eventually by subdivision produce the pollen-cells. At maturity there may therefore be one, two, or four cavities (Fig. 2, a) containing pollen, and this is set free by the longitudinal rupture of the anther (Fig. 1, b + k), or by the opening of a terminal or lateral pore (Fig. 1, i).

When associated with the petal in the same flower the stamens are usually below it (hypogynous), but by the adhesion of the floral parts they may be above it (epigynous). Normally they are separate from one another, but in some cases they are more or less united by their filaments, as in peas and beans, or even by their anthers, as in the *Compositae*. See *FLOWER*.

CHARLES E. DODGE.

Stamford: town and city; Fairfield co., Conn.; on Long Island Sound, Mill river, and the N. Y., N. H. and Hart. Railroad; 34 miles N. E. of New York, 78 miles S. W. of Hartford (for location, see map of Connecticut, ref. 13-D). The main part of the town lies in a valley, with hills on three sides and the Sound on the S. The harbor has been improved by the U. S. Government and is suitable for vessels of large draught. There is a daily steamboat line to New York. At Shapton Point, on the shore, are fine cottages, hotels, and other public resorts, and the Stamford Yacht Club building. The city comprises four-fifths of the population of the town, and has an excellent water-supply from Trinity Lake, sewerage system, paid police and fire departments, well-organized public-school system with high-school building erected in 1895, several private boarding and day schools and seminaries, a hospital and home maintained by St. John's church (Protestant Episcopal), the Ferguson Library, 2 national, a State, and 3 savings-banks, electric-light and railway plants, and a daily and 3 weekly

newspapers. The town and city have a combined bonded debt of \$600,000. There are extensive lumber-mills, a wood-mill, a pottery, and manufacturing of boots, builders' hardware, building appliances, post-office equipments, glass, stoves, shoes, patent medicines, chemicals, straw hats, carriages, and other articles. Stamford was settled in 1641; had its name changed from the Indian, *Hippowam*, in 1642; and was incorporated as a borough in 1830 and as a city in 1890. The assessed valuation of city property in 1895 was \$17,000,000. Pop. (1880) 11,209; (1890) 15,700; (1895) estimated, 19,000. (ROBERT WHITAKER.)

Stammering [from O. Eng. *stamian*, *stamian*, *stammering*; cf. O. H. Germ. *stammeln*; Germ. *stammeln*, whose root appears in Goth. *stammus*, *stammering*, in Germ. *stammeln*, make to halt (*stammeln*), and in *engsteln*, violent, unbroken]; an affection of the faculty of speech characterized by irregular, imperfect, or spasmodic action of the muscles concerned in articulation. It is in reality a choreiform, often hysterical, condition of the muscles concerned, a defective power of co-ordination. It may be manifested under two somewhat different forms. In the one there is a difficulty in beginning the enunciation of words, and this is shown especially in regard to those words which begin with what are called the "explosive consonants" (b, p), and which require the sudden opening of the lips. In the other form the word is begun, but after the enunciation of a syllable there is a spasmodic, and for a time uncontrollable, repetition of the same syllable. To this variety the term *stuttering* is sometimes applied. Stammering is one of the mimic diseases, and may be acquired by cohesions in speech or by association with others similarly affected, or even by mocking such persons. In the majority of cases it disappears after the attainment of adult age, probably in consequence of the constant efforts of the subject to improve his habit of speaking. It is generally increased by emotional disturbances, especially fright and apprehension, and is much mitigated, and often cured, by the patient acquiring confidence in himself, never attempting to speak in a hurry or when the chest is empty of air, or by reading measured sentences slowly and with deliberation. Stammerers never have any difficulty in singing, for they know that a certain definite manner is to be observed, and this gives them the confidence they require. The affection is sometimes permanently removed in time by the patient performing some trifling muscular action contemporaneously with the enunciation of the words over which he stumbles. Thus he can sometimes prevent the fault by moving a finger at the very instant that he begins to utter the word. Revised by W. PARRER.

Stamp Acts: laws requiring that stamps purchased from the government be placed on certain legal documents. In the history of the British colonies in North America the term Stamp Act refers to a law passed by the British Parliament Mar. 22, 1765, "for granting and applying certain stamp duties and other duties in the British colonies and plantations in America." It took effect from Nov. 1, 1765, but was the occasion of such excitement, protests, and open resistance in most of the colonies that it was repealed Mar. 18, 1766, and a bill of indemnity for those who had incurred penalties was passed June 6 of the same year.

Stamp-mill: See GRINDING AND GRINDING MACHINERY.

Stamps: official marks set upon things chargeable with some duty or tax, showing that the tax has been paid. These stamps may be either embossed, or printed separately and made adhesive by being gummed on the back. The British Government has long required the use of such stamps on checks, receipts, bank drafts, and legal documents of all kinds, and during the civil war in the U. S. (1861-65) a similar use of stamps was made for revenue purposes. Stamp duties were also levied during the same period on proprietary articles, incense matches, and a great variety of other commodities. Internal revenue stamps are used in the U. S. only for such articles as tobacco, snuff, cigars, ales, etc., and since 1894 for playing-cards.

Postage-stamps are also of two kinds: (1) those that are impressed on envelopes, newspaper wrappers, and post cards, and (2) adhesive labels. Their use is an evidence of prepayment of postage. Before their introduction it was the custom to take letters to the nearest post-office and prepay the postage or tax in cash; the postmaster then stamping such mail matter as prepaid. The introduction of the postage-stamp did away with this cumbersome method by enabling the corresponding public to purchase in advance the evidence of prepayment, and facilitated not only corre-

spondence, but also the work of the postal authorities by obviating the necessity for a separate handling of each piece of mail matter.

The first introduction of postage-stamps for regular issue took place in Great Britain on May 6, 1840, and was the result of the earnest efforts of Sir Rowland Hill, who had fought for three years in the House of Commons for postal reform. Prior to that time, James Chalmers, of Dundee, Scotland, had invented an adhesive label intended to be used as a postage-stamp, but he was unable to introduce his invention, and the real credit must remain with Sir Rowland Hill, who carried through successfully his scheme for the reduction of postage, and at the same time the introduction of evidences of prepayment. It is true that Sir Rowland Hill did not attach so much importance to the adhesive label as to prepaid envelopes, and his fame rests on the Mulready envelopes (engraved by W. A. Mulready), representing Britannia sending letters to all parts of the world; these were first placed on sale on May 6, 1840. The envelopes were received with ridicule throughout the United Kingdom, and were soon dropped out of use, the adhesive label taking their place.

It was in France that the first attempt was made to prepay letters by means of a cover, envelope, or band at a fixed rate. De Velay, master of petitions, was the inventor; the idea of cheap postage might also be ascribed to him, although it was only for the Paris local post. A postal system already existed in France and other countries, but no city had a delivery system. De Velay obtained in 1653 a special privilege from King Louis XIV. to establish a little post-office in Paris, and placed numerous boxes all over the city, which were to be emptied each day. He announced that in order to expedite the service his clerks would not receive any money, but that the letters must be accompanied by a ticket showing prepayment, which ticket must be attached to, wrapped around, or placed within the letter in such a manner that the clerk could easily remove it; when an answer was required the sender had to attach or inclose a second ticket. These tickets cost one sou (about a cent) each, and the principal office for their sale was at the palace. The postal system had some success as a curiosity, but it was in advance of its time, and, besides suffering from the indifference of the public, it was soon attacked by evil-wishers; the boxes were soiled, malicious people going so far as to put rats, mice, and even worse things into them, and the enterprise was soon abandoned.

Some collectors of postage-stamps accept certain letter-sheets stamped in the kingdom of Sardinia in 1818 and 1819. These stamps, however, represent the exact contrary of a postage-stamp, as they indicate the amount of tax paid by the writer for the privilege of sending his letter by other means than the regular postal service; this is a revenue tax, and not in any sense a postal tax.

The example of Great Britain was first imitated in the U. S., where the proprietors of local delivery companies began to sell postage-stamps to their patrons as early as the year 1842. The first one was the City Dispatch Post, owned by Alexander M. Greig, operating in the city of New York; in Aug., 1842, he sold the entire outfit to the U. S. Government, which retained his design for the postage-stamp, a three-quarter face portrait of Washington, changing the inscription to read "United States City Despatch Post." The Government of the U. S. was rather tardy in accepting the new system, and until 1847, when the first stamp for general use was issued, the postal service depended either upon the old cumbersome system or the individual enterprise of the postmasters in various towns, who, on their individual responsibility, had postage-stamps printed and sold to the patrons of their respective offices. This occurred in the following cities: Baltimore, Md. (1845); Brattleboro, Vt. (1846); Millbury, Mass. (1847); New Haven, Conn. (1845); New York, N. Y. (1845); Providence, R. I. (1846); St. Louis, Mo. (1845). It is of interest to note that before the introduction of postage-stamps in the U. S. the post-office authorities in large cities kept regular running accounts with all well-known merchants. Business houses sent their mail matter to the post-office daily, and the cost of postage was calculated by the clerks and charged up to the merchants, bills being rendered at the end of each month.

Among established governments, Brazil was the first to follow the example of Great Britain with an issue of stamps for general postal use. These appeared on July 1, 1843, and were of three values, 30, 60, and 90 reis; each

bore simply the numeral of value on an engine-turned groundwork. Postage-stamps were first issued by France on Jan. 1, 1849, in a set of two, bearing an allegorical head of Liberty; and by Belgium in Nov., 1849, in a set of two, with the portrait of King Leopold. Bavaria, which issued stamps in Nov., 1849, was the first of the many states and principalities which now constitute the German empire to adopt the new system; Prussia and Hanover followed in 1850, and Baden, Württemberg, and Saxony in 1851. The Princes of Thurn and Taxis, who for centuries had enjoyed the monopoly of the postal service in certain of the German states, issued their first stamps in 1852. These continued in use till 1868, or until the formation of the North German Confederation, which included all the states that employed the service of the Princes of Thurn and Taxis, with the addition of Prussia and Saxony. On the formation of the German empire in 1871 all the separate postal administrations, except those of Bavaria and Württemberg, were superseded by the service of the central Government.

The federal administration in Switzerland did not issue postage-stamps until 1850, but of the separate cantons Geneva and Zurich had issued them in 1843 and Basel in 1845. Most of the other prominent governments in Europe followed in rapid succession, but some were very slow in accepting the reform, as appears from the following list: Spain (1850), Italy (1851), Denmark (1851), Portugal (1853), Norway (1854), Russia (1857), Sweden (1858), Greece (1861), Turkey (1863).

In North America, Canada, New Brunswick, and Nova Scotia made their first issues in 1851, Mexico in 1856, and Newfoundland in 1857. In South America Brazil was followed by British Guiana in 1850, Chili in 1852, and Uruguay in 1856, while Ecuador waited until 1865, Bolivia until 1867, and Paraguay until 1870.

Every colony in Australia adopted the reform early in the fifties, while Mauritius, the Cape of Good Hope, and Natal were the first in Africa, Egypt being next in order in 1866, with a set of seven stamps bearing a representation of a pyramid. India in 1854 was the first government to issue postage-stamps in Asia, using the familiar portrait of Queen Victoria.

The processes employed for the manufacture of postage-stamps are extremely varied in character, every style of engraving and printing having been used in various parts of the world. Among them the most used are engraving on steel, on copper, on zinc, and on wood, surface-printing from steel, copper, and wood, and lithography. All early issues of postage-stamps were imperforate or with plain edges, until in 1848 Henry Archer, in London, invented a machine for perforating. The first experiments were in the nature of trials, and the device was not officially used until 1854, when Mr. Archer sold his device to the British Government.

The number of stamps issued by different countries, as well as the extremes, both high and low, of denomination, vary greatly. The U. S. enjoys the distinction of having had in regular use at one time a larger number than any other country. From 1873 to 1884, besides the regular issue for general use, which consisted of 13 adhesive stamps, 13 envelopes, and 2 wrappers, each department of the Government had its own series, with a total of 92 adhesives, 12 envelopes, and 2 wrappers; besides these there were 7 postage-due and 24 newspaper and periodical stamps. This enumeration does not take into account minor varieties of die or the different colors of paper used for the envelopes. The postage-stamps which have the lowest face value are the $\frac{1}{2}$ milésimo stamp of Cuba and Porto Rico and the $\frac{1}{2}$ centimo of Spain, each representing about $\frac{1}{100}$ th of a cent. These are used for local newspaper postage. The stamp of largest denomination is the £20 of South Australia, which is available for both postage and revenue purposes.

Overprinted Stamps, etc.—One of the most interesting developments of the use of postage-stamps is the means employed by postmasters in various parts of the world for providing a particular value the stock of which may have become exhausted. The usual method is to surcharge or overprint stamps of some other value with the new value intended to be given to the stamp, and the first instance of such practice appears in France in 1850, when, to supply the demand for a 25-centime stamp, to meet a newly established rate of postage, a quantity of 20-centime stamps, which had been printed by error in blue, were overprinted with the figures "25." These were not, however, placed in circulation, as a new supply of the desired value was prepared in time.



Philadelphia local delivery stamp. Blood & Co., 1841.

James M. Buchanan
5 Cents.

Baltimore, Md., 1846.



Brattleboro, Vt., 1846.



New Haven, Conn., 1845.



New York city carrier stamp, 1843.



Providence, R. I., 1846.



St. Louis, Mo., 1846.



Millbury, Mass., 1847.



Livingston, Ala. Confederate postmasters' stamps.



Victoria, Tex.



Anjouan (Johanna). Current type for all French colonial stamps.



Trinidad, 1852. Type used also in Barbados and Mauritius.



Barbados, 1892.



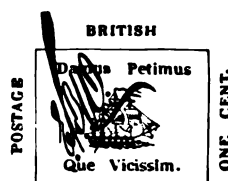
Afghanistan. Printed from ivory.



British Guiana, 1850. The plainest stamp.



Bolivar, Colombia, 1863. The smallest stamp.



British Guiana, 1856. The rarest stamp; only one known.



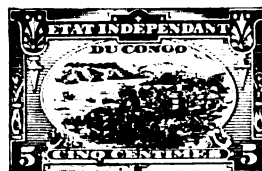
Korea, 1884. Used only one day.



Canada, 1851.



Cape of Good Hope, 1853. The first triangular stamp.



Congo, 1894. The handsomest stamp.



North Borneo, 1894. One of the handsomest stamps.



Spain, 1855. Type used for all Spanish colonies.



Great Britain, 1840. Mulready envelope, greatly reduced. The first stamp issued.



Hankow, 1893. One of the Chinese treaty-port issues.



Hawaii, 1851. One of the rarest stamps.

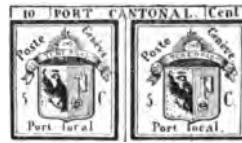
REPRESENTATIVE TYPES OF POSTAGE-STAMPS.



Basel.



Vaud.



Geneva.



Zurich.



Portuguese India. Type used for all Portuguese colonies.



Bavaria, 1849. The first German stamp.



Guadalajara, 1867. Issued during Mexican revolution.



New Caledonia, 1854. The worst engraved stamp.



Dominica, 1882. Stamp cut in half and surcharged.



Victoria, 1890. Unpaid letter stamp.



Obock, 1894. Camel post.



Portugal. Type introduced in 1871 and afterward used for all colonies.



Labuan, 1880. Stamp surcharged by pen and ink.



Surcharged stamps.



San Marino, 1894. Issued to celebrate the opening of a new palace.



Pacific Steam Navigation Co. Also used by Peru as an experiment.



Portugal, 1893. Jubilee issue in memory of Prince Henry the Navigator.



Salvador, 1892. Issued to commemorate the Columbus celebration.



Mauritius, 1847. One of the greatest rarities.



Brazil, 1843.



New Brunswick, 1851.



New South Wales, 1850. View of Sydney harbor.

REPRESENTATIVE TYPES OF POSTAGE-STAMPS.

As almost all such overprinted or surcharged stamps are made to supply a temporary want, in the nature of things they are rarer than the ordinary issues, and the increase in the number of collectors in recent years has opened this as a profitable field for speculation. Collectors and dealers in various parts of the world have succeeded in inducing postmasters and other officials to surcharge small quantities of stamps, supplying a few to the public for its correspondence and turning over the remainder to the speculator. In many such cases, the postmaster has participated in the profits. Another means of providing a temporary or provisional issue is to cut in half, in quarters, or in other sections stamps of a higher denomination, using the fraction to indicate such portion of the value of the original stamp as the fraction will represent. The most prolific producers of surcharged stamps have been the British and French colonial postmasters; but the Colonial Office in London has taken steps to stop further abuse by requiring responsible officials to maintain a sufficient supply of every value, imposing a fine in case this requirement should be neglected.

Memorial stamps.—Another interesting feature of the use of postage-stamps, and a direct result of the wide and varied interest manifested in all parts of the world, is the issue of a special kind of stamps on the occasion of any celebration or jubilee. The first issue of this description was made in Great Britain in 1867, on the fiftieth anniversary of the accession of Queen Victoria to the throne. The example was not followed for some years, but it has become fashionable to make such issues, and among them may be mentioned especially the Columbus issue made by the U. S. in 1892 to celebrate the discovery of America, and similar issues made by the Argentine Republic, Nicaragua, Salvador, Honduras, Venezuela, and Porto Rico in 1892 and 1893. All of these were legitimate issues, made to commemorate an event of real importance, but they have opened the eyes of other governments to the speculative value of such stamps, and 1894 saw a flood of jubilee and commemorative issues. Pivotal examples of such abuse are an issue in the republic of San Marino to commemorate the opening of a new palace, and an issue in Portugal to commemorate the 700th anniversary of the birth of St. Anthony of Padua, both of which are avowedly made solely on account of the profits to be derived from the sale to postage-stamp collectors.

Stamp-collecting.—The collecting of postage-stamps for amusement is said to have begun about the year 1850, or as soon as it was noticed that stamps of different colors, designs, and values were being received in mails from various parts of the world. The value and rarity of any particular specimen was not taken into account at all, and one frequently heard of exchanges made among collectors in years gone by of specimens, some of which are now worth hundreds of dollars, for others which still have no appreciable value. As the practice of collecting became more general, the study of postage-stamps became more and more minute, and the collector of early times can hardly realize the extent to which the study of postage-stamps has been carried. Every minute variation of paper, style of printing, perforation, gum, water-mark, etc., is considered as marking a different issue, and in some instances as many as fifty distinct variations of a single stamp are collected where in former years a single specimen would have been considered fully representative of the type.

Full recognition is also accorded to certain classes of adhesive labels which can not, in any sense, be justly termed postage-stamps, but in some instances represent the exact contrary. Prominent among these are the postage-due stamps issued by many countries for the convenience of the postal administration, and which indicate that the postage has not been prepaid, and the newspaper and periodical stamps issued by the U. S., which are never sold to the public but are used only as vouchers in the books of the Post-office Department.

The literature of philately (as the study of postage-stamps is called) embraces every section of the globe, and monthly and weekly journals are published even in India, China, Australia, and Africa. The chief books of reference are *A Catalogue for Advanced Collectors of Postage-stamps*, by the Scott Stamp and Coin Company (New York); *Catalogue de Timbres-Poste*, by J. H. Moens (Brussels); and the publications of the London (England) Philatelic Society. The leading philatelic journals are *The American Journal of Philately*, Scott Stamp and Coin Company, New York; *The London Philatelist* (The London Philatelic Society); *The Monthly Journal* (Stanley Gibbons, London); *Le Tim-*

bre-Poste (J. H. Moens, Brussels); *Der Philatelist* (Dresden); and *Illustriertes Briefmarken-Journal* (Göteborg, Scat, Leipzig).

Stanberry: city; Ramsey co., Minn., on the Omaha and St. L. Railway; 50 miles N. by E. of St. Joseph, 110 miles S. E. of Omaha, Neb. (for location, see map of Missouri, ref. 1-D). It is in an agricultural region, and contains a State bank with capital of \$20,000, a private bank, and a semi-weekly, a bi-weekly, a monthly, and 2 weekly periodicals. Pop. (1880) 1,307; (1900) 2,033.

Stanbery, Henry: jurist; b. in New York, Feb. 20, 1806; graduated at Washington College, Pennsylvania, in 1819; admitted to the bar in 1824; removed to Ohio and became attorney-general of the State in 1846; appointed Attorney-General of the U. S. in 1866 under the administration of President Johnson, for whom he acted as leading counsel in the impeachment trial of 1868; returned to the practice of his profession at Cincinnati. D. in New York, June 23, 1881.

Standbridge, John: teacher and author; b. at Heyford, Northamptonshire, England, about 1480; became perpetual fellow of New College, Oxford, 1491; first usher of the free school connected with Magdalen College about 1486, and afterward for many years its head master. D. about 1525. He was the first author of school-books that were extensively printed and used in England, though now so rare as to have become bibliographical curiosities. Among them were *The Decencies of Master Standbridge's new Makynge* (printed before 1500); *Encheyron Kelminum, sive Vocabularium* (of which at least eight editions were printed by Wynken de Worde); and *Vocabula Magistri Standbridge* (1510).

Staschle: See COS.

Standards: See RASHER and FLAG.

Standards of Value: See MONETARY STANDARDS.

Standard Time: See TIME.

Standish, Miles: soldier; b. in Lancashire, England, about 1584; claimed to be descended from the knightly family of Standish of Duxbury Hall, Lancashire; served on the Continent, probably with the English forces; became a captain; settled in Leyden, and, though not a member of the English Church or congregation, accompanied the Pilgrims of the Mayflower to New England 1620; lost his wife, Rose, during the first winter; is said by tradition to have employed his friend John Alden to negotiate his marriage with the fair Priscilla Mullins (see Longfellow's *Courtship of Miles Standish*), with the well-known result that Alden married the maiden; rendered important services to the colonists in preserving them from the open and secret hostilities of the Indians, having with his own hand killed at Weymouth (1620) Pocahont, an Indian chief who had planned a massacre; visited England as agent for the colony 1625, returning with supplies 1626; broke up the settlement at Merry Mount (see MORRIS, THOMAS) 1628; was one of the original proprietors and settlers of Duxbury, having given that name to the town in memory of the seat of his English ancestors; was for the remainder of his life either magistrate or a member of the board of assistants to the governor, and took part in the settlement of Bridgewater 1642. D. at Duxbury, Oct. 3 A. S., 15 S. S., 1656. He was of small stature and choleric temper, and possessed great energy and force of will. One of his swords and other relics are preserved in the Pilgrim Hall, Plymouth. A monument to his memory stands on the commanding eminence in South Duxbury, formerly called Captain's Hill, from having been the place of his residence. Many incidents of his career are given, with a partial genealogy of his descendants, in Justin Winsor's *History of Duxbury* (1849). Also see De Costa, *Footprints of Miles Standish* (Charlottesville, Mass., 1904).

Stand-pipe: a vertical cylindrical tower connected with a water-supply system to provide pressure and sometimes to serve partly as a storage-tank. Stand-pipes are made of wrought-iron or steel plates riveted together, and usually vary in diameter from 12 to 20 feet, although a few have been built 50 feet in diameter. The height depends upon the pressure required, and is usually from 60 to 150 feet, although some are nearly 250 feet high. Sometimes the upper part of the tower constitutes a tank supported by a frame, the water being carried to it by a pipe of much smaller diameter. A stand-pipe is used only in connection with a pumping system, and is most effective when placed near the pump.

The water is forced up against the head in the stand-pipe, and this in turn maintains the pressure throughout the pipe system. Stand-pipes are sometimes destroyed by wind or by accidents due to other causes. For an account of these, see a series of articles by Pence in *Engineering News* during 1884.

MANSFIELD MERRIMAN.

Stanfield, WILLIAM CLARKSON: landscape and marine painter; b. at Sunderland, Durham, England, in 1793; d. at Hampstead, May 18, 1867. He was a sailor in the British navy, became a scene-painter while still a young man, and taking up painting of landscape and naval battle scenes attained success and was elected a Royal Academician in 1835. Among his most celebrated works are *Battle of Trafalgar* (1836) and *Battle of Roveredo* (1851). W. A. C.

Stanford: town; capital of Lincoln co., Ky.; on the Lexington and East. Railway; 38 miles S. by W. of Lexington, 104 miles S. E. of Louisville (for location, see map of Kentucky, ref. 4-H). It is in an agricultural region, and contains woolen, flour, and grist mills, the Stanford Female College, a national bank with capital of \$200,000, a banking and trust company with capital of \$200,000, and a semi-weekly newspaper. Pop. (1880) 1,213; (1890) 1,885.

Stanford, CHARLES VILLIERS: composer; b. in Dublin, Ireland, Sept. 30, 1852; went to Leipzig to study in 1874, and then to Berlin, returning home in 1876. His compositions include several symphonies, much sacred music in large forms, the two oratorios *The Three Holy Children*, for the Birmingham festival of 1885, and *Eden*, for the Birmingham festival of 1891; three operas—*The Veiled Prophet*, produced at Hanover, Feb. 6, 1881, *Savonarola*, Hamburg, Apr. 18, 1884, and *The Canterbury Pilgrims*, for the Carl Rosa Company, Apr. 28, 1884; the cantata *Elegiac Ode*, 1884, being a setting of Walt Whitman's *Burial Hymn*; music to the Greek plays *Eumenides* and *Edipus Tyrannus*; and Psalm cl. in cantata form (1887). He received the degree of Mus. Doc. from Cambridge in 1883, succeeded Otto Goldschmidt as conductor of the Bach Choir in 1885, and was appointed Professor of Music in Cambridge University Dec., 1887, on the death of Sir George Macfarren. D. E. HERVEY.

Stanford, LELAND: capitalist and philanthropist; b. at Watervliet, N. Y., Mar. 9, 1824; received a common-school education; studied law, and was admitted to the bar in 1849; soon afterward removed to Port Washington, Wis., where he practiced law till 1852, when he went to California and engaged in gold-mining; settled in San Francisco in 1856, and entered into business with three of his brothers. He first appeared in politics as a delegate to the convention at Chicago in 1860 which nominated Abraham Lincoln for the presidency; was elected Governor of California in 1861, and in his inaugural address urged the importance of building the Pacific Railroad, and a company for that purpose, of which he was elected president, was formed on July 1 of that year. He superintended the construction of that part of the road that crossed the mountains, spending personally more than \$20,000,000 on a stretch of roadway of 100 miles. He became interested in the construction of other railways and in the development of the agriculture and manufactures of California. He was elected to the U. S. Senate as a Republican for the term 1885-91. With his wife he founded LELAND STANFORD JUNIOR UNIVERSITY (q. v.). D. at Palo Alto, Cal., June 20, 1893.

Stanhope, CHARLES MAHON, F. R. S., Third Earl Stanhope and Viscount Mahon: inventor; b. in London, England, Aug. 3, 1753; entered Parliament 1780; succeeded to the peerage 1786; was noted for his radical opinions; declared himself a republican, and laid aside the insignia of nobility; distinguished himself by his scientific researches; made many improvements in the art of printing, and in 1816 invented the Stanhope printing-press. D. in London, Dec. 15, 1816.

Stanhope, EDWARD: statesman; second son of the fifth Earl of Stanhope; b. in London, Sept. 24, 1840; educated at Harrow and Oxford; called to the bar 1865; entered Parliament 1874; Under-Secretary of State for India 1878-80; vice-president of the committee of council on education 1885; president of the Board of Trade 1885-86; Secretary of State for the Colonies under Lord Salisbury 1896; Secretary of State for War in his second administration 1887.

Stanhope, Lady HESTER LUCY: daughter of Charles, third Earl Stanhope; b. at Chevening, Kent, England, Mar. 12, 1776; was for ten years a member of the family of her

uncle, William Pitt, to whom she acted as confidential secretary until his death in 1806; received thereafter a pension of £1,200, upon which she resided some years in Wales; proceeded in 1810 to Syria; visited Jerusalem, Damascus, Baalbec, and Palmyra; acquired by her magnificent and singular ways of living the respect and veneration of the Arabs, who treated her almost as a queen; established herself in 1814 in the deserted convent of Mar Elias, 8 miles from Sidon, upon a crag of Lebanon; adopted the dress and style of an emir, having at her command a guard of Albanians, over whom she exercised an absolute authority; became a benefactress to political refugees and to the poor of every kind; exerted considerable political influence; and practiced astrology. D. at Mar Elias, June 23, 1839. Her *Memoirs* (3 vols., 1845) and *Seven Years' Travels* (3 vols., 1846) were published by her physician, Dr. Meryon.

Stanhope, JAMES, First Earl Stanhope: soldier; b. in Paris, France, in 1673; resided in Spain, where his father was minister during 1690-94; entered the army 1694; was wounded at the siege of Namur 1695; served in Flanders until the Peace of Ryswick; was elected to Parliament 1702; took part in the expeditions of 1702 and 1704 in Spain; was a brigadier-general at the siege of Barcelona 1705; major-general 1707; commander-in-chief in Spain, and took Port Mahon, Minorca, 1708; defeated the Spaniards at Almenara and Saragossa (Aug., 1710), but was forced to surrender to the Duke of Vendôme at Brihuega, Dec. 8, 1710; was appointed Secretary of State on the accession of George I., 1714; became First Lord of the Treasury and Chancellor of the Exchequer 1717; was created Viscount Stanhope of Mahon July 2, 1717, and Earl Stanhope Apr., 1718; was again Secretary of State, and took part in negotiating the Quadruple Alliance 1718. D. in London, Feb. 5, 1721.

Stanhope, PHILIP DORMER: See CHESTERFIELD.

Stanhope, PHILIP HENRY, Fifth Earl Stanhope, better known as Lord Mahon: statesman and author; b. at Walmer, Kent, England, Jan. 31, 1805; was a grandson of Charles, the third earl; graduated from Christ Church, Oxford, 1827; was elected to Parliament in 1830; was Under-Secretary of State for Foreign Affairs (the Duke of Wellington being the secretary) in the first Peel ministry 1834; was secretary to the board of control in the last year of the second Peel ministry 1845-46; supported the repeal of the corn-laws; introduced and carried the copyright act of 1842; was chosen president of the Society of Antiquaries 1846; was defeated at the parliamentary elections of 1852 in consequence of having voted with the protectionists against the modification of the navigation laws; succeeded to the earldom Mar. 2, 1855; founded the Stanhope prize for the study of modern history at Oxford 1855; was chosen lord rector of the University of Aberdeen 1858, and one of the six foreign members of the Academy of Moral and Political Sciences at Paris May 11, 1872. D. at Bournemouth, Hampshire, Dec. 24, 1875. Author of *History of the War of Succession in Spain* (1832); *History of England from the Peace of Utrecht to the Peace of Versailles, 1713-83* (7 vols. 8vo, 1836-53); *Essai sur la Vie du Grand Condé* (privately printed, 1842, and afterward appeared in English as *The Life of Louis, Prince of Condé*, 1845); *The Life of the Right Hon. William Pitt, with Extracts from his Unpublished Correspondence and MS. Papers* (4 vols., 1861-62; 4th ed. 1867); and a *History of England, comprising the Reign of Anne, until the Peace of Utrecht* (1870). Several fragments of his great work have been separately published, as *The Forty-Five, being a Narrative of the Rebellion in Scotland in 1745* (1851) and *The Rise of Our Indian Empire* (1858). Lord Stanhope edited, with notes, *The Letters of Philip Dormer Stanhope, Earl of Chesterfield* (4 vols., 1845); *The Memoirs of Sir Robert Peel* (2 vols., 1856-57).

Stan'islas Augustus, King of Poland: See PONIATOWSKI.

Stanislas Leszczyński. -lesh-tseñ'skée: King of Poland; b. at Lemberg, Galicia, Oct. 20, 1677, of one of the oldest and wealthiest families of the Polish nobility; held a high position at the Polish court, and was palatine of Posen when the war broke out between Charles XII. of Sweden and Augustus II. of Poland and Saxony. By the diplomatic negotiations which he carried on between Augustus and Charles he won the favor, and even the friendship, of the latter, and when, after the complete defeat of Augustus, Charles declared the Polish throne vacant, Stanislas was by his influence elected King of Poland in 1705. He was a noble character, and not without talent as a ruler, but after

the disease of Charles II. Poland in 1709 he was compelled to flee from Poland, where even his private fortune was confiscated. He joined his friends at Bender, and was in 1714 made governor of the duchy of Sandomierz, but after the death of Charles in 1738 he fled to France, and settled at Walsenburg in Alsace. In 1735 his daughter, Marie Louise, was married to Louis XV., and at the death of Augustus II. in 1763 he was re-elected King of Poland by French influence. Russia, however, was opposed to his restoration, and by the intervention of a powerful Russian army Augustus III. was raised to the Polish throne. After a desperate resistance at Danzig, where he was besieged by the Russians, he fled for the second time from his native country, but by the Peace of Vienna (1765) his family estates were restored to him, he received the duchy of Lorraine as a pension, and retained the title of King of Poland. He subsequently resided at Lunville or Nancy, where he held a brilliant court, gathered scientific men around him, founded splendid educational institutions, erected magnificent public buildings, and was generally called *Le Bien-aimé*. D. Feb. 24, 1796. Among his *Œuvres du Philanthrope bienfaisant* (4 vols., 1767) is a little essay, *Voix d'un Citoyen*, in which he predicts the division of Poland.

Stanislaw: town and railway junction in the province of Galicia, Austria; pleasantly situated between two branches of the Riksdal, in the center of a very fertile and well-cultivated plain; 75 miles S. E. of Lemberg (see map of Austria-Hungary, ref. 4-L). It has several good educational institutions and some manufactures and trade. Pop. (1900) 22,500.

Stanley, Arthur Penrhyn, D. D., LL. D.: clergyman and author; son of Bishop Edward and nephew of the first Lord Stanley of Alderley; b. at Alderley, Cheshire, England, Dec. 18, 1815; was a favorite student of Dr. Thomas Arnold at Rugby 1833-34; gained a scholarship at Balliol College, Oxford, 1834; took the Newdigate prize for his English poem, *The Oppress*, the Ireland scholarship, and a first class in classics (1837); a fellowship at University College 1838; and was tutor for twelve years, and examiner 1841; obtained the chancellor's Latin essay 1839 and the chancellor's English essay and the Elberton theological essay 1840; took orders in the Church of England 1840, affiliating himself with the Broad Church party; was selected preacher to the University of Oxford 1846-47; secretary to the Oxford University commission 1850-52; canon of Canterbury 1851-58, Regius Professor of Ecclesiastical History at Oxford 1856-64, and canon of Christ Church 1858-64; became chaplain to Prince Albert 1864, to Dr. Tall, Bishop of London, 1857, and to Queen Victoria and the Prince of Wales 1862; declined the archbishopric of Dublin 1863, was installed dean of Westminster Jan. 9, 1864, and was elected lord rector of the University of St. Andrews Nov., 1874. He made a tour in the East, visiting Egypt and Palestine, 1859-61, and again as chaplain and traveling companion to the Prince of Wales 1862; was prominent as a defender of broad-mindedness in the Church of England in the controversies connected with the celebrated *Essays and Reviews* (1861), Bishop Colenso's work on the *Pentateuch* (1863), and the later series of ecclesiastical prosecutions; was an active promoter of charitable, missionary, and educational enterprises and of biblical, antiquarian, and scientific researches, cultivated friendly relations with Dissenters to an extraordinary degree, and was much more popular with them than in his own church; and was for some years regarded as the leading representative of the progressive school of British theology. Dec. 29, 1868, he married Lady Augusta Bruce (1822-76), daughter of the Earl of Elgin, and the most intimate friend of the Queen. Her death broke his heart. He was a sensitive, highly gifted, poetic, spiritual, pure, and very picturesque personality. He was the author of many publications, which have passed through numerous editions and been reprinted in America. The chief of these are *The Life and Correspondence of Thomas Arnold* (1844); *Sermons and Essays on the Apostolic Age* (1847); *The Epistles of St. Paul to the Corinthians, with Critical Notes and Dissertations* (2 vols., 1855; 4th ed. 1876); *Historical Memorials of Canterbury Cathedral* (1855); *Sinai and Palestine, in connection with their History* (1856; 20th ed. 1874); *Lectures on the History of the Eastern Church* (1861); *New York, 1862; new ed.* (1870); *Lectures on the History of the Jewish Church* (2 vols., 1862; vol. II., 1865, vol. III., 1870); *Historical Memorials of Westminster Abbey* (1867; 4th ed. 1874); *Lectures on the History of the Church of Scotland* (1872); and *Christian Institutions* (1878). He was a voluminous con-

tributor to reviews and periodicals, furnished a valuable series of biblical biographies to Dr. William Smith's *Dictionary of the Bible*, and published many notable sermons. See the bibliography in Prothero's *Stanley* (vol. II., 375-382). He was a member of the Bible revision committee. In 1878 he visited the U. S., and in 1879 published a volume of addresses and sermons delivered there. D. in the sanctuary, Westminster, July 18, 1891, and was buried in Henry VII.'s chapel, Westminster Abbey. See his *Life* by H. K. Prothero (London and New York, 1894, 2 vols.).

Revised by S. M. JACKSON.

Stanley, David Edmund: soldier; b. at Chester, Wayne co., O., June 1, 1828; graduated at the U. S. Military Academy July 1, 1852, and was appointed brevet second lieutenant in the Second Dragoons. As a cavalry officer he served almost constantly on frontier duty, and in 1869 was complimented by Gen. Scott in general orders for a successful fight with the Comanches. On the outbreak of the civil war in 1861, having attained the rank of captain in the First Cavalry, he was sent to the field of active operations in Missouri, and on Sept. 29 was commissioned a brigadier-general of volunteers. He commanded the second division of the army of the Mississippi at the capture of Island No. 10; in the Corinth campaign, including the battle of Farmington and pursuit of the enemy upon the evacuation of Corinth; at the battles of Iuka (Sept. 19) and Corinth (Oct. 3-4). In Nov., 1862, he was appointed chief of cavalry of the army of the Cumberland, and the same month promoted to be major-general of volunteers, and was engaged in the battle of Murfreesboro, the Tullahoma campaign, including the action of Shelbyville and frequent minor engagements until Sept., 1863, when compelled by sickness to take a short leave. Returning to duty in November, he was assigned to the first division of the Fourth Army-corps, and held command of the corps from July, 1864, until the close of the war. In Sherman's invasion of Georgia he bore a conspicuous part in the severe and almost constant fighting from Dalton to Atlanta, being wounded at the battle of Jonesboro, Sept. 1. During the month of October his command was engaged in pursuit of Hood's army until the 27th, when it was detached from the army of Gen. Sherman to strengthen Gen. Thomas at Nashville, to whom was intrusted the duty of opposing an invasion of Tennessee. With numerous skirmishes the Fourth and Twenty-third Corps had arrived at Franklin, Tenn., Nov. 30, where, being closely followed by the enemy, a stand was made and a notable victory gained. During the fight Gen. Stanley was severely wounded. He was breveted lieutenant-colonel, colonel, brigadier-general, and major-general for gallantry in battle. On Feb. 1, 1866, he was mustered out of the volunteer service, and resumed his commission in the regular army, having become major of the Fifth Cavalry in 1863. He was appointed colonel Twenty-second Infantry July, 1866; in command of Yellowstone expedition 1872-73; of various military posts 1873-84; promoted to be brigadier-general U. S. army Mar. 24, 1884; commanded the district of New Mexico and the department of Texas until he was retired June 1, 1892.

Revised by JAMES MARVIN.

Stanley, Edward John, second Baron Stanley of Alderley: statesman; b. at Alderley Park, Cheshire, England, Nov. 13, 1802; studied at Eton; took the degree of B. A. at Oxford, 1823; entered Parliament as a Liberal 1831; was Under-Secretary of State for the Colonies 1833-34; patronage Secretary of the Treasury 1835-41; paymaster-general of the forces several months in 1841; Under-Secretary of State for Foreign Affairs in the Russell administration 1846-51; was raised to the House of Peers as Baron Eddisbury 1848; succeeded to his father's title 1859; held the conjoint offices of paymaster of the forces and vice-president of the Board of Trade a few weeks in 1852, and again 1853-55; was president of the Board of Trade 1855-56, and Postmaster-General 1860-65. D. in London, June 16, 1869.

Stanley, Frederick Arthur, G. C. B., Baron Stanley of Preston: b. Jan. 15, 1841; educated at Eton. He is the second son of the fourteenth Earl of Derby; was formerly a captain in the Grenadier Guards. He was civil lord of the Admiralty Aug. to Nov., 1868; financial secretary to the War Office 1874-77; Secretary to the Treasury 1877-78; Secretary of State for War 1878-80; Secretary of State for the Colonies 1885-86; and president of the Board of Trade 1886-89. He was Governor-General of Canada May 6, 1888, to July 15, 1893. He married (May 31, 1864) Lady Constance Villiers, eldest daughter of the fourth Earl of Clarendon;

was created Baron Stanley of Preston in the peerage of Great Britain in 1896, and on the death of his brother in 1898 became sixteenth Earl of Derby. NEIL MACDONALD.

Stanley, HENRY MORTON, D. C. L.: African explorer; b. near Denbigh, Wales, in 1841, of humble parentage. He was placed in the poorhouse, where he remained until his thirteenth year, after which he taught in a school, and subsequently shipped as cabin-boy for New Orleans, where he was adopted by a merchant, whose name he assumed instead of his own, which was John Rowlands. His adoptive father having died without a will, and the civil war breaking out, he enlisted in the Confederate army; was taken prisoner; volunteered in the U. S. navy, and became acting ensign on an ironclad. After the close of the war he went as a newspaper correspondent to Turkey and Asia Minor, and in 1868 accompanied the British expedition to Abyssinia as correspondent of *The New York Herald*, a portion of his correspondence being subsequently embodied in a volume. In Oct., 1869, being then in Spain, he was employed by the *Herald* to head an expedition to learn the fate of Livingstone, the African explorer, from whom only vague intimations had been heard for two years. He reached Zanzibar in Jan., 1871, and toward the end of March set out for the interior, with a company of 192 men. In November he found Livingstone, who was living near Lake Tanganyika, and furnished him with supplies for further explorations. After having explored the northern portion of the lake, Stanley set out on his return journey in Mar., 1872, reaching England in July, where he was received with distinguished honor, the Queen sending him a gold snuff-box set with diamonds, and the Royal Geographical Society awarding to him in 1873 its patron's medal. Tidings having been received of the death of Livingstone in Central Africa, Stanley was placed at the head of an expedition, the cost of which was jointly undertaken by *The New York Herald* and the *London Daily Telegraph*, to explore the lake region of equatorial Africa. He left the coast in Nov., 1874, at the head of 300 men, and after many hardships and some severe contests with the natives reached Lake Victoria Nyanza Feb. 27, 1875, having in the meantime lost 194 men by death and desertion. He circumnavigated the lake in a boat brought with him in pieces, and found it to be a single large lake, and not, as supposed by Burton and Livingstone, a group of lagoons, thus confirming the opinions of Speke and Grant. He started Apr. 17, 1875, to continue his explorations in the direction of Lake Albert Edward Nyanza. He arrived at the mouth of the Congo river Aug. 12, 1877, having explored its whole course; returned to the Congo in 1879, at the head of a Belgian international expedition; lectured in the U. S., on Africa, in Dec., 1886; returned to Congo Free State in 1887 with an expedition for the relief of Emin Bey, whom he found on the Albert Nyanza Apr. 28, 1888. He returned with Emin toward the east coast in May, 1889, and reached the coast himself on Dec. 6 of the same year. On the return trip he discovered the Ruwenzori Mountains S. of Albert Nyanza. On his return to England in 1890 he received honorary degrees from the universities, and a special medal from the Royal Geographical Society. In the following year he visited the U. S. and Australia on lecturing tours, and returning to London in 1892 he unsuccessfully stood for North Lambeth as a Unionist candidate. His principal works are *How I found Livingstone* (London and New York, 1872); *Coomassie and Magdala* (1874); *Through the Dark Continent* (1878); *The Congo, and the Founding of its Free State* (2 vols., 1885); *In Darkest Africa* (1890); *My Dark Companions* (1893); and *Slavery and the Slave-trade in Africa* (1893).

Revised by M. W. HARRINGTON.

Stanley, THOMAS: classical scholar; b. at Comberlow, Hertfordshire, England, in 1625; was carefully educated at home; graduated at Cambridge 1641; studied law at the Middle Temple; published in 1647 a volume of *Poems and Translations* (from Anacreon, Bion, Moschus, etc.), frequently reprinted; issued his chief work, *The History of Philosophy, containing the Lives, Opinions, Actions, and Discourses of the Philosophers of every Sect*, in 4 vols., at intervals between 1655 and 1682 (2d ed. folio, 1687; best ed., with *Life of the author*, 4to, 1743), and in 1663-64 his elaborate edition of *The Tragedies of Æschylus*, with Latin translation, Greek scholia, and commentary, which long maintained its ground among English scholars (best ed. by Butler, 1809-16). D. in London, Apr. 12, 1678. See Brydges's edition of Stanley's *Poems with Life* (1814-15).

Stannard, HENRIETTA ELIZA VAUGHAN (Palmer): novelist; b. at York, England, Jan. 13, 1856; daughter of Rev. Henry Vaughan Palmer, rector of St. Margaret's, York; married, 1884, Arthur Stannard, a civil engineer. Her father had been an artillery officer before taking holy orders, and Mrs. Stannard's numerous fictions have dealt mainly with army life. Among these, published under the pseudonyms of John Strange Winter and Violet Whyte, are *Cavalry Life* (1881); *Regimental Legends* (1883); the very popular *Bootie's Baby* (1885); *Houp-la* (1885); *Army Society Life in a Garrison Town* (1886); *Garrison Gossip* (1887); and *A Siege Baby* (1887). H. A. BEERS.

Stannaries [from Lat. *stan'num*, tin]: in general, tin mines; in a special sense, those of Cornwall and Devon, concerning which there are peculiar laws and usages. The court of the stannaries is very ancient, exercising a jurisdiction in the time of Lord Coke which was "guided by special laws, by customs, and by prescription time out of mind." It was established in order that the workers in these mines might sue and be sued in their own court, "and not be drawn from their business to their own private loss and to the public detriment by attending their lawsuits in other courts." The early charters, records, and acts of Parliament relating to this subject are summarized in Coke's *Fourth Institute*, chap. xlv. The principal modern statutes bearing upon the stannaries are 6 and 7 Will. IV., c. 106, as amended by subsequent acts, which regulates the constitution and the procedure in these courts, and 33 and 38 Vict., c. 19, amended by 50 and 51 Vict., c. 23, relating to mining partnerships within their jurisdiction. The judges of the stannaries court are appointed by the Duke of Cornwall (the Prince of Wales), or, when there is none of full age, by the crown. See Bainbridge on *Mines*, ch. vi., §§ 8-5, and Batten's *Stannaries Act*. FRANCIS M. BURDICK.

Stannic Acid: a-hydrate, SnO(OH)₂, obtained from stannous oxide. See TIN (*Compounds of Tin*).

Stanovoi' Range [Russ. *Stanovoi Khrebet*, i. e. back-bone]: name given by Pallas to the mountains at the source of the Olekma, but since expanded to embrace the whole Siberian watershed between the Arctic and Pacific drainage systems. It is very imperfectly known, but appears to extend N. E. from near Urga, in North Central Mongolia, to the Chukchu Peninsula, a distance of 2,700 miles. It consists of parallel ranges of mountains with elevated plateaus, which are often very marshy, is more rugged on its eastern than on the western slopes, and is through much of its extent clothed with forests and rich in minerals. A principal range on the western side is the Yablonnoi Khrebet, which borders the plateau of Vitim. The highest point is Mt. Sokhondo (lat. about 50° N., lon. 110° E.), about 9,250 feet. MARK W. HARRINGTON.

Stanstead: the *chef-lieu* of Stanstead County, Quebec, Canada, and the terminus of a branch of the Boston and Maine Railway line, which runs through the Masawippi valley (see map of Quebec, ref. 6-C). It is close to the boundary-line of the U. S., which separates it from North Derby or Derby Line, Vt. It includes Stanstead Plain and Rock Island; in the former there is a Wesleyan College and several churches; in the latter are several factories. It is on the edge of a rich farming and grazing country. Pop. 4,200. J. M. H.

Stanton: city; capital of Montcalm co., Mich.; on the Detroit, Lans., and N. Railroad; 15 miles N. E. of Greenville, 62 miles N. W. of Lansing (for location, see map of Michigan, ref. 6-I). It is in an agricultural region, and contains a public high school, flour-mills, planing-mills, foundry, machine-shops, a private bank, and two weekly newspapers. Pop. (1880) 1,760; (1890) 1,352.

Stanton, EDWIN McMASTERS: lawyer and Secretary of War; b. at Steubenville, O., Dec. 19, 1814; admitted to the bar in 1836; reporter of the Supreme Court of Ohio 1842-45, reporting vols. xi.-xiii. of *Ohio Reports*. In 1845 he successfully and with distinction defended in the criminal court at Washington Caleb J. McNulty, clerk of the House of Representatives, tried for embezzlement. He first acquired national reputation as a lawyer in the important case of *The State of Pennsylvania vs. The Wheeling Bridge Company*, involving the question whether control of bridges over navigable rivers of the West flowing between the several States is vested by the Constitution in Congress or the State Legislatures. It was decided that Pennsylvania's interest in the controversy gave her standing in that court, and that regulation of bridges over navigable rivers of the

West is tested in Congress, exclusive of State control. Successive arguments in the case by Stanton were so marked by legal learning, logic, and eloquence that at once and at a comparatively early age he took place in the front rank of national lawyers. In 1806 he removed to Washington to attend to his practice before the U. S. Supreme Court, and in 1808 went to California and remained nearly a year as counsel for the U. S. in certain landcases involving many millions of dollars. Besides carrying in a successful issue those cases to which his employment especially related, his services were invaluable in the collection, collation, and translation of Mexican archives. The archives collected through his efforts furnished conclusive evidence of an organized system of fabricating land-titles carried on for a long time in California. The value of lands claimed under forged grants was estimated at not less than \$150,000,000. Afterward, however, these archives furnished the means of discrediting valid from forged grants, and enabled a successful defense to be made to every fraudulent claim.

In Dec. 1860, when active preparations were being made for secession and the indications as to the political future of the republic were appalling, Cass, Secretary of State, suddenly resigned, and Black, Attorney-General, succeeded him. Stanton, then in Cincinnati arguing a case before the U. S. circuit court, was appointed Attorney-General. Acceptance of the office involved relinquishment of profitable professional business and assumption of great responsibility, with little prospect of personal distinction. He accepted the office, and in it his attitude was that of resolute maintenance of national honor and determined opposition to treason. Only a handful of U. S. troops was assembled at Washington, and the residents of the capital were mainly in sympathy with secession. To a greater extent probably than any of his associates in the cabinet, Stanton perceived the danger of an attempt to prevent Lincoln's inauguration, to seize and hold the capital and insignia of government for the seceding States, and thus to exhibit the latter to the world as a government *de facto*, succeeding to the power and authority of the U. S. On Mar. 4, 1861, Stanton retired with the outgoing administration and resumed his profession. After the civil war had existed several months, patriotic citizens and eminent capitalists, without Stanton's knowledge, urged President Lincoln to place him in charge of the War Department. On Jan. 30, 1862, he became Secretary of War. Excepting a brief meeting in 1857 in Cincinnati, in a lawsuit in which they were both of counsel, there had previously been no intercourse between Lincoln and Stanton; but after the latter entered the War Department their mutual friendship and confidence grew with every day. The characteristics of Stanton's administration were integrity, energy, determination, singleness of purpose, and capacity to comprehend the magnitude of the insurrection and the labor and cost in blood and treasure involved in suppressing it.

After Lincoln's assassination and Johnson's accession to the presidency, Stanton was connected with the latter's administration for three years. He supported many measures which were vetoed by the President and re-enacted by Congress, including those for the establishment of the Freedmen's Bureau, for protection of civil rights, for admission of Colorado as a State, for organization of governments in insurrectionary States, and for conferring suffrage without regard to color in the District of Columbia. These differences of opinion and the continued adherence of Stanton to the Republican party and the President's separation from and avowed hostility toward it, led the President on Aug. 5, 1867, to notify Stanton that public considerations of a high character constrained him to request the latter's resignation; to which Stanton answered that public considerations of a high character, which alone had induced him to remain at the head of the department, constrained him not to resign before the next meeting of Congress. On Aug. 12 the President notified him of his suspension from office. After Congress convened, the Senate refused by a vote of 83 to 6 its concurrence in the suspension. Having received official information of this from the Senate, Stanton, on the next day (Jan. 13, 1869), resumed his office. On Feb. 21, 1869, the President undertook to remove him and to appoint Lorenzo Thomas Secretary of War *ad interim*. The Senate, sitting on the same day officially informed by the President of this action, resolved that under the Constitution and laws the President had no power to remove the Secretary of War and designate another officer to perform the duties of that office, and officially communicated this

resolution to Stanton. The House of Representatives immediately decided to impeach the President. In consequence of this action of both houses of Congress and the general apprehension of revolutionary purposes on the part of the President, Stanton refused to relinquish control of his department. After the trial and acquittal of the President under articles of impeachment, Stanton relinquished his office. The Senate on May 28 again resolved that he had not been legally removed, and based its confirmation of his successor, Gen. Schofield, upon Stanton's voluntary retirement. Soon afterward both houses of Congress passed a vote of thanks to him for his great ability, purity, and fidelity.

With his health shattered by his labors in the War Department, he resumed his profession and argued several important cases. The last was *Whitely vs. Hoover*, an important patent case, which, in consequence of Stanton's feeble health, was heard by Judge Swayne in Stanton's own library two weeks before the latter's death. He never again left his chamber. On Dec. 20, 1869, he was nominated by President Grant as an associate justice of the U. S. Supreme Court, and was immediately confirmed by the Senate; but on Dec. 24 he died without having entered upon the duties of his new office.

Revised by C. K. ARNOLD.

Stanton, Elizabeth (Cady): reformer; b. at Johnstown, N. Y., Nov. 12, 1815; daughter of Judge Daniel Cady; educated at the Johnstown Academy, where she studied with a class of boys; was fitted for college at the age of fifteen, and pursued her studies at Mrs. Willard's Seminary at Troy; had her attention turned to the disabilities of sex by her own educational experience and a study of Blackstone, Story, and Kent; married, in 1840, Henry R. Stanton (reformer, author, and State Senator; d. 1887); accompanied him to the World's Anti-Slavery convention at London; there made the acquaintance of Lucretia Mott; resided in Boston until 1847, when they settled at Seneca Falls, N. Y.; with Lucretia Mott signed the call for the first woman's rights convention, which met at her place of residence July 19-20, 1848, on which occasion the first formal claim of suffrage for women was made; circulated petitions for the married woman's property bill, and had a hearing before a legislative committee 1844; addressed the New York Legislature in 1834 on the right of suffrage, in 1860 in advocacy of divorce for drunkenness, and in 1867 both the Legislature and the constitutional convention, maintaining that during the revision of the constitution the State was resolved into its original elements, and that all the citizens had therefore a right to vote for members of that convention. Since 1869 she has frequently addressed congressional committees and State constitutional conventions. She canvassed Kansas in 1867, and Michigan in 1874, when the question of woman suffrage was submitted in those States; was one of the editors of *The Revolution*. Most of the calls and resolutions for conventions, addresses to women, legislatures, and Congress, have been from her pen. She was president of the national woman's rights committee 1855-63, of the Woman's Loyal League 1863, and of the National Association until she withdrew in 1892; spent several years in France and England, and spoke many times in the great conventions in England and Scotland, and at parlor meetings in London; contributed articles to *The Westminster Review* and to journals and magazines in the U. S. She was president of the first International Council of Women held in Washington in 1893. With Miss Susan B. Anthony and Mrs. Matilda J. Gage she is the author of *The History of Woman Suffrage* (3 vols., New York, 1881-86).

Susan B. Anthony.

Stanton, Thomas, M. A.: journalist; son of Mrs. Elizabeth Cady Stanton; b. at Seneca Falls, N. Y., Feb. 10, 1831; educated at the College of the City of New York and at Cornell University; was Berlin correspondent of *The New York Tribune* 1850; settled in Paris to engage in journalism; member International Jury, Paris Exposition, 1889; resident commissioner in France, Columbian Exposition, 1893; Chevalier of the Legion of Honor; translator and editor of *Le Goff's Life of Thiers* (New York, 1870); author of *The Woman Question in Europe* (1884) and of contributions to periodicals.

Stanwix, John: soldier; b. in England about 1680; entered the British army 1700; served as an officer of grenadiers and marines; became Lieutenant-colonel 1745; equerry to Frederick, Prince of Wales, 1740; was governor of Carlisle and its representative in Parliament 1759; became deputy quartermaster-general of the forces 1754; was made colonel commanding the first battalion of the Sixtieth Regi-

ment (Royal Americans) Jan. 1, 1756; was in command of the southern district of the American colonies, with headquarters at Carlisle, Pa., 1757; was appointed brigadier-general Dec. 27, 1757; was relieved by Gen. Forbes early in 1758, and intrusted (1758) with the erection of the important fortress known as Fort Stanwix at the "Oneida carrying-place" (now Rome) on Mohawk river, at an expense of £60,000, as a defense against incursions from the French in Canada; returned to Pennsylvania; was appointed major-general June 19, 1759; repaired and fortified the old fort Du Quesne at Pittsburg, securing the good will of the Ohio Indians; resigned his commission in America to Gen. Monckton May 4, 1760, and returned to England; was appointed lieutenant-general Jan. 19, 1761; was made lieutenant-governor of the Isle of Wight and colonel of the Eighth Foot, and was elected member of Parliament for Appleby. He was lost at sea in Dec., 1765, while crossing the Irish Channel from Dublin to Holyhead in a packet.

Stan'yhurst, RICHARD: historian and theologian; b. in Dublin about 1545; educated at University College, Oxford; studied law; returned to Ireland; married, became a Roman Catholic, and went to the Continent. On the death of his wife he became a priest, and was appointed chaplain to Archduke Albert, governor of the Spanish Netherlands. D. at Brussels in 1618. He translated into English heroic verse *The First Four Bookes of Virgils Aeneis* (1588); furnished a *Description of Ireland* to Holinshead's *Chronicles*; wrote historical treatises (in Latin) on Ireland, and English and Latin theological works.

Staphyllin'idæ: the ROVE-BEETLES (q. v.).

Stapleton, THOMAS, D.D.: theologian, b. at Henfield, Sussex, England, in 1535; educated at Canterbury and Winchester schools and at New College, Oxford, where he was admitted perpetual fellow 1554; took orders in the Church; became a Roman Catholic; was appointed by Queen Mary prebendary of Chichester; retired on the accession of Elizabeth to Louvain, where he acquired publicity by his polemical writings against Calvin and Beza, Jewel, Horne, Whitaker, and other Protestant divines; became Regius Professor of Divinity at the University of Douay, where he had already become doctor of theology; returned to Louvain, where he was appointed divinity professor as successor to Baius. D. at Louvain, Oct. 12, 1599. His best-known works are *Principiorum fidei doctrinalium Demonstratio, Selectio principiorum fidei doctrinalium, Defensio auctoritatis ecclesiasticæ, De Justificatione, De magnitudine Ecclesiæ Romanæ, Propugnaculum fidei primitivæ Anglorum, Antidota Evangelica, Antidota Apostolica, Promptuarium Morale, Promptuarium Dogmaticum, Tres Thomæ*. Cardinal Duperron looked on him as the greatest of the polemical theologians, and Döllinger says that he was the greatest champion of the Church against the new doctrines. His works were published at Paris, 1620 (4 vols. fol.).

J. J. KEANE.

Star: See STARS.

Star-anise: See ANISE-SEED.

Star-apple Family: the *Sapotaceæ*, a small family (400 species) of gamopetalous, dicotyledonous shrubs and trees, mostly latex-bearing. The flowers are regular and hermaphrodite in the axils of the leaves, and have one or two series of stamens, and a superior two to five celled, few-ovuled ovary. They are mainly tropical and sub-tropical. In the Southern U. S. there are nine or ten species, five of which are small trees of the genus *Bumelia*. "Several species of this family are useful to man. The fruits of *Lucuma mammosa*, the marmalade of the West Indies, are a very agreeable food, as are those of *Achras sapota* (the sapodilla-plum) and various species of *Chrysophyllum* (star-apples), which are much sought after in the Antilles." Some species of *Bassia*, the butter-trees, yield a fatty substance by pressure of the seeds. Gutta-percha is obtained from *Isonandra gutta*, a large tree of the East Indies, by the evaporation of its milky juice. CHARLES E. BESSEY.

Starch [deriv. of *starch*, stiff < O. Eng. *stearc*, strong] ($C_6H_{10}O_5$ or $C_{12}H_{20}O_{11}$): a substance (also called *fecula*, *amidon*, and *amylum*) widely diffused in the vegetable kingdom, being found in almost every plant, at least at some period of its development. It is especially abundant in some families of plants, and often occurs in large quantities in the seeds, pith, stalks, bark, bulbs, tubers, roots, etc. There are two other substances found in plants which resemble starch in many respects—the inulin, which occurs

in the dahlia, elecampane, dandelion, chicory, mustard-seed, etc., and the lichen-starch which is found in Iceland moss, carrageen-moss, and several of the lichen and fucus tribes of plants. See INULIN and LICHENINE.

Preparation.—Starch is extracted from a great variety of plants, chiefly from wheat, Indian corn, rice, potatoes, the root of manioc or cassava, *Jatropha manihot* (tapioca), the root of several species of the *Maranta* (arrowroot), and the pith of a great variety of palms (sago). Wheat-flour contains from 50 to 80 per cent. of starch. The starch is extracted from the whole wheat by "softening" in cold water and pressing under millstones or rollers, or in bags under water, as long as milky water runs off from it. This liquid, when left to itself, deposits starch containing gluten; the latter, however, dissolves for the most part in the supernatant liquid, which gradually turns sour; and on decanting this acid liquid, repeatedly stirring up the starch with fresh water, and leaving it to settle, it is at length obtained pure, and may be dried in suitable desiccating chambers. Corn-starch is extensively manufactured in the U. S. by soaking corn in water containing caustic soda or hydrochloric acid to dissolve the gluten, grinding, washing on sieves, etc. The cheapness and excellence of this starch has put an end to the importation of starch from foreign countries, and large quantities are now exported. Rice-starch is largely manufactured in Great Britain, France, and Belgium. The rice is first soaked in a weak lye, then ground, and washed on a sieve. Potato-starch is largely manufactured in Europe and in the U. S. Horse-chestnut starch is made in France. A solution of sodic carbonate is used to remove the bitter principle. The yield is about 20 per cent. For ARROWROOT, SAGO, and TAPIOCA, see those articles.

Properties.—"Starch is a white shining powder, soft to the touch, grating between the fingers or the teeth, sometimes consisting of amorphous masses, but more frequently of granules recognizable by the microscope. . . . Starch, so long as it retains its natural state of aggregation, is insoluble in water, alcohol, and ether; but when placed in contact with hot water, the water penetrates between the different layers of which the granules are composed, swelling them up and forming a gelatinous mass known as *starch-paste*, and used for stiffening linen, etc."—*Watts's Dictionary*.

Applications of Starch.—Starch is used for stiffening cotton and linen cloth, paper, etc. Wiesner says corn-starch possesses the highest, and potato-starch the lowest stiffening qualities. It is used for food in the form of arrowroot, tapioca, sago, etc., for making paste, for powdering the hair, for the manufacture of dextrin, glucose (corn-sirup), etc. See FOOD.

Revised by IRA REMSEN.

Star Chamber: an English high court of justice prominent in the fifteenth, sixteenth, and seventeenth centuries, supposed to have derived its name from the fact that the room in which it was held at Westminster was decorated with gilt stars. The first historical instance of the use of the title is in the reign of Edward III., when the chancellor, treasurer, justices, and others are mentioned as exercising jurisdiction in the "star chamber." Its powers are thought to have been derived from the council which in 1453 was recognized as having jurisdiction over all cases not determinable by common law, but which declined in power during the Wars of the Roses. By the act of 1488 Henry VII. empowered a committee of the council, consisting of the chancellor, treasurer, keeper of the privy seal, chief justices (or, in their absence, two other justices), a bishop, and a temporal lord to act as a court of justice with jurisdiction over cases in which the operation of the law was wrongfully impeded. It had the right to punish without a jury the misdemeanors of sheriffs and juries, and in spite of its arbitrary nature was of use in quelling the turbulent spirit of the great nobles and bringing in a period of good order. In Henry VIII.'s reign its powers were reabsorbed by the council, but thenceforth the composition of the court was uncertain. Its jurisdiction, which was equally vague, comprised in practice almost every class of offenses, and it could inflict any penalty short of death. The peculiar uncertainty of its legal rules made it the defense of absolute power, and under the Stuarts its arbitrary decisions and cruel punishments brought down upon it the popular hatred. It was abolished by the Long Parliament in 1641.

F. M. COLBY.

Stare Decisis, stā'rē-dēē-sī'sis [Lat.]: a shortened form of the maxim, "*stare decisis, et non quæla movere*"—"to stand by decisions and not to disturb matters once settled."

Ordinarily, it applies only to decisions of the court in which the question is again mooted, or to those of its superior. At times, however, the rule is followed with regard to decisions of inferior courts and even to decisions of executive departments, which have been acquiesced in by the public and under which rights have been acquired. (*Schell vs. Pausch*, 128 U. S. 923.) The reasons for the rule and its limitations are considered in the article on **PRECEDENTS** (p. 61).

FRANCIS M. BURGESS.

Starfish: any animal belonging to the class of *Echinodermata*, order *Asteroides*; characterized by having the body more or less plainly star-shaped, and without sharp distinction between the five or more rays or arms and the central disk. The body-wall is hardened with calcareous plates and spines; the mouth is in the center of the lower surface of the disk, and the vent, when present, is above. Each arm bears on its lower surface two zigzag rows of tubular suckers (ambulacra), by means of which the animal moves about or anchors itself; while at the tip of each ray is an ocellus. The round spot noticeable on the upper surface is a siphon (madreporite) through which water is admitted to tubes connected with the ambulacra. The spines of the starfish are separate, and the eggs, which are usually committed to the waves, undergo in most forms strange metamorphoses in their development. Starfish lack all hard structures to the mouth, and they eat by protruding the stomach, inserting it into the mollus upon which they feed. They are extremely destructive to oysters. See Alexander Agassiz, *North American Starfishes* (1877); *Development*, Pilsch, *Quarterly Jour. Microsc. Sci.* (1892); *Fishes*, Bulletin Mus. Comp. Zool. (n. s.), 1887. J. S. KINGSLEY.

Stargazers: marine fishes of the family *Uranoscopus*. The best known species is *Uranoscopus scaber* of the Mediterranean; *Asteriscopus stimpsoni* and *Uranoscopus y-gracius* are found on the Atlantic coast of the U. S., but most of the species are East Indian. They are spiny fishes, having the eyes on top of the head, whence the name. The cyprinodont fishes of the genus *Amblopleg*, found in Guinea, are also called stargazers. See **ASARLES**.

Starke, JAMES: soldier; b. at Londonderry, N. H., Aug. 28, 1729; became a farmer, and in 1762 was taken prisoner by the St. Francis Indians, but after six weeks was ransomed, having in the meantime gained so much favor with his captives that he was subsequently adopted into their tribe. In 1769 he was appointed a lieutenant in Rogers's Rangers; took part in Abercrombie's campaign in 1758, and in Amherst's reduction of Crown Point and Ticonderoga in 1759; early in 1775 was chosen a member of the New Hampshire committee of safety; as colonel of the New Hampshire troops took part in the battle of Bunker Hill; accompanied Montgomery's expedition to Canada 1775-76; joined Washington at Newton, N. J., Dec. 1776, and took part in the battle of Trenton. Being aggrieved at the action of Congress in regard to promotions, he resigned his commission in Aug., 1777. Upon the advance of Burgoyne from Canada, the authorities of New Hampshire commissioned him to raise a force for the defense of the State, which was then held to include Vermont. He attacked the Hessian colonel Donon near Bennington Aug. 16, 1777, routed him, and later in the day defeated a force under Col. Breymann. For this he received from Congress a commission as brigadier-general; served under Gates in the Saratoga campaign; was with Gates in Rhode Island in 1778-79, and in 1780 joined Washington at Morristown; was a member of the court martial for the trial of Maj. André, and in 1781 was placed in command of the northern department. After the close of the war he retired to his farm. D. at Manchester, N. H., May 5, 1822. His *Biography* was written by Edward Everett for Sparks's *American Biography*, and his *Life and Official Correspondence*, edited by his grandson, was published in 1860 (Concord, N. H.).

Starke, THOMAS: jurist; b. at Blackburn, England, Apr. 12, 1792; graduated at Cambridge, where he was senior wrangler and Smith's prizeman 1803; was called to the bar at Lincoln's Inn May, 1810; became Downing Professor of Law 1823, and a judge of the county court at Clerkenwell 1847. His most important service in a public capacity was his labor in a commission appointed for the amendment of the law, and for digesting it into a code, for which his fullness of information especially fitted him. D. in London, Apr. 15, 1849. Besides *A Practical Treatise on the Law of Abuses, Liabilities, and, incidentally, of Misdemeanors* (1812), *A Treatise on Criminal Pleading* (2 vols., 1814), and

A Practical Treatise on the Law of Evidence and Digest of Precedents in Civil and Criminal Proceedings (3 vols., 1824), which (especially the last) are his most important works and have been repeatedly reprinted, he published *Reports of Cases Determined at New Trials, King's Bench, and Common Pleas* (1817-22), and numerous magazine articles.

Revised by F. NEVINS ANDERSON.

Starkville: town; capital of Oktibbeha co., Miss.; on the Ill. Cent. and the Mobile and Ohio railways; 20 miles S. W. of Aberdeen, 35 miles W. of Columbus (for location, see map of Mississippi, ref. 5-H). It is in a stock-raising and hay-making region, is the seat of the Mississippi Agricultural and Mechanical College, and contains the Starkville Female Institute, a savings-bank with capital of \$25,000, and two weekly newspapers. Pop. (1880) 1,800; (1890) 1,725.

Starling [M. Eng. *sterlyng*, dimia. of *stare* < O. Eng. *star* (> Eng. *stare*, *starling*; O. H. Germ. *stara* > Mod. Germ. *star*, *starling*; cf. Lat. *sternus*, *starling*]; the *Sternus vulgaris*, a common European bird of the family *Sternidae*. It is a great favorite, especially with the Germans, who often have it caged, and teach it to whistle tunes and even speak words very plainly. It makes a nest of twigs, straw, grass, and roots in holes of rocks and buildings and in hollow trees. The bird is 84 inches long, black, with violet and green reflections and buff spots.

Revised by F. A. LUGER.

Starnina, GUERARDI: painter; b. in Florence in 1524; a pupil of Antonio Veneziano. After painting the history of St. Nicholas and St. Anthony on the ceiling of the Gualtari chapel in Santa Croce, he was taken to Spain by some Spaniards who were enthusiastic admirers of his art. In that country he worked for the king and other patrons, and returned to Italy rich and covered with honor. Of his frescoes for the chapel of St. Jerome in the Carmelite church, executed soon after his return, nothing remains but the *Death of St. Jerome*. When Pisa was conquered by the Florentine republic Starnina was commissioned to paint on the facade of the Gualtari palace an effigy of St. Denis, it being on his day that the city surrendered. He was one of the most consummate draughtsmen of his time. Masolino da Panicale, Masaccio, and Antonio da Pisano were his pupils. D. about 1497. W. J. SWANMAN.

Star-of-Bethlehem: the *Ornithogalum umbellatum*, a common spring garden-flower of the family *Liliaceae*. The genus includes many bulbous-rooted plants of the Old World and of Southern Africa, several of which are cultivated. The above-mentioned species (the white star-of-Bethlehem) is a native of Europe, and is sparingly naturalized in the U. S.

Revised by L. H. BAILEY.

Star of India: Order of the: a British order of knighthood, provided to reward distinction in the Government service in India. It was instituted in 1861, and reorganized in 1866 and 1873. It consists of the sovereign, the viceroy of India, and three classes of members, viz.: 1, knights grand commanders (G. C. S. I.); 2, knights commanders (K. C. S. I.); and 3, companions (C. S. I.). The badge of the order is a light-blue ribbon with white stripes and the motto "Heaven's Light our Guide."

Staroverski: See **PHILIPPINI**.

Starr, MILES ALLEN, A. M., M. D., Ph. D.: neurologist; b. in Brooklyn, N. Y., May 16, 1854; educated at Princeton College (A. B. 1876, A. M. 1879, Ph. D. 1884), and at the College of Physicians and Surgeons, New York (M. D. 1880); studied at the Universities of Berlin, Heidelberg, Vienna, and Paris; was Professor of Nervous Diseases, New York Polyclinic, 1886-88, and has been Professor of Diseases of the Mind and Nervous System, College of Physicians and Surgeons, New York, since 1888; is attending and consulting physician to a number of hospitals; corresponding secretary of New York Academy of Medicine 1899 to 1905; president New York Neurological Society 1902-04. He delivered the Middleton Goldsmith lectures of the New York Pathological Society in 1887, his subject being *Multiple Neuritis*. Among his works are *Familial Forms of Nervous Diseases* (New York, 1899); *Lectures on Insanity* (1901); and *Brain Surgery* (New York, 1903).

S. T. ARMSTRONG.

Stars [M. Eng. *stare* < O. Eng. *steara*; O. H. Germ. *stern*, *sternus* (> Mod. Germ. *stern*; Goth. *stairus* < Teuton. *stern*); Lat. *stel* in (for **ste* *culis*) (Gr. *sternē*); by general, immense masses of matter, at a temperature so high as to be self-luminous, scattered through the celestial spaces, and of

the same general nature as the sun. From the standpoint of the nebular hypothesis, each mass is hot because it has never had time to cool since it was first formed from the condensation of the nebula. Like the sun, the stars are surrounded by atmospheres of vapor, cooler than themselves, and spectrum analysis shows that they are composed of chemical elements similar to those found upon the earth.

Number of Stars.—The number of stars which can be seen at one time by the average eye, on a clear evening, may be estimated as between 2,000 and 2,500. As only half the celestial sphere is above the horizon, and few stars can be seen near the horizon, owing to the vapors in the lower part of the atmosphere, the number in the whole celestial sphere is more than double that visible at any one time. The total number in the heavens which the ordinary eye can see may be roughly estimated at 5,000; but these are only a small proportion of the whole number, the great majority being invisible without telescopic aid. It was estimated by Struve that 20,000,000 were visible with Herschel's 20-foot telescope. The more powerful the telescope, the greater the number. No exact estimate has ever been made of the total number visible with the great refractor of the Lick Observatory, but it would probably exceed 50,000,000.

Magnitudes of the Stars.—A glance at the nocturnal sky shows that the stars are of widely different degrees of brightness. A system of estimating the apparent magnitudes or brightness of the stars, which has come down to us from ancient times, is still in use by astronomers. On this system, in its original form, the stars were divided into six different orders of brilliancy. About twenty of the brightest stars in the heavens were called of the first magnitude. Next in order came the brightest stars of the Great Bear and of Cassiopeia. These were called of the second magnitude. The successive magnitudes corresponded with the continually diminishing degree of light, until the sixth was reached, which included the faintest visible with the naked eye. The original division into magnitudes was not founded on any exact photometric scale, but merely on general impressions derived from estimates by means of the eye. In modern times greater exactness has been aimed at. The general system which astronomers have attempted to follow is that the amounts of light represented by increasing magnitudes shall decrease in geometrical progression. Supposing this system to be exactly followed, a star of the second magnitude would be one which emitted two-fifths as much light as one of the first; one of the third magnitude would be two-fifths as bright as one of the second, and so on. Computing this ratio down to the sixth magnitude, we see that it would represent but little more than one-hundredth part of the light of a star of the first magnitude. The same ratio is continued in the star invisible to the naked eye; a star of the eleventh magnitude means one emitting about 1 per cent. as much light as one of the sixth magnitude. This scale of increase, however, is not perfectly exact, owing to the difficulties of making precise photometric comparisons between stars of greatly different magnitudes. The general rule has been that the magnitudes have been determined merely by estimates, and thus the results given by some observers have been systematically different from those given by others. This is especially true in the case of telescopic stars. Even in the case of the stars visible to the naked eye the difference of light is probably greater than that given by the above rule, some magnitudes being, in a general average, three times as bright as those next below them. The most recent investigators have gone far, however, toward removing all these discrepancies by using a uniform light ratio of two and a half for a unit difference of magnitude.

On the ancient system every star was supposed to belong to one of the six orders of magnitude, and no distinction was made between those belonging to the same order; but, as a matter of fact, the stars range over every degree of brilliancy from the first to the sixth, and the classification into magnitudes is arbitrary. How exact soever we might make it, the brightest star of the fifth magnitude would be equal with the faintest star of the fourth, the brightest star of the fourth equal to the faintest star of the third, etc.; hence astronomers have striven to express the magnitudes more exactly by introducing subdivisions. At first each magnitude was divided into three subdivisions: a bright one, a medium, and a faint one. The two extreme subdivisions were designated by writing the number both of that magnitude and the one next to it. For example, the magnitude of an average third-magnitude star was represented by the number 3 simply. A star between the third

and fourth, but nearer to the third, was represented by the number 3.4. The next class in order would be the brightest stars of the fourth magnitude, which were represented by 4.3. Then the average fourth-magnitude stars were represented by 4 simply. Next, the fainter stars of this order, or those which approached the fifth magnitude, were called 4.5. Next came the brighter fifth-magnitude stars, which approached the fourth magnitude, and were called 5.4, etc. This system, though very recently in use, is too clumsy to meet the requirements of exactness in science, and it is now common to consider the magnitudes as regularly variable quantities, and represent them in the usual way by numbers and decimals. Accordingly, in modern photometry units and tenths are used. An average third-magnitude star is represented by 3.0; one fainter by a certain amount is called 3.1; next, 3.2, etc. The progression of 0.1 in each magnitude corresponds to an increase in light of nearly one-tenth; that is to say, a star of magnitude 2.9 is about one-tenth brighter than one of 3.0; one of 2.8 a tenth brighter than one of 2.9, etc. This rate of increase is such that a change of a whole magnitude will correspond to an increase of about two and a half times. Indeed, in the most recent photometries the decimals are carried to hundredths.

This system does not express the amount of light emitted by a star, but rather the negative of its logarithm. It is more convenient, however, than one which would attempt to express the exact amount of light. Photometric estimates are necessarily made by the eye, and do not admit of direct measures. Now a geometrical progression of this sort can be estimated better by the eye than one in which an attempt is made to measure the quantity of light.

The number of stars of each magnitude increases with their minuteness. Roughly speaking, there are three times as many of the second magnitude as of the first; three times as many of the third as of the second, and so on. In the case of the fainter stars, however, the progression is not so rapid. There are between two and three times as many stars of the sixth magnitude as of the fifth; probably about twice as many of the seventh as of the sixth, and so on. An idea of this order may be gained by saying that the absolute amount of light emitted by the entire number of all the stars of any given order of magnitudes is not extravagantly different from the third down to the fainter telescopic stars. For example, each star of the sixth magnitude emits about two-fifths as much light as one of the fifth; but as there are two and a half times as many stars, the greater number nearly compensates for their smaller brilliancy, so that the total amount of light emitted by all of the sixth magnitude is about the same as the total amount emitted by all of the fifth.

Constellations and Names.—In former ages the figures of men, animals, or natural objects were supposed to be delineated on the face of the nocturnal sky, so as to include all the principal stars, and the stars were designated by the particular limb or part of the animal in which they were found. The bright red star, Aldebaran, for example, in the constellation Taurus, formed the eye of the bull, and two other smaller stars were at the ends of his horns. So we have three stars forming the belt of Orion, and three others his sword. In ancient times special names were given to several of the brighter stars; thus Arcturus is alluded to in the book of Job. The Arabs introduced special names for 100 or 200 of the stars. Some of these names are still used, but the tendency in astronomical practice is to drop them and designate the stars according to the system of Bayer. This system, now in vogue for all the more conspicuous stars, was introduced by Bayer about the year 1600. It is analogous to that which is used in distinguishing persons by two names, the surname and the Christian name. All the stars of a constellation have the name of that constellation as a surname. The Christian names are the letters of the Greek alphabet, α , β , etc. These letters are used in each constellation in the same manner that persons of different families may have the same Christian name. The first letters of the alphabet are applied to the brighter stars, but their order as laid down by Bayer on his maps is not exactly that of brilliancy. Thus α Ursa Minoris is one of the two brightest stars in Ursa Minor; β Ursa Minoris is the other; γ Minoris is the third in the order of brilliancy, etc. So α Aquila is the brightest star in the constellation Aquila; β Aquila the next brightest, etc. When the Greek alphabet was exhausted, in the case of any one constellation, the Italic alphabet was used. In modern times several stars are represented by one of Bayer's letters and a number attached to it. Thus

two stars in Aquarius are represented by h_1 and h_2 respectively. Flamsteed, in making his great catalogue of stars, found that he had to include so many stars not lettered by Bayer that he adopted the plan of using numbers, instead of the Greek and Italic letters. These numbers were ar-

by Flamsteed's number. Stars which have neither letter nor number are distinguished simply by their magnitude, right ascension, and declination, or by their number in some well-known catalogue; but for uniformity the constellation to which they belong is frequently indicated.

Distribution of the Stars.—The distribution of the stars in space has been considered by Herschel and other astronomers, but, though some traces of arrangement have been discerned, no distinct law has yet been formulated. (See GALAXY.) In certain parts of the heavens the stars are heaped together in clusters. The telescope reveals wonderful groups, such as that in Hercules, which contains thousands of stars in a small space, spreading at the edge into curved sprays. A group near κ of the Southern Cross shows an aggregation of variously colored stars. In Fig. 1 the central portion of the group in Perseus is exhibited. Figs. 2 and 3, representing clusters in Canes Venatici and Aquarius, give an idea of groups composed of immense numbers of small stars arranged in a globular form.

TABLE A.—DISTRIBUTION OF STARS ACCORDING TO THEIR CONSTELLATIONS AND MAGNITUDES. (STARS VISIBLE TO THE NAKED EYE IN THE LATITUDES OF THE NORTHERN UNITED STATES.) SEE ALSO CONSTELLATION.

CONSTELLATIONS.	Magn. 1.	Magn. 2.	Magn. 3.	Magn. 4.	Magn. 5.	Magn. 6.	Var.	Class.	Neb.	Total.
A. Northern Constellations, between the zenith of latitude 45° and the pole.										
1 Ursa Minor.....	2	1	3	8	40	163	...	...	...	54
2 Draco.....	1	9	8	39	163	...	...	...	...	220
3 Cepheus.....	2	5	4	21	127	2	...	...	...	159
4 Cassiopeia.....	2	2	6	21	93	2	...	...	...	126
5 Perseus.....	1	4	13	23	90	2	...	...	...	136
6 Camelopardus.....	...	...	2	25	110	1	...	...	...	138
7 Lacerta.....	...	...	1	12	35	...	...	...	...	48
8 Lynx.....	...	...	1	12	73	...	...	...	...	87
9 Ursa Major.....	6	9	5	30	166	2	...	...	...	227
10 Canes Venatici.....	...	1	1	18	65	...	2	1	...	88
B. Mean Constellations, between the zenith of latitude 45° and the equator.										
11 Andromeda.....	3	1	13	14	106	1	...	1	...	139
12 Equuleus.....	...	...	1	4	11	...	...	...	...	16
13 Pegasus.....	2	4	8	22	140	1	...	1	...	178
14 Pisces.....	1	10	21	96	...	...	...	...	...	128
15 Triangulum.....	...	1	2	4	22	...	...	1	...	30
16 Aries.....	1	1	4	11	63	...	...	...	...	80
17 Auriga.....	1	1	2	4	115	2	...	...	...	144
18 Taurus.....	1	1	2	15	28	140	1	...	...	188
19 Gemini.....	1	2	5	5	78	1	...	...	...	106
20 Canis Minor.....	1	...	1	5	30	...	...	...	...	37
21 Cancer.....	...	...	5	5	79	1	1	1	...	92
22 Leo.....	1	2	5	8	20	124	1	...	...	161
23 Leo Minor.....	...	...	3	6	30	1	...	...	...	40
24 Coma Berenices.....	...	...	2	17	51	...	...	...	...	70
25 Boötes.....	1	1	6	10	100	...	...	...	...	140
26 Corona Borealis.....	1	...	6	7	15	2	...	...	...	31
27 Hercules.....	1	9	12	23	172	3	2	...	...	227
28 Lyra.....	1	...	1	5	52	2	...	...	...	69
29 Cygnus.....	2	4	15	34	138	3	1	...	...	197
30 Vulpecula.....	...	...	1	14	47	...	...	...	...	62
31 Sagitta.....	...	...	4	2	12	...	...	...	...	18
32 Delphinus.....	...	1	4	2	24	...	...	...	...	31
C. Southern Constellations, from the equator to the southern horizon.										
33 Cetus.....	2	6	7	24	122	1	...	...	...	162
34 Eridanus.....	...	7	17	24	99	...	...	...	...	147
35 Orion.....	1	3	4	6	25	95	2	...	...	136
36 Monoceros.....	...	...	4	15	90	1	2	...	...	112
37 Lepus.....	...	2	6	10	26	1	...	...	...	45
38 Columba Noachi.....	1	1	3	1	2	...	...	...	...	8
39 Canis Major.....	1	2	4	5	44	...	...	...	...	70
40 Argo Navis.....	...	1	4	13	52	...	...	...	...	71
41 Hydra.....	1	4	10	20	117	1	...	...	...	153
42 Sextans Uranie.....	...	...	1	5	42	...	...	...	...	48
43 Virgo.....	1	...	6	9	144	2	...	...	...	181
44 Crater.....	...	1	4	2	28	...	...	...	...	35
45 Corvus.....	3	1	1	4	17	...	...	...	...	26
46 Centaurus.....	...	2	3	2	5	...	...	...	...	12
47 Serpens.....	1	5	5	10	59	1	1	...	...	82
48 Ophiuchus.....	2	7	7	24	71	...	2	...	...	113
49 Scutum Sobieskil.....	...	...	1	5	4	...	...	...	...	11
50 Aquila et Antinous.....	1	...	5	4	95	1	...	...	...	123
51 Libra.....	2	...	1	8	41	1	...	...	...	53
52 Lupus.....	...	...	...	4	...	...	...	...	...	4
53 Scorpio.....	1	1	7	5	10	17	...	...	...	41
54 Sagittarius.....	1	6	8	19	53	2	1	...	...	90
55 Capricornus.....	...	3	7	12	41	...	...	...	...	63
56 Aquarius.....	...	5	11	31	98	...	1	...	...	146
57 Piscis Australia.....	1	...	3	13	5	...	...	...	...	22
Northern.....	10	12	32	44	218	902	8	6	1	1,283
Mean.....	22	7	17	43	137	306	1,645	19	4	2,184
Southern.....	25	6	19	77	132	330	1,367	14	9	1,854
Totals.....	57	18	48	152	313	854	3,974	41	19	5,421



FIG. 1.—Portion of the group in Perseus.

ranged in the orders of right ascension; thus 1 Scorpii was the first star in Scorpius which passed the meridian, 2 Scorpii



FIG. 2.—Globular cluster in Canes Venatici.

the second, etc. The system commonly used now is to designate the star by Bayer's letter, when it has one, otherwise

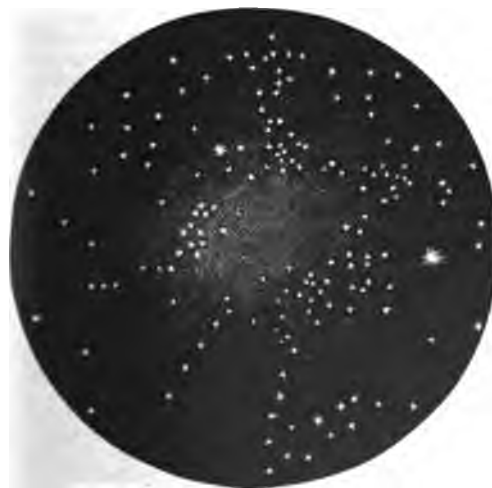


FIG. 3.—Globular cluster in Aquarius.

Variable Stars.—It has long been known that certain stars vary in brilliancy from time to time. The two most remarkable ones, which have long been known, are α Ceti and β Persei, or Algol. During the greater part of the time the former of these stars is invisible to the naked eye; but at intervals of about eleven months it increases so as to become plainly visible, and after retaining a maximum brilliancy for some two weeks fades away again. Its maximum brilliancy, however, is very different at different appearances, ranging from the second all the way to the fifth. The law of variation is so irregular as not to admit of any exact statement; even the period of 331 days varies from time to time. Owing to the manner in which it blazes up, it was formerly called *Mira Ceti*. For an account of the variations in the light of Algol, and the discoveries to which they have given rise, see ALGOL.

In the southern hemisphere there is a star, η Argus, which for several centuries past has varied in the most singular manner. The first record of it was by Halley in 1677, when it was classed as of the fourth magnitude. In 1837 Sir John Herschel, while making observations at the Cape of Good Hope, was astonished by the appearance of a new star of the first magnitude, which on referring to a map he found to be η Argus. Its light was, however, nearly trebled, being then greater than that of Rigel. He states that the light continued to increase until the beginning of 1838, when it was brighter than most of the stars of the first magnitude. It then gradually faded away for two or three years, but in 1842 and 1843 blazed up brighter than ever, so as to be the brightest star in the heavens, except Sirius. Since that time it has been steadily diminishing; in 1868 it was no longer visible to the naked eye, and since that time has sunk to about the eighth magnitude.

Why some stars vary while others do not science has not been able to explain, except in a few cases. One of these is Algol, whose variations are due to a partial eclipse by a dark body revolving around it. There are a few other stars whose light slightly fades away at certain intervals, and whose variations are therefore presumed to be due to a similar cause. With most of the variable stars, however, the changes of light go on so continuously as to show that it is due to the constitution of the star itself. It has been suggested that such stars are brighter on one side than on the other, and show different faces as they revolve. This hypothesis is a purely speculative one, not only without proof, but without any great degree of probability. The theory which at present seems to rest upon the best foundation is that the variations are due to a process analogous to that of the formation of spots on the sun. The actual area of the sun covered by spots is so small that the variation of the light thus caused would evade photometric measurement; but it may easily be supposed that this spotted area upon a few of the stars so much exceeds that of the sun, both in variation and amount, as to be sensible to such measurement. The spots on the sun go through a regular period in eleven years. It may therefore be called a variable star, with a period of eleven years. It may therefore be said, with a considerable degree of probability, that variations in brilliancy among the stars are due to the regular formation of spots like those on the sun, at intervals which are sometimes fairly regular, and at other times very irregular, according to the constitution of the star itself.

Colored Stars.—A very slight examination will show to any observer of the heavens that the stars are of different colors. The great majority are what would be called white. A few, however, such as Sirius and Alpha Lyrae, have a slightly bluish tint. Many others, as Aldebaran, Arcturus, Antares, and Alpha Orionis, have a reddish tinge. These differences of color are probably due in part to differences in the temperature of the stars, and in the absorbing power of the atmospheres which surround them. It is familiarly known that the color of the light emitted by a piece of heated iron is at first red, and then it changes toward white as the iron gets hotter. This law is so well established in the case of terrestrial bodies that little doubt is felt that the red stars are not at so high temperature as those of other colors. Another curious fact in connection with this is that variability predominates among the red stars. It is thus rendered likely that the red stars are those in the most advanced stage of cooling, and most subject to the formation of spots. Probably if such a star were brought as near to us as the sun is we should find the spots frequently covering half the disk, or more, and changing from time to time in amount, as the spots on the sun change.

Stellar spectra can be distinguished into four categories or types. The first is that of the white or azure-tinted stars, like Sirius, Lyra, etc., β , γ , δ , ϵ , ζ , η of the Great Bear, etc. The spectra of these are almost continuous, except that they are furrowed by four strong black lines, which are absorption-lines of hydrogen. All four lines can be seen in the most brilliant, as Sirius, Lyra, etc.; in the feeblest only the H β , or the F of the sun, is ordinarily visible; but in general this is broad and dilated, and frequently diffused at the edges, especially in Sirius. This is an indication of a very high temperature, and of great density in the hydrogen atmosphere of the stars of this order. There are also seen traces of other lines, as of magnesium, sodium, and some of iron; but these are extremely feeble, and require for their observation an atmosphere of great purity. Many stars appear of uniform light, without lines, which studied with care are found to belong to this type.

The second type is that of the yellow stars. They have very fine lines, and their spectra are perfectly similar in character to that of the sun. Capella, Pollux, and many others feebly yellow have such a character. The fineness of the lines requires that in these researches the atmosphere should be very clear and quiet. Sodium, hydrogen, and iron are very conspicuous in them. Arcturus and Aldebaran, in their periods of lively yellow light, approach this type, and in the periods of red light the following. It is curious that α Ursæ Majoris is of this type, while all the others of that constellation belong to the first.

The third type is that which is exhibited by the orange and red stars. It is formed of lines and zones or nebulous bands. A specially striking example is α Orionis, the prototype of this class, to which belong also α Scorpionis, α Ceti, β Pegasi, α Herculis, and many other beautiful examples. This spectrum ought to be considered as really composed of two spectra superposed—one formed of broad zones of gradually deepening cloudiness, producing the effect of lights and shadows in a fluted column; the other formed of black absorption-lines of the metals. This, for the structure of the broad zones, has for type α Herculis, where the principal channelings are seven in number, but upon these channelings, in the periods of lively red color, the black lines can be perceived. In some variable red stars, in the period of feebleness, is seen a spectrum of a few lively bright lines, as, for example, in α Ceti. The black reversion-lines of hydrogen are feeble, and sometimes not present at all in these spectra, while the sodium, iron, and magnesium lines are very strong; hydrogen is truly there, but is difficult of detection, because the lines are not perfectly reversed.

The fourth type embraces some curious stars, for the most part red. They have only three bands, coinciding in limits with those of the third type, but having twice the breadth; and they are bright notwithstanding the minuteness of the stars. There are lucid lines in some of them, but in general these are feeble and few. They have the bright and well-defined side of their channelings turned toward the violet, while those of the third type turn it toward the red. They appear to give a spectrum similar to that of carbon as it is seen in the central part of the voltaic arch projected between two carbon points; except that, in the stars, the shading off is in the opposite direction—that is, the maximum light is turned toward the violet, while in the carbon arch it is turned toward the red. Many of these stars exhibit only a few luminous lines, and are without the channeled and cloudy spaces; all such are of a deep red, and among them are found the most beautiful spectra.

TABLE B.—THE MORE REMARKABLE STARS OF THE FOURTH TYPE.

Right ascension.	Declination.	Magnitude.
4h. 36.2m.	+67° 54'	6. Fine.
4 42.8	+25 16	8
4 58.1	+0 59	6
6 26.9	+38 33	6.5. Fine.
7 11.5	-11 45	7.5
9 44.6	-22 22	6.5
10 5.8	-34 35	7
10 20.7	-12 39	6. Fine.
10 44.8	-30 30	6.5
12 38.5	+46 13	6. Very fine.
13 19.3	-11 59	7.5
13 47.3	-41 2	7
19 26.5	+76 17	6.5
20 8.6	-21 45	6
21 25.8	+50 58	9
21 38.6	+37 13	8.5
23 39.2	+2 42	6. Fine.

New Stars.—The view has sometimes been entertained that new stars show themselves in the heavens from time to time and that old ones disappear; but neither of these propositions is correct. There is no well-established case of a known star disappearing from the heavens. The supposed cases were those when an observer had made some mistake in recording the position of a star, so that future observers on looking at the place found it vacant. The direct proof that no really new star ever appears is not so easy. As a matter of fact, stars apparently new do appear in the heavens from time to time. The most extraordinary on record was that of 1752, which was described by Tycho Brahe. For nearly a month it was so bright as to be discernible in full daylight. It then faded away, and at the end of another year gradually became invisible. The position of the star was determined by Tycho as well as his instruments would permit, and there is now found to be a telescopic star near the place. Kepler records a similar star, which appeared in 1604, in the constellation Ophiuchus. In October of that year it was of the first magnitude, and remained visible during 1605. It faded away early in 1606.

The question whether such stars were new might have been considered an open one until the appearance of γ Cygni in May, 1860. It was first seen on the 11th of that month, when it had attained the second magnitude. On the question whether the star was visible before that day the testimony is conflicting. The most important circumstances connected with this star is that it was found to have been already recorded in Argelander's catalogue, being a telescopic star of the ninth magnitude. A few days after it blazed forth in the way just described it began to fade again, and has since diminished to its former state. In 1892 a new star appeared in the constellation Auriga, but it did not rise above the fifth magnitude, and would therefore have passed unnoticed but for the watchful eyes constantly directed at the heavens. No certain explanation can be given of these phenomena. In the case of γ Cygni spectroscopic observation seemed to show that the increase of light was due to glowing hydrogen. The suggestion has been made that the outburst was caused by a collision, perhaps by a planet falling into the star. The explanation is purely hypothetical.

Proper Motions of the Stars.—To the unaided vision the stars seem to preserve the same relative position in the heavens from year to year and from century to century. The earliest maps of the constellations show the same arrangement of the stars as the latest ones, but the refined measurements of modern astronomy show a slow motion in the taking place in at least all the brighter stars. This motion, however, does not follow any exact law that has yet been discovered, except in the extent that there is a preponderance of motions in a certain direction in the heavens which may be described as from the constellation Hercules in the northern hemisphere toward that of β Centauri in the southern. The common and natural explanation of this is that the sun has a proper motion toward the constellation Hercules. The preponderance of motions on which this view rests is, however, only the result of a general average; the actual motions of the individual stars take place in all directions. Clusters of stars frequently have a common motion among themselves. This is especially true of the Pleiades, which are moving southward at the rate of about six seconds in a century. The proper motions of the stars all take place in straight lines, so far as observations have yet shown. If any deviations occur, many centuries will be required to show them. For shooting stars, see METEORS.

Stellar Astronomy.—For a very complete general outline of stellar astronomy, reference may be made to the book of Miss Agnes M. Clerke, *The System of the Stars*. The best accounts of the methods of measuring the magnitudes of the stars, and the results of such work, are found in the *Annals of the Harvard Observatory*, especially vols. xiv. and xlv., and in the *Publications of the Potsdam Observatory*, vol. ix., 1894. For details concerning the spectra of the stars, see Schuster, *Spectroscopic Analysis*, translated by E. B. Frost (Boston, 1894). A catalogue of the variable stars, by Chandler, is found in *Ward's Astronomical Journal*, vol. xlii. Among star maps are Proctor's and Collam's, published in England, and Heale's, in Germany. S. NEWCOMB.

Starstone: a variety of sapphire, the *asterion* of Pliny and the *asturion*, found in Ceylon. It presents, when cut in *cabochon*, or in a hemispherical form, and viewed in a direction perpendicular to the axis, a peculiar reflection of light in the form of a star.

Starvation, or Inanition (*starvation* is deriv. of *stare* < M. Eng. *sterven*, die > O. Eng. *starfon* > O. H. Germ. *starben* > Mod. Germ. *sterben*, die; cf. *Ich. starb*, I died, *Ich. lebe*, I am alive. *Inanition* is from Lat. *inani*, the emptiness, deriv. of *stare* re, to empty, deriv. of *inani*, empty); the condition of tissue-waste, exhausted vitality, and death resulting from prolonged privation of food. A slower starvation occurs when food is scanty and unwholesome, or is persistently deficient in one or more of the several constituents essential to the mixed diet of man. Animals have been fed experimentally on single classes of food—one upon albuminoid matter, another partaking of only farinaceous substances, a third only of the hydrocarbons or fats. Such exclusive diet, of whatever kind, proved disastrous; emaciation, enfeeblement, and death by starvation ensued. The phenomena of starvation, complete and partial, have often been studied and recorded, by the shipwrecked, by persons immured in mines, soldiers deprived of supplies, Arctic explorers, as also in the case of the insane and others practicing voluntary starvation. Prolonged abstinence necessitates bodily waste; hence the reported cases of prolonged subsistence without food, usually women apparently in a state of trance or catalepsy, are not to be accredited; carefully investigated, they invariably prove to be artful deceptions by hysterical or demented persons. Rigid exclusion of food and drink causes death, on an average, in from five to eight days. Water, freely supplied, with exclusion of solid food, may prolong life two or three weeks, exceptionally longer. Water constitutes over half the weight and bulk of the body; it is the solvent for all nutritive matter entering the body, and all excreted products which are to be excreted. Even solid food, so called, is in part water. If desiccated food alone be supplied, with no drink, death will result in a few days. Starvation at the outset produces urgent hunger; this may gradually lessen, be replaced by faintness, loss of appetite, and even loathing of food. The strength fails, the body wastes, the mind becomes unbalanced; in some cases there is delirium, and stupor; in others marked nervous excitement and delirium—phenomena excited by non-excreted effete matter accumulated in the blood. The starving person is liable to intercurrent disease, and the community suffering privation is often visited by epidemics of contagious and infectious diseases, which assume an unusually malignant and fatal type, consequent upon the nervous depression and vitiated blood of the persons attacked. Starving persons, when rescued, should not be supplied too suddenly or freely with food; the overworked digestive apparatus can retain and assimilate but small quantities at a time, an excess exciting irritation and dangerous and fatal diarrhoea. Certain diseased conditions may cause starvation; such are stricture and cancer of the oesophagus and upper orifice of the stomach, gastric ulcer, atrophy of the gastric and intestinal glands, and tubercle of the intestine.

Revised by W. PARKER.

Stassfurt: town and railway junction; in province of Saxony, Prussia; on the Bode; 50 miles S. S. W. of Magdeburg (see map of German Empire, ref. 4-P). It is noted for the immense layer of rock-salt in its vicinity, which was discovered in 1827 at a depth of 826 feet and with a thickness of about 1,000 feet. A shaft was finally opened in 1852 and steam-engines used to operate the mine. The total production in 1887 was 301,965 tons of rock-salt and 1,294,081 tons of other salts. An extensive chemical industry has been built up. Pop. (1890) 19,104.

State [M. Eng. *stat*, from O. Fr. *estat* < Fr. *stat*: Ital. *stato* < Lat. *stare*, a standing, position, condition, status, rank, public condition, the commonwealth]; in its present sense, a body politic; a self-governing community organized under permanent law which has for its aim justice and the security of all. It is the best term for denoting communities on their political side whatever their form of government be. The term *nation* implies common origin and language, and as Cicero spoke of the *Greek nation*, although the Greeks never formed a state, nor even a confederation, embracing all who spoke the Greek tongue; and, on the other hand, the kingdom of the Netherlands, such as it was before the disruption in 1830, consisted of inhabitants speaking three languages—Dutch, Flemish, and French—with various earlier institutions and political connections. This was in no sense a nation, but was a state. So Austria at present is not a nation, but is a state where three nationalities at least—a German, a Hungarian, and a Slavonic, to say nothing of Polish and Roumanian and other subjects—are bound together under the same political institutions.

The political senses which the word state and others from the same source took on were more than one. Thus the estates of the later feudal kingdoms were the three or four groups holding the property and represented in the assemblies called the assemblies of the estates. These were the clergy, nobles, burghers, and, in a few countries, the peasants. In the Dutch republic much later each province held a meeting of its estates, and the general meeting of the provinces was called the States-General, where all were represented. The abstract sense of an organized body politic also came into the word. When the North American colonies called themselves free and independent states this sense was adopted, and this sense remained in the term *United States*, which was attached to the new federal republic for want of a better. The reasoning from this term and from sovereignty as to what the rights of the States and of the Union are under the Constitution, instead of discovering from their attributions and powers what they are, has been a source of much confusion and error. Political science, however, is not responsible for this confusion. It knows of independent and of dependent states, of states formed out of states and of simple states, of states under the most varied and dissimilar forms. From the word state, then, we can argue nothing positively of the attributes of that which is so called. The most that can be said is that a state entirely independent and self-governing in order to carry out the ends of its existence ought to have such and such powers. See also SOVEREIGNTY and INTERNATIONAL LAW.

Revised by T. S. WOOLSEY.

State, Department of: the name of an executive department in the U. S. Government, having charge of the relations of that Government with foreign powers. Its head is the Secretary of State, who ranks as the first of the cabinet officers, and is aided in the administration of his office by an assistant secretary, and second and third assistant secretaries. The Secretary not only is charged, under the direction of the President, with all negotiations relating to foreign affairs, but is the medium of correspondence between the President and the executive of the several States, is custodian of the great seal of the U. S., and publishes the laws and resolutions of Congress, proclamations admitting new States into the Union, and amendments to the constitutions. He is further required to issue annual reports to Congress containing information received from members of the consular and diplomatic service.

Staten Island [named by the Dutch in honor of the States- (Dutch *Staten*) General]: largest island in New York harbor; forming Richmond co., N. Y., with county-seat at Richmond (for location, see map of New York, ref. 8-A). It has an extreme length of about 13 miles, extreme width of 8 miles, and area of 58½ sq. miles, and is bounded on the N. by the Kill von Kull, E. by New York harbor, New York Bay, and the Narrows, S. S. E. by Raritan Bay and the lower bay of New York, and W. by Staten Island Sound. It is connected with New York by steam-ferry to St. George, with Perth Amboy, N. J., by ferry from Tottenville, and with Elizabeth, N. J., by a railway bridge across the Arthur Kill. The island is very hilly, has lines of railway extending from St. George to Tottenville and from South Beach to Erastina, and contains the towns of Castleton, Middletown, Northfield, Southfield, and Westfield, in which are the villages of New Brighton, Edgewater, Linoleumville, Port Richmond, and Tottenville. A mile S. E. of Clifton is Fort Wadsworth with a long line of water-batteries, on the north shore is the Sailors' Snug Harbor, and between St. George and Tompkinsville is a U. S. lighthouse station. The island contains many churches, public and private schools, libraries, newspapers, and manufacturing establishments, has excellent drives, and is a place of residence of many New York business men. Pop. (1880) 38,991; (1890) 51,693 (Castleton, 16,423; Middletown, 10,557; Northfield, 9,811; Southfield, 6,644; Westfield, 8,258).

State Rights: See SOVEREIGNTY.

State's Evidence, or (in Great Britain) **King's or Queen's Evidence:** a phrase popularly used to describe the evidence of an accomplice, generally given under an arrangement made with the officer representing the state (in Great Britain the crown) that the witness so testifying shall not himself be prosecuted for the crime of which he confesses himself to be guilty while he is disclosing the guilt of the party on trial. It is often necessary, in order that the ends of justice may not be defeated, that one of several criminals, whether indicted jointly with the others or indicted sepa-

ately, or perhaps not indicted at all, should be procured or suffered by the prosecution to become a witness for the state and to testify on the trial of his fellows, although his evidence may show himself to be guilty of the same offense or of some other offense. When this is done there is generally a tacit understanding or an express agreement with the prosecuting officer that the person whose disclosures are thus used on behalf of the public shall not be brought to trial and conviction. When and with whom such an arrangement shall be made rests on the sound discretion of the officer who represents the people, or, if suit has already been instituted, of the court, and largely depends upon the exigencies of each particular case. The evidence given under such circumstances is of course very suspicious, and it has even been said that as a matter of law no conviction can be had upon the uncorroborated testimony of an accomplice. The better doctrine, however, is, that this is a rule not of the law, but of practice and of expediency. A jury has the power to convict upon such evidence, and their verdict could not be set aside as illegal. The judge should always instruct the jury that the testimony of an accomplice is to be most carefully scrutinized, and that, unless confirmed in material points by other and reliable evidence, a conviction upon it is inexpedient—that the corroboration should extend not merely to the circumstances of the crime itself, but also to the participation therein by the accused who is on trial. Still, such instructions are rather in the nature of advice than of direction or command, and they may therefore be disregarded.

Revised by F. STURGES ALLEN.

States-General: an assembly composed of representatives of the nation. In France it consisted of representatives of the three orders of the kingdom—the nobility, the clergy, and the third estate, or the *bourgeoisie*. Its origin seems to date back to the time of Charlemagne. The first convocation of which history gives an elaborate and authentic report is that of Blois, 1302, by which Philippe le Bel tried to give a greater weight to the course he had adopted in his quarrel with Pope Boniface VIII. The most memorable convocation was that of 1789, which ushered in the Revolution. (See FRANCE, HISTORY OF.) In Holland the name States-General is applied to the legislative body of the kingdom, there distinguishing that assembly from the merely provincial states. The Dutch States-General is composed of two chambers—the upper, elected by the provincial states, and the lower, chosen by the citizens.

States of the Church: See PAPAL STATES.

Statesville: city; capital of Iredell co., N. C.; on the Southern Railway; 25 miles W. by N. of Salisbury, 45 miles N. of Charlotte (for location, see map of North Carolina, ref. 8-E). It is in a stock-raising, a corundum-mining, and a cotton, tobacco, and grain growing region, and contains a U. S. Government building, 7 churches, academy for boys, several public and private schools, manufactories of cotton and tobacco, a national bank with capital of \$50,000, and 2 weekly newspapers. Pop. (1880) 1,062; (1890) 2,318; (1895) estimated, 3,500.

EDITOR OF "LANDMARK."

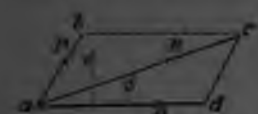
Statice: a genus of plants to which the MARSH ROSEMARY (*g. v.*) belongs.

Statics [plur. of *static*, from Gr. *στατικός* (sc. *ῥέζον*, art), the art of weighing, liter., fem. of *στατικός*, causing to stand, skilled in weighing, deriv. of *ἰσθάναι*, cause to stand]: that branch of mechanics which treats of the properties and relations of forces in equilibrium. By equilibrium is meant that the forces are in perfect balance, so that the body upon which they act is in a state of rest. According to the classification presented in some text-books on the subject, and, in fact, usually employed by engineers, the word statics is used in opposition to dynamics, the former being the science of equilibrium or rest, the latter of motion, and both together constituting mechanics. Other books regard statics as a subdivision of dynamics. See DYNAMICS.

In statics, forces are measured by the pressures that they will produce, and for convenience the unit of pressure is a certain effect of the force of gravitation as indicated by a spring-balance (not by a steelyard or scales) acted upon at some assigned place by a definite quantity of matter. Thus the unit may be the pressure called an ounce, a pound, or a kilogramme, as may be agreed upon beforehand. In the discussions of statics it is convenient to represent forces by lines, the lengths of the lines being proportional to the intensities of the forces, their directions parallel to the direc-

sums of the forces, and their ends denoting the points of application of the forces; reasoning upon the properties of the lines then leads to the properties and relations of the forces themselves.

The resultant of two or more forces is a single force which produces the same effect as the several forces acting together. The components of a single force are forces whose united action produces the same effect as the single one. The process of combining forces into a resultant is called composition and that of separating a single force into components is called resolution. These processes are effected by means of the principle of the parallelogram of forces, which is thus stated: If two forces P and Q



acting upon the material point a are represented in intensity and direction by the lines ab and ad , their resultant R will be represented in intensity and direction by the diagonal ac of the parallelogram $abed$ constructed upon the two given sides. Since the relations between the forces P , Q , and R are the same as between the corresponding lines in the parallelogram, the two following equations result:

$$R^2 = P^2 + Q^2 + 2PQ \cos \delta, \text{ and } \cos \phi = \frac{R^2 + Q^2 - P^2}{2RQ}.$$

The first determines the intensity of R when P , Q , and the angle δ are given, and the second determines the direction of R , or the angle ϕ which it makes with the given force Q . These two equations contain five quantities, and hence, if three of them are given, the other two may be found. The two forces P and Q , acting at a given angle δ , may thus be decomposed into their resultant, and the angle force R may be resolved into any two components whose directions are given. If the resultant R act as represented in the figure from a toward c , it will replace the two forces P and Q ; if it be taken as acting from c toward a it will hold them in equilibrium.

Another fundamental law of the greatest importance is the principle of moments. (See MOMENT.) This teaches that if several forces acting upon a body be in equilibrium there will be no tendency to rotation in any direction, while that of the parallelogram of forces teaches that there will be no tendency to a motion of translation in any direction. Text-books on statics, after having established and illustrated these fundamental principles, proceed to the consideration of parallel forces and to the determination of centers of gravity and moments of inertia of bodies, after which the equilibrium of forces acting through the cord, lever, pulley, inclined plane, and screw, of which all machines are compounded, is discussed, both in its simplest theoretical conception, and as modified by the forces of friction and cohesion. The laws of the equilibrium of gases and of liquids (hydrostatics), with their applications to the barometer, pump, and hydrostatic press, are then developed and illustrated. The treatment of these questions in the elementary text-books exhibits, however, only the first principles, and forms merely the introduction to the science, whose complete development in its several departments must be sought for in special and technical treatises. Among these, where experiment lends its aid to theory by determining the necessary constants for the full discussion and application of the laws of friction, elasticity, and tension, may be mentioned the theory of the equilibrium of arches and bridges, the theory of the flexure of elastic bodies, the theory of the strength of materials subject to forces of tension, compression, shearing, or torsion, the theory of the tension of fluids, and the statics of molecules.

The forces which come under consideration in statical investigations are all the forces of nature which can be measured by pressures. As to their origin, they may be forces of gravitation, of molecular attraction and repulsion, of friction, or of muscular strength. If the equilibrium of a system of forces is disturbed, motion ensues, and statics passes into kinetics. The very disturbance of equilibrium, however, calls into action the resistance of inertia, and by the consideration of this resistance as a force the laws of statics become applicable, even though the body be not at rest. For by the principle of d'Alembert (which is nothing more than a particular case of Newton's third law of motion) the resistance of the inertia of a body at any instant of its motion is equal and opposite to the resultant of all the exterior forces acting upon it. Hence, regarding inertia as a force,

all the forces acting upon a moving body at any instant are in equilibrium, and the principles of statics suffice for their discussion. It thus appears that statics is but a special case of kinetics, and that the law of d'Alembert furnishes the means of passing from one to the other.

HISTORY AND LITERATURE.—The first recorded principle of statics is that of the equilibrium of weights on a lever, which is a special case of the principle of moments. This was discovered by Archimedes (B. C. 287-212), as also its application in the determination of the centers of gravity of plane figures; in his writings also appear the first investigations concerning the equilibrium of bodies floating or immersed in liquids. For 1800 years after his time there was no further advance. The next step was made by Stevinus (1548-1633), who represented the intensity and direction of forces by straight lines, deduced the principle of the resolution of forces in rectangular directions, and investigated the equilibrium of a body resting upon an inclined plane. Next followed the principle of the parallelogram of forces, which, partially implied by the methods of Stevinus, was only completely established by the labors of Galileo (1564-1642), Varignon (1654-1722), and Newton (1642-1727). To Varignon is also due the development of the simpler properties of the force and equilibrium polygons. About the same time the statics of fluids began to receive attention, the first true explanation of their equilibrium being due to Torricelli (1608-47), the inventor of the barometer. The application of these principles has since those days occupied the attention of a host of writers, and the science has grown to a vast extent. The new branch of graphic statics may be said to have been entirely developed since 1866, when Culmann's work appeared. For detailed information concerning the early history of the subject, see the section on mechanics in Whewell's *History of the Inductive Sciences* (London, 1847; New York, 1859). SEE COMPOSITION OF FORCES, DYNAMICS, FORCE, GRAPHIC STATICS, HYDROSTATICS, MECHANICS, MOMENT, AND STRESSES. MANSFIELD MERRIMAN.

Stations of the Cross: a series of figures or pictures, usually fourteen in number, representing the various stages of the *Via Dolorum*, or our Lord's Passion on the way to Calvary. They are generally found in every Roman Catholic church. In Roman Catholic countries they are often erected by the wayside, in cemeteries, on prominent sites, etc. J. J. K.

Statistics [plur. of *statistic*, liter., pertaining to a statistic or to matters of state]: in its simplest meaning, a description of any class of facts expressed by means of figures. The credit of having founded a science of statistics is usually given to Prof. Achenwall (1712-72), of the University of Göttingen. According to him the total of *Staatsverhältnisse* (the remarkable things pertaining to the state) makes up the constitution of a state in its broadest sense, and "an account of such constitutions of one or more states is statistics." In the development of statistics since Achenwall there seems to have been two stages, or, as Maurice Block prefers to express it, a twofold tendency. The one confines itself to descriptive statistics, that is to say, to a picture of society or of the state, or of any phase of human activity, drawn in figures, and in this manner reduced to measurements. The chief merit of this phase of statistics lies in the fact that it permits a study of conditions by means of comparison. The other tendency is the development of statistics goes a step further than description, and by submitting any class of facts at different times to systematic observation reduces change itself to numerical measurement, and in this way seeks to prove relationships and to discover laws of growth.

Historical Sketch.—(a) *Statistics as a Branch of Government Service.*—The collection of facts pertaining to a state was undertaken long before scientific statistics were thought of. The book of Numbers is in fact a statistical report. There is record of statistical work in China in 2300 B. C. In Greece and Rome also there was considerable activity in systematic collections of data pertaining to national life. In 594 B. C. a census was taken in Greece for the purpose of levying taxes which divided the people into four classes according to wealth. Athens took a census of population in 399 B. C. The constitution of Servius Tullius, 550 B. C., distinguished six property classes. These are all instances of work which in modern times would be called statistical. Also there is evidence that in the Middle Ages there was national enumeration of population or of property. The work, however, was suggested by some practical necessity.

as, for example, the *Domesday Book* of William I., 1088 A. D., or the *Land Register* of Waldemar II., 1231 A. D. In the fifteenth century evidently there was an unusual interest in systematic investigations into the conditions of the various countries of Europe. A second revival of interest in statistical work took place in the latter part of the eighteenth century, due to the new measures, the new hopes, and the new ideas which came in with the French Revolution. In France the need of definite information was formally recognized, and a commission established to collect data for reforms in administration and finance. This finally led to the establishment of statistical bureaus in France, as also in all other countries which felt the influence of modern political life. The need of statistical investigation is one which increases as the spirit of popular government becomes more intense, or the means of realizing popular government more perfect.

(b) *Statistics as a Branch of Knowledge.*—When statistics was first recognized as an independent study, the claims made for it were very broad and comprehensive. The course of lectures in which Achenwall founded this branch of investigation placed before itself this purpose, "To gain political wisdom by means of a knowledge of the various states." His plan contemplated a comparative study of all modern states under seven distinct heads: Literature, geography, physiography and fertility, the number and character of inhabitants, the rights of the several classes, the organization of the state, and a consideration of the needs of the state. The work of Achenwall exerted a great influence throughout Europe. The name of Süssmilch (1707-67) must also be mentioned, since his work was the first which conclusively proved the existence of a rigid law in the matter of births and deaths. Annuities and life-insurance, which presupposed such a law, existed indeed in the Middle Ages, but they were not regarded as a business which could be conducted on a scientific basis. The view taken by Süssmilch was carried further by the well-known Belgian writer, Quetelet (1796-1874), whose work entitled *Sur l'homme et le développement de ses facultés ou essai de physique sociale* declares that the constant averages in moral statistics are a proof that the actions of mankind are regulated by laws. The field of statistics as it was first defined was curtailed by the rise of independent sciences in the latter part of the eighteenth century. The development of political economy at the hands of Adam Smith took from statistics one phase of its investigation. The development of public and administrative law and of practical life-insurance deprived it of other lines of investigation. Thus the scope of statistics as originally held has been very materially narrowed.

Is there a Science of Statistics?—The phrase "science of statistics" has been loosely used to convey a number of indefinite ideas. Its claim to be a science usually rests on the observation of uniformity in those domains of human activity which are commonly regarded as subject to the control of the individual. For example, one would suppose that suicides, being wholly under the direction of the individual will, would show no rule of recurrence, but a study of the statistics of suicides shows that nothing is more constant in its recurrence than the cause for which, the time in which, and the manner by which suicides are committed. The same is true in any domain of human activity, so much so indeed that by the use of statistics one is able to predict with a very great degree of assurance what is likely to happen. This fact, however, does not seem to make good the claim that statistics may be regarded as an independent science, but indicates rather the possibility of scientific treatment of all social and moral questions. From this point of view statistics comes to be a method of investigation. It is not an independent science, but a branch of the science of logic. Were the existence of a science of statistics admitted, it would necessarily be a science that would include investigations into every department of political, social, and industrial life, since all of these may be studied by the statistical method. Accepting then statistics as a science of method, it may be regarded as consisting in a systematic observation and classification of facts.

Methods of Comparison in Statistics.—The chief use of statistical investigation, in addition to the discovery of laws of constant recurrence, is the discovery of laws of change. It is the peculiar office of statistics to discern the direction of progress and to measure both the actual and the relative strength of the forces which impel it, and this it does by providing the means of accurate comparison between conditions of society and phases of human activity at various

times. This, however, is no light task. The difficulty in carrying it through arises from the fact that the mass of data necessary for accurate description is likely to be so great that the mind can not grasp it. The student who avails himself of statistics as a means of reasoning is, on this account, obliged to reduce the mass of information presented to him in the form of tables of figures to some simple equivalent for the purpose of comparison, or, if the data comprises incongruous factors, they must be reduced to some common denominator. There are several methods by which this may be accomplished, and the trustworthiness of the conclusions arrived at depends in very large measure upon the intelligence with which these methods are followed. Three of these methods may be noted: First, statistics may make use of percentages as a basis of comparison either for the purpose of measuring the relative importance of similar factors, which, taken in the aggregate, comprise a total, or for the purpose of measuring the progress or regress of specific lines of facts during a definite period of time. The chief error to which the use of percentages as a basis of comparison is liable arises from the failure to observe the basal numbers upon which percentages are computed. For example, an increase of 10 miles in railway mileage in a district which had but 10 miles to start with would show a higher percentage of increase than an increase of 1,000 miles in a district which had 10,000 miles of line at the outset. One who reasons by means of percentages must hold constantly in mind that he is dealing with ratios and not with absolute facts. A second method of bringing large masses of facts into usable shape is by means of "index figures." All investigations must of course begin at some definite period of time, and all the facts subjected to observation are arbitrarily reduced to some common basis. The subsequent changes for each line of facts are then set down in their relation to this assumed basis, and the divergence which in this manner is brought to light shows clearly the relative movements. For the purpose of illustration let it be assumed that one desires to investigate the changes in the prices of various commodities. The price of all articles considered will be set down, let us say, as 100; subsequent variations from what may be termed the original price are noted with relation to this figure, and the divergence of quotations from the assumed index figure shows the changes in price of any particular commodity as compared with other commodities. The general movement also in the price of commodities as compared with the index figure indicates the trend of general prices. Thus the index figure serves for the statistician a purpose similar to that which the "bench mark" serves for the civil engineer. Third, the most common basis of comparison is by means of averages. The idea of an average is to obtain a typical unit. A typical unit may be accepted as the representative of the mass of facts from which it is deduced, and as such can be used as a basis of comparison. There is great danger, however, in reasoning upon a basis of averages. This is not because the theory of averages is incorrect, but is due to the difficulty of obtaining an average which is really typical in character. Two rules must be observed in arriving at a true average. In the first place, a sufficiently large number of individual facts must be collected to nullify the influence of any unusual or abnormal cases. In the second place, individual facts should be allowed to influence the average in proportion to their relative importance. For example, wheat is relatively of more vital importance to the people than silks, and any investigation which holds in view the effect of changes in prices upon the wellbeing of a community must lay greater stress on variations in the price of wheat than in that of silks. Again, it will not do in determining the average of wages to rely upon the daily rate of wages reported as paid, but the number of days in the year for which the workmen receive the stated wages must also be taken into account. As in the case of percentages, it is necessary that averages should be used in an intelligent manner, and with a clear appreciation of what they mean and how they are obtained.

Use of Statistics.—The most familiar use made of statistics is to portray existing social conditions and to measure the strength of existing social forces. A statistical inquiry has been aptly termed an instantaneous photograph expressed in figures. They are of immense importance to the statesman in gaining a knowledge of the exact condition of the country, and if several statistical investigations, taken at different times, be subjected to comparative scrutiny and studied in the light of current history, the knowledge thus

valued should guarantee society against pernicious legislation. This is the original idea of statistics, and it is perhaps at present the most significant. The economist and the student of philosophy also derive great assistance from statistical investigations in that they throw light upon the character of nations and the character of individuals, without which no trustworthy conclusions may be arrived at. At present, however, there is another and a more practical use which statistics are in some degree coming to serve. The tendency toward combination of industries and concentration of capital is very marked. The trust and various forms of combinations among corporations seem to have become a permanent form of industrial organization. This tendency has brought society face to face with the monopoly problem, and the question frequently presents itself, How will society be able to control this great aggregation of capital and at the same time maintain the conditions of individual liberty? Without attempting a discussion of this question, it is suggested that the increasingly organic character of society is recognized the more complete will be the reliance placed upon the principle of publicity as a principle of control. Wherever the principle of publicity is realized, however, these statistics must become of relatively more and more importance. The final use of statistics, then, as here suggested, is that they may serve as the medium for realizing the conservative influence which lies in the principle of publicity. The revival of interest in statistics since 1870 can only be explained by a recognition of their great importance from the point of view of administrative control.

Branches of Statistical Inquiry.—There is no limit, so far as theory is concerned, to the possible development of statistical investigation, nor is there any universally accepted classification. The classification here submitted is the one adopted by Haushofer, professor in the School of Technology at Munich, and gives four heads: Population statistics, industrial statistics, statistics of social and political life, and moral statistics. Under population statistics are included all extensive class of facts. Thus in addition to the actual count there is included a classification of population by territorial groups for the purpose of ascertaining the density of population. Changes in population are also included, thus bringing into under all questions of birth-rate and death-rate (see *VITAL STATISTICS*) and immigration. The facts pertaining to the physical life of the people are also included under population statistics, as, for example, expectation of life at various ages (see *LIFE-MATHS*), classification on a basis of age, and other like facts. Under industrial statistics are included all facts pertaining to the production, the exchange, the distribution, and the consumption of wealth, as also to the means or instruments by which the industrial process is carried on. Statistics of wages, capital, railways, money, prices, and the like are all included under the head of industrial statistics. The statistics of social and political life include that large range of facts descriptive of the manner in which people live and of the governments under which they live. Under the head of moral statistics are included all facts which indicate the character and habits of the people. Here are to be found the statistics of education, of religion, of crime, of marriage, of the dependent classes, and others of like character.

Official Statistics in the U. S.—It is not possible to give a complete list of the bureaus of investigation for which the State and Federal governments have made provision in the U. S., but a few of the more important may be mentioned. In the Federal Constitution it is provided that a census shall be taken once in ten years, and many of the States also require that a State census shall be taken at certain intervals. In 1870 the scope of the Federal census was greatly extended until at present it may be regarded as a statistical bureau in the widest sense of that term. (See *CENSUS*.) The Agricultural Department has a bureau of statistics which aims to collect all facts of interest to the growers and consumers of farm products. The Treasury Department, in addition to financial statistics, maintains a bureau of statistics which makes regular reports on the imports and exports of the U. S. The comptroller of the currency makes annual reports upon the condition of banking, and the director of the mint upon coinage and the production of the precious metals. The commissioner of education publishes a yearly report on education in the U. S., showing the number of schools, colleges, and universities in the republic, the number of pupils attending each grade of school, the number of teachers, their compensation, and other similar facts. There is also a department of labor established by Congress

for the purpose of collecting statistics of especial interest to the working classes. The interstate commerce commission also provides for an annual publication of the statistics of railways. In addition to these provisions for the collection and compilation of statistics, Congress frequently authorizes special investigations into special topics. The public documents of the Federal Government are rich in statistical material, while many of the States maintain efficient bureaus for the collection of facts of local interest.

LITERATURE.—The following are some of the important statistical works: *Lehr- und Handbuch der Statistik*, by Dr. Max Haushofer; *Traité Théorique et Pratique de Statistique*, by Maurice Block; *The History, Theory, and Techniques of Statistics*, by August Mehm, translation into English by Roland Falkner; *Die Moralstatistik*, by Alois von Oettingen; *Journal of the London Statistical Society*; publications of the American Statistical Association; *Bulletin de l'Institut International de Statistique*.
HENRY U. ALLAN.

Statins, CUCULIN. See CUCULIN STATIN.

Statius, PUBLIUS PAVINUS, author, is about 45 a. d. in Naples; seems to have acquired early and rapidly a great fame by his victories in the Alban poetical contests, and then to have lost it again as rapidly after his defeat in the quinquennial contest instituted by Domitian, but very little is known of his personal life. He lived at one time in Rome and enjoyed the favor of Domitian, but died about 96 a. d., in retirement at Naples. Juvenal is the only contemporary author who mentions him. For the story that Domitian stabbed him in a fit of anger there is no foundation. Of his works are still extant *Silvæ*, *Libri V.*, a collection of miscellaneous poems; *Thebaidos Libri XII.*, translated into English, the first book by Pope, the first five books by Thomas Stephens (1648), the whole poem by W. L. Lewis (1767); *Achilleidos Libri II.*, unfinished, translated into English by Howard (1656); best editions by Anser and Lonsie (4 vols., Paris, 1825-30); *Thebaidos Libri I.-VI.*, by G. Müller (Leipzig, 1870); *Silvæ*, by Böhrens (Leipzig, 1870); and *Achilleis und Thebais*, by Kohlmann (Leipzig, 1879-80).

Revised by M. WAGNER.

Statoblast: one of the peculiar thick-walled buds occurring in fresh-water sponges and polyzoans, which serve to carry the species over periods of drought or of freezing weather.

Statuary: See SCULPTURE.

Status: a term of the Roman law, borrowed thence by the jurisprudence of continental Europe, denoting the legal condition of a person, or the sum of his capacities and incapacities to hold legal rights or to be subjected to legal duties. The word does not belong to the technical nomenclature of the American and English law, although it is used by some modern text-writers in the same general sense in which it was employed by the Roman jurists. In the Roman law there were three grades of status or legal condition, the lower and more general of which might exist without the others, while the higher and more special always presupposed the lesser. The first and most general was that of liberty (*status libertatis*), by virtue of which a person was either a freeman (*liber*) or a slave (*servus*). The second was that of citizenship (*status civitatis*), by virtue of which a person was either a citizen (*civis*) or a stranger (*peregrinus*). The highest was that of the family (*status familiaris*), by virtue of which a person might be the head of a household (*paterfamilias*) and his own master (*sei juris*), or under the control of another (*alieni juris*), as a son, daughter, wife, ward, and the like. An individual might be a freeman without being a citizen or the head of a household, but he could not be the head of a household without being at the same time a freeman and a citizen. It was possible that a person might lose a higher status, and yet remain in a lower condition; he might cease to be *sei juris*, and still be a citizen; he might forfeit his citizenship, and yet remain free; finally, in the earlier periods of Roman history at least, he might sink from freedom into slavery. Although there is not in U. S. law the technical term *status*, it is plain that to a certain extent the facts denoted by it are present. It is true that at birth a person becomes clothed with the great mass of rights conferred by the law of the U. S., but he may be subjected to certain special capacities or incapacities depending upon the existence of particular circumstances. Among these incapacities are those resulting from infancy, lunacy, marriage in case of the wife, conviction or imprisonment for

crime, public pauperism, and the like. Among the special capacities the most important are those pertaining to citizenship and to the electoral franchise. In the U. S. the differences of legal condition or status belonging to class, rank, profession, or trade have no existence, for every person—at least every sane person—is clothed with the same capacity in respect to these subjects. See **LIBERTY, CITIZEN, and MARRIAGE**. Revised by F. M. BURDICK.

Statute of Frauds: See FRAUDS, STATUTE OF.

Statutes [viâ O. Fr. from Late Lat. *statutum*, liter., something established, neut. perf. partic. of *statuere*, *statutum*, set up, establish, deriv. of *status*, condition, status]: laws in a written form enacted by the supreme legislative authority of a nation or commonwealth, as contradistinguished from laws established by judicial decision. In its generic sense the term includes all legislative as opposed to judicial creations of the law, whatever be the nature and organization of the body—persons or person—which exercises the creative function.

Their Sources.—The sources from which statutes have emanated or may emanate, according to the varying political constitutions of different states, are the general or partial assemblies of the citizens, the emperors, kings, or other single heads of despotic governments, and the representative assemblies, either hereditary or elective. The *leges* and *plebiscita* of the Roman citizens during the republic were produced by the first class of legislators; the "constitutions" of the Roman emperors by the second; while the parliaments of Great Britain and of many other European nations, the U. S. Congress, and the State Legislatures are the modern forms of the third. The extent of the powers held by these bodies is determined by the organic law of each country. The British Parliament is said to be omnipotent; which simply means that the restrictions under which it ordinarily acts are self-imposed. In the U. S. the most remarkable feature of the political organization is the express, positive, and extensive limitation of the legislative function contained in all the written constitutions, which are themselves fundamental statutes adopted by the people in their sovereign capacity. With every new revision of the State constitutions this limitation in reference to the forms and modes of legislation, as well as its subject-matter, is made more far-reaching, minute, and prohibitory.

Their Kinds.—Statutes are variously classified, according to their external form and according to their subject-matter and effects. See **LAW and JURISPRUDENCE**.

Their Parts.—Statutes in Great Britain and the U. S. may, and sometimes do, comprise the following distinct parts: the title, the beginning or enacting clause, the preamble, and the purview. The *title* is a brief preliminary description, e. g. "An act for the amendment of the law." It has become of great importance in the law of the U. S., since most of the State constitutions prescribe in substance that every statute shall contain but one subject, and that this shall be properly expressed in the title. By the *commencement* is meant the formal enacting clause—namely, "Be it enacted by the Senate and House of Representatives of the U. S. of America, in Congress assembled," and "Be it enacted by the queen's most excellent majesty, by and with the advice and consent of the Lords spiritual and temporal and Commons in this present Parliament assembled, and by the authority of the same." The *preamble* is a preface setting forth the reasons and motives for the act. Once very common, it is now generally omitted. The *purview* is the main body, the effective portion of the statute, which contains a statement of the legislative will, and declares its object and purpose. Among the special clauses or subdivisions which may be found in it are the interpretation clause, the saving clause, the repealing clause, the provisos, the exceptions, and the schedules, the objects of which are sufficiently indicated by their names. In codes, whether complete or partial, a more orderly and scientific arrangement of parts is always made, and a division, according to some general plan, into books, titles, chapters, sections, and the like is universal.

When Operative.—The time when statutes take effect is fixed in most of the States of the U. S. either by a constitutional provision or by a general law. In some they become operative at the expiration of a specified number of days after the close of the session, in others at a specified period after the day of their passage; but the Legislature may in the body of a statute prescribe a different time, as, for example, that it shall take effect immediately. The common

law made an act operative from the first day of the session at which it was passed, but this absurd doctrine was abolished in the thirty-third year of George III., and all laws were declared to be binding from the time when they received the royal assent. The repeal of a statute may be either express or by implication. It is express when effected by a clause inserted for that specific purpose in a subsequent act; it is by implication when the provisions of a later enactment are wholly and irreconcilably inconsistent with those contained in an earlier one. Repeal by implication is not favored. If the two statutes concerning the same subject-matter can possibly be harmonized, both will stand; if the contradiction is absolute, the prior one gives way. For a treatment of other topics connected with the general theory of statutes, see **INTERPRETATION, CONSTITUTION, CODE, LAW, and LAW-MAKING, METHODS OF**.

Revised by F. STURGES ALLEN.

Statutes of Limitation: See LIMITATION OF ACTIONS.

Stäudlin, stoid-leen', KARL FRIEDRICH: author; b. at Stuttgart, July 25, 1761; studied theology at Tübingen 1779-84; traveled in Switzerland, France, and England, and was appointed in 1790 Professor of Theology at Göttingen, where he died July 5, 1826. His numerous writings relate mostly to Church history, such as *Universalgeschichte der christlichen Kirche* (Göttingen, 1806; 5th ed. 1833); *Kirchliche Geographie und Statistik* (2 vols., 1804); *Allgemeine Kirchengeschichte von Grossbritannien* (2 vols., 1819); or to the history of special theological disciplines, such as *Geschichte der Sittenlehre Jesu* (4 vols., 1799-1822); *Geschichte der christlichen Moral seit dem Wiederaufleben der Wissenschaften* (1808); *Geschichte der Moralphilosophie* (1822), etc. His first work, strongly impregnated by the reigning rationalism, was *Geschichte und Geist des Skepticismus* (2 vols., 1794). His autobiography was published by J. T. Hemsen (1826).

Revised by S. M. JACKSON.

Staunton: village; Macoupin co., Ill.; on the Chi., Peoria, and St. L. and the Wabash railways; 14 miles S. S. W. of Litchfield, 36 miles N. E. of St. Louis (for location, see map of Illinois, ref. 8-D). It is in an agricultural and coal-mining region, and contains a private bank and a weekly newspaper. Pop. (1880) 1,358; (1890) 2,209.

Staunton: city (incorporated in 1749); capital of Augusta, co., Va.; on the Balt. and Ohio and the Ches. and Ohio railways; 39 miles W. by N. of Charlottesville, 60 miles N. of Lynchburg (for location, see map of Virginia, ref. 5-F). It is in an agricultural region; has important manufacturing; is the seat of the State Deaf, Dumb, and Blind Institution and of the Western Lunatic Asylum; and is noted for its educational institutions, which include a military academy, 4 seminaries for young ladies, and 2 business colleges. There are 2 national banks with combined capital of \$300,000, a savings-bank, and a daily, a monthly, and 8 weekly newspapers. Pop. (1880) 6,664; (1890) 6,975.

EDITOR OF "NEWS."

Staunton, Sir GEORGE LEONARD: traveler and diplomatist; b. at Cargin, Galway, Ireland, Apr. 19, 1737; educated at Dublin and at Montpellier, France, where he graduated in medicine; returned to England 1760; wrote for London periodicals, acquiring the friendship of Dr. Johnson and other eminent men of letters; settled in 1762 as a physician in the island of Grenada in the West Indies, where he held several official positions, including that of attorney-general, for which he had qualified himself by legal study, and acquired a considerable fortune, which he invested in landed estates; formed in 1774 an intimate friendship with Lord Macartney, the new governor of the island, with whom he was sent prisoner to France on the capture of Grenada in 1779, and whom he accompanied as secretary during his governorship of Madras (1781-84) and his celebrated embassy to China (1792), of which he published in 1797 an interesting narrative. D. in London, Jan. 14, 1801. He was made a baronet 1784 in reward for his success in negotiating a treaty with Tippoo Sahib.—His son, Sir GEORGE THOMAS, b. at Milford, England, May 26, 1781, accompanied his father to China in 1792; learned the Chinese language; held important posts in China in the service of the East India Company; returned to England 1817, and was a member of Parliament, with short intervals, from 1818 to 1852. D. Aug. 10, 1859. He wrote a *Memoir* of his father (1823), an autobiography (1856), and published various works on China.

Staunton, HOWARD: Shakspearean scholar and chess-player; b. in England in 1810; educated at Oxford; settled

in London, was the champion chess-player of his day; edited for many years *The Chess-players' Chronicle* and the chess column of *The Illustrated London News*; published several manuals of the game, including the *Handbook* (1844), *The Companion* (1849), *The Chess Tournament* (1851), and *Chess Praxis* (1869). He published an edition of *Shakespeare's Plays and Poems* in vols., 1857-60, and library ed., 4 vols., 1869, preceded by a *Life*, a photolithographic facsimile of the celebrated "first folio" of 1623 (1866); *Memoirs of Shakespeare, his Will, Indentures of Conveyance, etc.*, photographed (Apr., 1864); also published *The Great Schools of England* (1865; 2d ed., 1869). He was extremely familiar with Elizabethan dramatic literature, and sometimes acted, chiefly in Shakespearean dramas. D. in London, June 25, 1874. Revised by H. A. Berns.

Staunton, William, D. D.: clergyman; b. at Chester, England, Apr. 20, 1803; removed to the U. S. in 1819; was ordained deacon in the Protestant Episcopal Church June 9, 1833, and priest Sept. 7, 1834; rector of churches at Roxbury, Mass., Morristown, N. J., Brooklyn, N. Y., and Potsdam, N. Y. He was the author of *A Dictionary of the Church* (New York, 1840, 1844), republished, much enlarged, as *An Ecclesiastical Dictionary* (New York, 1861); *The Book of Church, Songs, and Prayers for the Family Altar* (1860); *The Book of Common Prayer* (1866); *Voluntaries for the Organ*; and a prize *Te Deum*. D. in New York, Sept. 23, 1889.

Staunton River: a stream of Southern Virginia; rising in the Alleghany Mountains in Montgomery County, flowing N. and S. E. through a pass in the Blue Mountains, and emptying into the Dan at Clarksville, Mecklenburg County, to form the Roanoke. In the first 20 miles of its course it descends 1,000 feet; its entire length is about 900 miles.

Staupitz, now *plis*, *Jomax*; vnc: *medesastie*; descended from a noble family in Meissen, but his parentage and birth-date are unknown; entered the Augustinian order; became prior of its convent in Tübingen 1497, where he took D. D. 1498. Turning entirely from the barren method of the schoolmen, he found in the writings of Augustine and the medieval mystics his spiritual models; took a very active part in the foundation of the University of Wittenberg 1502, and was appointed its first Professor of Theology; became, as vicar-general of the Augustinian order in Germany (1503), acquainted with the young Luther, for whom he conceived a warm friendship, and on whom he exercised considerable influence; procured his appointment as professor in Wittenberg 1508, approved fully of his theses against the sale of indulgences, and gave him, during the first stage of his contest with the Roman Catholic Church, his valuable and effective support. Subsequently, when the controversy became too violent, and an open breach with the Church took place, he retired from Wittenberg 1512, but continued to be vicar-general until 1520. He then went to Salzburg as court-preacher to the archbishop and became abbot of a Benedictine monastery 1522. D. there of apoplexy, Dec. 28, 1534. His friendship for Luther remained unaltered to his death: all the Reformer's writings were found in his library, and his own works, *De Amore Dei* and *De Fide Christiana*, show the spiritual sympathy he felt for the Reformation. Roman Catholic writers have explained the support he gave Luther as an act of jealousy because the sale of indulgences was given to the Dominican, and not to the Augustinian order. A new edition of his works was begun by J. K. P. Knauke (vol. i., *Deutsche Schriften*, Götting, 1867). For his *Biography*, see works by T. Kuhn (Götting, 1870) and L. Keller (Leipzig, 1888).

Revised by S. M. Jargsoy.

Stavang'er: an old town of Norway; at the head of Boksfjorden; about 100 miles S. of Bergen (see map of Norway and Sweden, ref. H-A). It has a cathedral dating from the eleventh century and two harbors. It exports timber and salt herrings. Pop. (1901) 23,030.

Stave, or Staff: in music, the lines and spaces on which the notes are placed. See *NOTATION*.

Stavropol: government of Russia, bordering on the Caspian Sea; area, 23,297 sq. miles. It is mostly low and flat, dotted all over with shallow lakes and covered with extensive swamps. In the southwestern part agriculture is the principal occupation; wheat, millet, wine, and mulberry are cultivated. In the northeastern part the inhabitants are nomads, and immense herds of cattle, horses, and sheep are reared. Pop. (1890) 672,358.

Stavropol: capital of the government of Stavropol, Russia; a fortified town with a trade in cattle, horses, sheep, skins, wool, furs, and honey (see map of Russia, ref. H-A). Its sulphur springs are much frequented. Pop. 35,012.

Stchedrin, *stshed-roon*: pseudonym of MIKHAIL KHRISTIANOVICH SAKHAROV, a satirical writer born in the government of Tver, Russia, Jan. 15, 1826. He entered the Government service in St. Petersburg in 1844, but was removed two years later to Viatka for his two first published stories. Pardoned in 1858, he continued his official career till 1865, after which he devoted himself exclusively to literature. He ranks with the greatest Russian authors of his day, and with the chief satirical ones of all time. In his numerous tales and sketches he touched on every class of society, bringing out with masterly skill their characteristics, at times with brilliant wit, at others with deep pathos, alternately soothing, sad, and amusing, full of originality as well as of the most acute observation. Unfortunately, his works demand an intimate acquaintance with Russian affairs, and, owing to the necessity of escaping the jealousy of the owners, often have to convey their meaning by allusions almost impossible for a foreigner to grasp. Of the many volumes of his works, among the best known are the *Satire a Paris* (satires in prose) and *Nepriyemlye Razgovory* (unpleasant talks, both in 1863); *Dnevnik Prosvetitel'stva* (Diary of a Prosvetitel), *Tashkent'sky* (The People of Tashkent), *Ryuganovskoye Rusko* (Well-known Speeches, 1876), etc. Two or three of his stories have been translated into English; more into French and German. D. in St. Petersburg, May 10, 1890. A. C. C.

Stead, William Thomas: journalist; b. at Middleton, Northumberland, England, July 5, 1849; son of a Congregational minister; became editor of *The Northern Echo*, a halfpenny daily, 1871; assistant editor to John Morley on *The Pall Mall Gazette* Sept., 1880; editor of that paper 1883-90; founded *The Review of Reviews* Jan., 1890. As the editor of *The Pall Mall Gazette* he introduced the system of interviewing and illustrations into the daily newspapers of Great Britain. In July, 1895, he published *The Maiden Tribute of Modern Babylon*. For some of his acts in procuring the evidence on which his statements were based he was imprisoned for three months. The Criminal Law Amendment Act of 1885 was passed in consequence of his exposure. In 1890 he established *Boothland*, a periodical devoted to Spiritualism. He has also published *No Reduction, No Rest, a Plea for the Plan of Campaign*, *Truth about Russia: The Pope and the New Era*, and *If Christ came to Chicago*. C. H. THORNB.

Steam (M. Eng. *stew* < O. Eng. *stōm*, vapor, smoke; Dutch, *stoom*; Fris. *stoams*, steam); aqueous vapor. This substance is of great interest to students of physics and likewise, on account of its application in nearly all thermal engines, to the engineer.

The physical properties of steam, which, like those of other vapors, are less simple than those of a perfect gas, have been exhaustively studied. Some of these properties will be briefly described.

Fluctuations of Boiling-point, Maximum Tension.—Water is converted into steam, at all temperatures, by evaporation. Even below the freezing-point the solid aqueous materials known as ice and snow evaporate slowly unless surrounded by an atmosphere saturated with aqueous vapor.

The process by which steam is obtained for practical purposes, however, is distillation, which begins whenever, at any temperature, the tension of the forming vapor within the mass of the liquid becomes equal to the pressure exerted upon it by the liquid itself and by the superimposed atmosphere above the surface of the latter. Boiling depends then upon a property of steam which enables it to exert pressure, an expansive power which is a function of the temperature. This property, for which the term *tension*, or sometimes *vapor-tension*, is used, has been determined with the utmost exactitude by Regnault. His results are given in Table I., in which the vapor-tension is expressed by means of the height (in centimeters) of the column of pure mercury which the steam is capable of sustaining. This is the quantity given in the second column. It is also expressed in terms of the pressure in grammes which the steam exerts upon a square centimeter of surface (third column of the table).

If the data given in the first two columns of Table I. are plotted with temperatures as abscissas and tensions as ordinates, the result will be a graphical representation of the results obtained by Regnault. This method of presentation

TABLE I.—TENSION OF STEAM AT VARIOUS TEMPERATURES.

Tempera- ture.	Tension in cm.	Pressure upon 1 sq. cm.	Tempera- ture.	Tension in cm.	Pressure upon 1 sq. cm.
		Grammes.			Grammes.
-30° C.	0.0386	0.52	105° C.	90.641	1,232.36
-25	0.0605	0.82	110	107.537	1,432.10
-20	0.0927	1.26	115	126.941	1,725.90
-15	0.1400	1.90	120	149.128	2,027.55
-10	0.2093	2.85	125	174.388	2,370.98
-5	0.3113	4.23	130	203.028	2,760.37
0	0.4600	6.25	135	235.873	3,200.13
+5	0.6534	8.88	140	271.763	3,694.90
10	0.9165	12.46	145	312.555	4,249.50
15	1.2699	17.27	150	358.123	4,869.04
20	1.7391	23.65	155	406.856	5,558.81
25	2.3550	32.02	160	465.162	6,324.34
30	3.1548	42.89	165	527.454	7,171.27
35	4.1827	56.87	170	596.166	8,105.47
40	5.4906	74.55	175	671.743	9,133.02
45	7.1391	97.06	180	754.639	10,260.1
50	9.1961	125.06	185	845.223	11,493.0
55	11.7478	159.72	190	944.270	12,838.3
60	14.8791	203.23	195	1,061.963	14,302.5
65	18.6945	254.17	200	1,168.896	15,892.3
70	23.3093	316.92	205	1,295.566	17,614.5
75	28.6517	392.27	210	1,432.490	19,478.0
80	35.4643	482.17	215	1,580.133	21,483.5
85	43.3041	588.77	220	1,739.00	23,643.9
90	52.5450	714.40	225	19,097.04	25,964.3
95	63.8773	861.68	230	20,926.40	28,451.5
100	76.0000	1,033.30			

offers many advantages over a table, but in order to make it of service in a case like the above it must be plotted to a

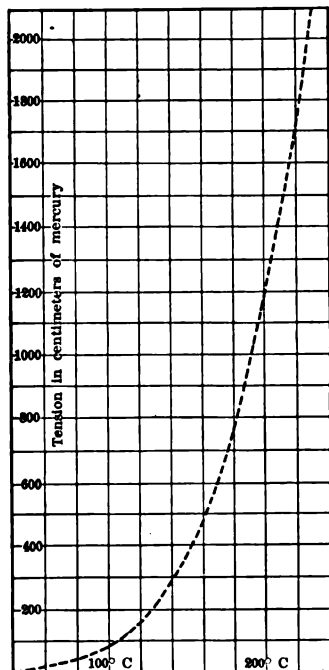


FIG. 1.

curve for a vapor is also the boiling-point curve of the liquid for the same vapor. Thus in Fig. 2 abscissas give tempera-

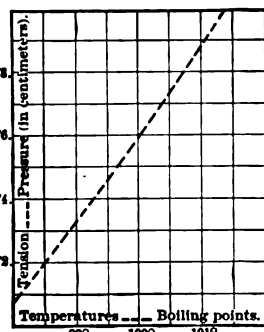


FIG. 2.

very large scale. Fig. 1 shows the general form of the curve between +40° and +230° upon a scale too small to be of service for actual readings.

For many practical purposes one needs to use only a small portion of the entire range of temperatures. If, for example, the change in boiling-point under ordinary barometric fluctuations is desired, the extreme range of ordinates to be considered is from 70 cm. to 80 cm. Fig. 2 is such a boiling-point curve. It follows from the definition of ebullition given in an earlier paragraph that the boiling-point corresponding to a given pressure is simply the temperature at which steam acquires a tension equivalent to the pressure in question. Since tensions, like atmospheric pressures, are measured in centimeters of mercury, the tension-

Closely related to the property of steam just described, and equally important, are its variations of volume when subjected to changes of temperature and pressure. A perfect gas possesses a coefficient of expansion (by constant pressure) of 0.00367, a coefficient constant for the range of pressures and tem-

peratures within which the gas obeys Charles's law. Steam, according to Hirn (*Théorie mécanique de la Chaleur*), possesses a coefficient considerably larger than the above at ordinary temperatures and gradually approaches it as the temperature rises. See Table II.

TABLE II.—COEFFICIENT OF EXPANSION OF STEAM AT CONSTANT PRESSURES.

Range of temperature.	Mean coefficient.
0° to 119°	0.004187
0° to 141°	0.004089
0° to 162°	0.004071
0° to 200°	0.003935
0° to 247°	0.003799

The behavior of a gas or vapor when subjected to simultaneous changes of pressure and temperature can be expressed by means of a surface, the three Cartesian co-ordinates of which are volume (v), pressure (p), and temperature (t). For a perfect gas this surface is hyperbolic, its intersection with any plane parallel to the axes v and p being a rectangular hyperbola (Fig. 3). This hyperbola is an isothermal curve for the gas. The intersection of the surface with planes parallel to the axes v and t forms a series of straight lines, showing the relation between t and v for constant p . The characteristics of vapors, as distinguished from true gases, as has been pointed out in the article PNEUMATICS ($q. v.$), are too great compressibility to satisfy Mariotte's law and too great a change of volume when heated or cooled to satisfy the law of Charles. The result of these peculiarities is to alter the form of surface which exhibits the relation between p , v , and t in such a manner as to cause the isothermal curves to deviate from the hyperbolic form, while at the same time the intersections with planes parallel to the plane t v are no longer straight lines. The existence of such a divergence in the case of steam appears at once from inspection of Table II. The curve marked Vapor in Fig. 3 shows the character of the divergence of the isothermal curve from the hyperbolic form.

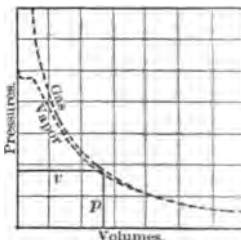


FIG. 3.

The conditions under which steam is made and used compel the consideration of its behavior under conditions different from those of an isolated mass of vapor, which loses nothing by condensation and gains nothing from the evaporation of contiguous liquid. Ordinarily we have steam in the presence of unvaporized water, from which it receives or to which it gives up portions of its substance at every change of condition. Steam thus situated is said to be saturated. It is much easier to study the properties of saturated than of unsaturated steam, and its behavior when in that condition is of prime importance.

Energy required for the Production of Steam.—In the conversion of a gramme of water at 0° C. into steam at any given temperature there is a double process: (1) the heating of the liquid up to the boiling-point, and (2) ebullition of the liquid. If the given temperature lies above the boiling-point for the pressure at which the experiment is to be performed—if, that is to say, we are to produce superheated instead of saturated steam—a third process must be added: (3) the heating of the vapor resulting from ebullition from the boiling-point to the required temperature.

To compute the expenditure of energy in these three processes the specific heat of water throughout the range of temperature, from 0° to the boiling-point, the heat of vaporization at the latter temperature, and the specific heat of steam must be known.

The specific heat of water, although taken as a reference unit in calorimetry, was found by Regnault to vary slightly from its value at low temperatures when the investigation was extended over a considerable range. This variation, the existence of which has been abundantly verified by subsequent observers, is of the nature of a very slight increase in the specific heat. Regnault expressed the change by means of the empirical formula,

$$c = 1 + 0.00004t + 0.0000009t^2,$$

in which c is the specific heat and t the temperature. Table III. gives the results of Regnault's determination.

The heat of vaporization of water is likewise a function of the temperature, diminishing as the temperature rises.

TABLE III.—SPECIFIC HEAT OF WATER (AFTER REGNAULT)

Temperature, °C.	Specific heat, c_p	Temperature, °F.	Specific heat, c_p
0	1.000	32	1.000
10	0.999	50	0.999
20	0.998	68	0.998
30	0.997	86	0.997
40	0.996	104	0.996
50	0.995	122	0.995
60	0.994	140	0.994
70	0.993	158	0.993
80	0.992	176	0.992
90	0.991	194	0.991
100	0.990	212	0.990
110	0.989	230	0.989
120	0.988	248	0.988
130	0.987	266	0.987
140	0.986	284	0.986
150	0.985	302	0.985
160	0.984	320	0.984
170	0.983	338	0.983
180	0.982	356	0.982
190	0.981	374	0.981
200	0.980	392	0.980
210	0.979	410	0.979
220	0.978	428	0.978
230	0.977	446	0.977
240	0.976	464	0.976
250	0.975	482	0.975
260	0.974	500	0.974
270	0.973	518	0.973
280	0.972	536	0.972
290	0.971	554	0.971
300	0.970	572	0.970
310	0.969	590	0.969
320	0.968	608	0.968
330	0.967	626	0.967
340	0.966	644	0.966
350	0.965	662	0.965
360	0.964	680	0.964
370	0.963	698	0.963
380	0.962	716	0.962
390	0.961	734	0.961
400	0.960	752	0.960
410	0.959	770	0.959
420	0.958	788	0.958
430	0.957	806	0.957
440	0.956	824	0.956
450	0.955	842	0.955
460	0.954	860	0.954
470	0.953	878	0.953
480	0.952	896	0.952
490	0.951	914	0.951
500	0.950	932	0.950
510	0.949	950	0.949
520	0.948	968	0.948
530	0.947	986	0.947
540	0.946	1004	0.946
550	0.945	1022	0.945
560	0.944	1040	0.944
570	0.943	1058	0.943
580	0.942	1076	0.942
590	0.941	1094	0.941
600	0.940	1112	0.940
610	0.939	1130	0.939
620	0.938	1148	0.938
630	0.937	1166	0.937
640	0.936	1184	0.936
650	0.935	1202	0.935
660	0.934	1220	0.934
670	0.933	1238	0.933
680	0.932	1256	0.932
690	0.931	1274	0.931
700	0.930	1292	0.930
710	0.929	1310	0.929
720	0.928	1328	0.928
730	0.927	1346	0.927
740	0.926	1364	0.926
750	0.925	1382	0.925
760	0.924	1400	0.924
770	0.923	1418	0.923
780	0.922	1436	0.922
790	0.921	1454	0.921
800	0.920	1472	0.920
810	0.919	1490	0.919
820	0.918	1508	0.918
830	0.917	1526	0.917
840	0.916	1544	0.916
850	0.915	1562	0.915
860	0.914	1580	0.914
870	0.913	1598	0.913
880	0.912	1616	0.912
890	0.911	1634	0.911
900	0.910	1652	0.910
910	0.909	1670	0.909
920	0.908	1688	0.908
930	0.907	1706	0.907
940	0.906	1724	0.906
950	0.905	1742	0.905
960	0.904	1760	0.904
970	0.903	1778	0.903
980	0.902	1796	0.902
990	0.901	1814	0.901
1000	0.900	1832	0.900

and finally disappearing altogether at the "critical temperature" of the liquid.

The heat of vaporization of water between 0° C. and 300° C., and the total heat in lower values necessary to convert a gramme of water at 0° into steam at the required temperature, are given in Table IV. The quantity designated as *total heat* is calculated by means of the equation

$$T = \int_0^t c_p dt + r,$$

where T is the total heat, c_p the specific heat of water, t the range of temperatures through which it is necessary to raise the water to bring it to the boiling-point, and r is the heat of vaporization at the boiling-temperature.

TABLE IV.—HEAT OF VAPORIZATION AND "TOTAL HEAT" OF STEAM.*

Temperature of vaporization, °C.	Heat of vaporization, r , kcal/kg.	Total heat, T , kcal/kg.	Temperature of vaporization, °F.	Heat of vaporization, r , Btu/lb.	Total heat, T , Btu/lb.
0	598.0	598.0	32	970.3	970.3
10	597.8	970.3	50	969.8	1019.8
20	597.6	1019.8	68	969.3	1069.3
30	597.4	1069.3	86	968.8	1118.8
40	597.2	1118.8	104	968.3	1168.3
50	597.0	1168.3	122	967.8	1217.8
60	596.8	1217.8	140	967.3	1267.3
70	596.6	1267.3	158	966.8	1316.8
80	596.4	1316.8	176	966.3	1366.3
90	596.2	1366.3	194	965.8	1415.8
100	596.0	1415.8	212	965.3	1465.3
110	595.8	1465.3	230	964.8	1514.8
120	595.6	1514.8	248	964.3	1564.3
130	595.4	1564.3	266	963.8	1613.8
140	595.2	1613.8	284	963.3	1663.3
150	595.0	1663.3	302	962.8	1712.8
160	594.8	1712.8	320	962.3	1762.3
170	594.6	1762.3	338	961.8	1811.8
180	594.4	1811.8	356	961.3	1861.3
190	594.2	1861.3	374	960.8	1910.8
200	594.0	1910.8	392	960.3	1960.3
210	593.8	1960.3	410	959.8	2009.8
220	593.6	2009.8	428	959.3	2059.3
230	593.4	2059.3	446	958.8	2108.8
240	593.2	2108.8	464	958.3	2158.3
250	593.0	2158.3	482	957.8	2207.8
260	592.8	2207.8	500	957.3	2257.3
270	592.6	2257.3	518	956.8	2306.8
280	592.4	2306.8	536	956.3	2356.3
290	592.2	2356.3	554	955.8	2405.8
300	592.0	2405.8	572	955.3	2455.3
310	591.8	2455.3	590	954.8	2504.8
320	591.6	2504.8	608	954.3	2554.3
330	591.4	2554.3	626	953.8	2603.8
340	591.2	2603.8	644	953.3	2653.3
350	591.0	2653.3	662	952.8	2702.8
360	590.8	2702.8	680	952.3	2752.3
370	590.6	2752.3	698	951.8	2801.8
380	590.4	2801.8	716	951.3	2851.3
390	590.2	2851.3	734	950.8	2900.8
400	590.0	2900.8	752	950.3	2950.3
410	589.8	2950.3	770	949.8	2999.8
420	589.6	2999.8	788	949.3	3049.3
430	589.4	3049.3	806	948.8	3098.8
440	589.2	3098.8	824	948.3	3148.3
450	589.0	3148.3	842	947.8	3197.8
460	588.8	3197.8	860	947.3	3247.3
470	588.6	3247.3	878	946.8	3296.8
480	588.4	3296.8	896	946.3	3346.3
490	588.2	3346.3	914	945.8	3395.8
500	588.0	3395.8	932	945.3	3445.3
510	587.8	3445.3	950	944.8	3494.8
520	587.6	3494.8	968	944.3	3544.3
530	587.4	3544.3	986	943.8	3593.8
540	587.2	3593.8	1004	943.3	3643.3
550	587.0	3643.3	1022	942.8	3692.8
560	586.8	3692.8	1040	942.3	3742.3
570	586.6	3742.3	1058	941.8	3791.8
580	586.4	3791.8	1076	941.3	3841.3
590	586.2	3841.3	1094	940.8	3890.8
600	586.0	3890.8	1112	940.3	3940.3
610	585.8	3940.3	1130	939.8	3989.8
620	585.6	3989.8	1148	939.3	4039.3
630	585.4	4039.3	1166	938.8	4088.8
640	585.2	4088.8	1184	938.3	4138.3
650	585.0	4138.3	1202	937.8	4187.8
660	584.8	4187.8	1220	937.3	4237.3
670	584.6	4237.3	1238	936.8	4286.8
680	584.4	4286.8	1256	936.3	4336.3
690	584.2	4336.3	1274	935.8	4385.8
700	584.0	4385.8	1292	935.3	4435.3
710	583.8	4435.3	1310	934.8	4484.8
720	583.6	4484.8	1328	934.3	4534.3
730	583.4	4534.3	1346	933.8	4583.8
740	583.2	4583.8	1364	933.3	4633.3
750	583.0	4633.3	1382	932.8	4682.8
760	582.8	4682.8	1400	932.3	4732.3
770	582.6	4732.3	1418	931.8	4781.8
780	582.4	4781.8	1436	931.3	4831.3
790	582.2	4831.3	1454	930.8	4880.8
800	582.0	4880.8	1472	930.3	4930.3
810	581.8	4930.3	1490	929.8	4979.8
820	581.6	4979.8	1508	929.3	5029.3
830	581.4	5029.3	1526	928.8	5078.8
840	581.2	5078.8	1544	928.3	5128.3
850	581.0	5128.3	1562	927.8	5177.8
860	580.8	5177.8	1580	927.3	5227.3
870	580.6	5227.3	1598	926.8	5276.8
880	580.4	5276.8	1616	926.3	5326.3
890	580.2	5326.3	1634	925.8	5375.8
900	580.0	5375.8	1652	925.3	5425.3
910	579.8	5425.3	1670	924.8	5474.8
920	579.6	5474.8	1688	924.3	5524.3
930	579.4	5524.3	1706	923.8	5573.8
940	579.2	5573.8	1724	923.3	5623.3
950	579.0	5623.3	1742	922.8	5672.8
960	578.8	5672.8	1760	922.3	5722.3
970	578.6	5722.3	1778	921.8	5771.8
980	578.4	5771.8	1796	921.3	5821.3
990	578.2	5821.3	1814	920.8	5870.8
1000	578.0	5870.8	1832	920.3	5920.3

* From Zeuner's *Grundriss der mechanischen Wärmetheorie*.

The relations of heat of vaporization and total heat to one another and to the temperature are shown graphically in Fig. 4, in which abscissas are temperatures. The curve marked r represents the heat of vaporization, and that marked T the total heat.

The specific heat of steam is a subject the experimental investigation of which presents great difficulty. The data thus far obtained show, as might be expected, wide divergence. Thus Regnault found the mean specific heat between 100° and 217° C. to be 0.49351, while Gray (*Philosophical Magazine*, 5, xii, 1882) obtained for the lower range of temperatures, 100° - - - 125°, the value 0.3787.

Fortunately a precise knowledge of the specific heat is not of prime importance in most practical cases, since the total amount of heat-energy expended in superheating steam is insignificant when compared with that necessary

in its production. The study of the properties of a vapor like steam are rendered difficult on account of the presence of finely divided water in the unvaporized form of spray, by the admixture of air, and likewise by the fact that any complete investigation involves the use of temperatures difficult to measure with precision, and of pressures hard to deal with experimentally. The engineer, for his part, is embarrassed by the fact that he must use steam sometimes wet and sometimes superheated, and under circumstances such that it is often impossible to know its precise condition. See Regnault, *Qualques Expériences sur la Théorie mécanique de la Chaleur*; Clausius, *Theory of Heat*; Preston on *Heat*; also the chapters on heat, and especially thermodynamics, in the various larger text-books of physics. For the applications of steam in theory and practice, see Rankine's classical work on the steam-engine; Ewing, *Steam and other Heat Engines*; the treatise by Thurston on the same subject, and Carpenter's *Manual of Steam Engineering*. See also LAQUIDS (*Properties of Liquids*), GAS, FLUID, ENCOMPRESS, and STEAM-ENGINE.

E. L. NICHOLS.

Steam-boiler: an apparatus for generating steam by the application of heat. It may be described in general terms as a closed metallic vessel, kept partly filled with water, with arrangements for imparting heat to the water by means of the combustion of fuel. The steam generated is confined in the vessel above the water until it is required for use, when it is drawn off through pipes. This metallic vessel, with its compartments and openings, takes the name of a "boiler" in the shops where it is manufactured; but in many classes or forms of boilers the steam-generating apparatus

additional heating-surface without increased diameter is known as the French or Elephant boiler, shown in Figs. 2

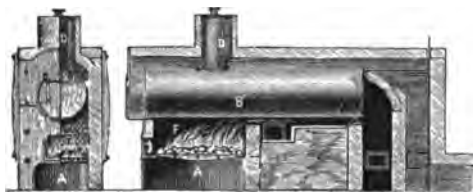
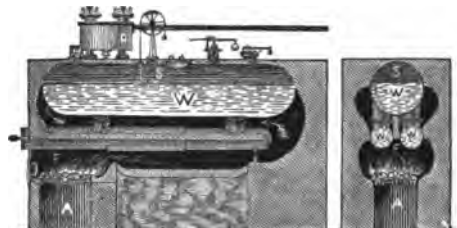


FIG. 1.—Plain cylinder boiler set in brickwork.

and 3. This type has been much used in iron-works practice, where it is desired that a large volume of water serve to



FIGS. 2 and 3.—French boiler. A, ash-pit; F, furnace; W, water-space; S, steam-space; D, steam-dome.

store the heat given off from metallurgical furnaces when there may be considerable variation in the intensity of combustion from time to time.

The next types of externally fired boilers are those containing, in the space devoted to water, flues or tubes through which the hot gases pass on their way to the chimney. The difference between a flue and a tube is that of size merely, a tube larger than 8 inches in diameter being designated as a flue. The flue boiler is shown in Figs. 4 and 5, and the



FIGS. 4 and 5.—Cylinder-flue boiler.

tubular boiler in Fig. 6. The flue boiler is preferred where the fuel has a long flame from the presence of combustible gas, since the fine subdivision of the products of partial combustion in the tubes tends to extinguish the flame before the union with oxygen is complete. On the other hand, where the fuel is anthracite, or where the combustion can be completed before the gases enter the tubes, the extended

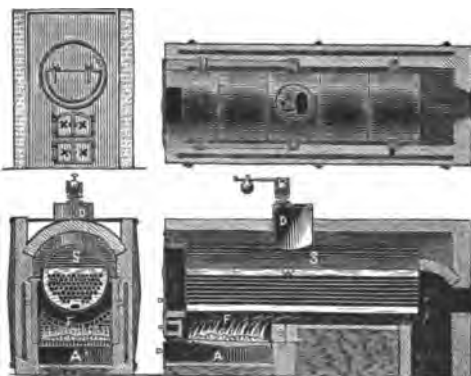


FIG. 6.—Cylinder tubular boiler set in brickwork.

heating-surface of the multitubular boiler gives it the preference, provided the quality of the water is consistent with a design of boiler which has parts to which access is so difficult as in the small spaces about the tubes.

The fourth type of externally fired boiler is what is known

as the sectional boiler. It consists essentially of a system of tubes or small units so arranged that a continuous circulation of the water is maintained through the tubes from the mechanical action arising from some portions of the



FIG. 7.—The sectional boiler.

tubes being maintained at a higher temperature than others, the heated and lighter water ascending and the cooler and heavier water descending. The large shell is dispensed with, and the heat applied directly by both radiation and contact to the exterior surfaces of the tubes. The steam-space is usually a large drum or a system of drums with which the various sections of tubes are connected, and there are various devices in practical use for connecting and arranging the tubes, so that they shall form a compact arrangement with all the necessary conditions for applying heat, for accessibility, and for securing circulation and disengagement of steam from the water. Fig. 7 shows a side elevation of one of the early pioneers among boilers of this type in the U. S., but many other forms, and the modern type of the form illustrated, are improvements in many respects upon the original type. The origination of this system is generally ascribed to Jacob Perkins, who in 1831 obtained a patent in England for improvements in generating steam, in which he insisted on the advantages to be gained by causing the water to circulate rapidly over the heating-surfaces exposed to the direct action of the fire. In 1839 Perkins obtained a patent for a more complete apparatus involving this idea, under the title "apparatus for transmitting heat by circulating water." Steam-generators constructed with special reference to this idea had already been tried, however, by John Fitch, John Stevens, and others, 1787-1804; later they were abandoned, owing to practical difficulties in their construction and keeping them in repair.

From the sectional type have been derived the water-tube or coil boilers, in which the heating-surface is made up of a great surface of tubes of small diameter in curved or spiral sections within which the water to be evaporated circulates at high velocity either naturally or by means of a forced circulation. The compactness of such boilers and their availability for high pressures have made them popular for small high-speed marine vessels.

Of the *internally fired* boilers, one representative is the locomotive boiler, in which a rectangular fire-box is surrounded by the water to be evaporated on all sides except the bottom. From the front side of this fire-box the tubes carry the hot gases through the water in the barrel of the boiler to discharge them into the smoke-box at the extreme front.

The flatness of the upper side of the fire-box or crown sheet necessitates an elaborate system of bracing or staying for that exposed surface. The sides or water-legs are prevented from bulging by being tied together by stay-bolts. Fig. 8 shows a typical construction of a locomotive-engine boiler without the extension smoke-box, which is designed to catch and hold the cinders and sparks which the intensely rapid draught of the locomotive-engine boiler carries out of the fire-box in great quantities. Many so-called portable boilers are of the locomotive type.

A modification of the locomotive boiler, much used for portable and stationary engines, is known as the *upright*



FIG. 9.—Locomotive-engine boiler.

boiler, an illustration of which is given in Fig. 9. The simplicity of construction, convenience of access, and small



FIG. 10.—Upright boiler.

space occupied by these boilers, together with their evaporative qualities and strength, render them peculiarly adaptable for some conditions of use.

A form of this boiler which demands special interest and attention is found in the *fire-engine boiler* represented in Fig. 10. This is essentially an upright boiler of the locomotive type, but its peculiarity consists in the great number of tubes and the great extent of heating-surface, compared with the cubic dimensions and the water-space. The tubes are comparatively thin (usually made of brass or copper), thus not only permitting the introduction of a larger number in a given space, but also lessening the

time for the first development of steam. The dimensions of the boiler represented in Fig. 10 are as follows: Total height, 6 ft. 4 in.; outside diameter, 31½ inches; number of brass tubes, 301; diameter of tubes, 1½ inches; length of tubes, 10 inches; distance from center to center of tubes, 1½ inches; heating-surface, 157 sq. feet.

For marine practice, where a boiler thoroughly self-contained is a necessity, the internally fired type has received great development. In the days of early and lighter pressures it was usual to give the boiler a shape which would adapt it to fill the cramped quarters assigned to it in the hull.

Fig. 11 represents varieties of a class of boilers which are known as *return-flue boilers*. They were at one time in very general use in steamboats and steamships in the U. S., and are still employed in some extent for lower pressures. They are characterized by having internal furnaces and internal flues, with no external furnaces or brickwork. The shell in these boilers is made sufficiently large to receive within it the direct flues from the furnace, from front to rear, and also the return flues, the arrangements being as exhibited in the plate. As these boilers have large diameters, it is necessary to strengthen the various parts by stays, as shown in Fig. 12. Around the furnaces the plates are stayed and kept in position by sockets and bolts; the sockets acting as struts and the bolts as stays.

Fig. 12 represents a modification of the return-tubular boiler suited to marine purposes. Such a boiler contains several furnaces, and two or more boilers are usually set together on opposite sides of the hold of the vessel, in such a manner as to have a common chimney. Figs. 13-16 show the more prevalent type of boilers for the recent high pres-

sure requirements of both naval and merchant service. They have received the general name of *Scotch boilers*, while the



FIG. 11.—Return-flue boiler.

type shown in Fig. 12 is usually known as the *Martin boiler*. The cylindrical furnaces shown in Figs. 13-14 are flues



FIG. 12.

corrugated crosswise, so as to secure by this means a greater resistance to the tendency to collapse, which is always pres-



FIG. 13.

FIG. 14.

ent in flues of such large diameter. Where the flue is not corrugated it can be stiffened by means of rings of proper



FIGS. 15 AND 16.—English marine tubular boilers, with cylindrical shells.

dimensions, to which the more flexible furnaces can be attached.

A type of internally fired boiler which has received considerable development in Great Britain is called the *Cornish boiler* (Fig. 17-18); it has the ordinary form of large in-



FIGS. 17 AND 18.—The Cornish boiler.

ternal flue enclosing the fire. The double Cornish boiler has two such flues. The gases pass back through the flue, return to the front at the sides of the boiler, and turn again

to the back underneath. This secures abundant contact between the heating-surface and the gases.

What is commonly known as a Galloway boiler is usually a Cornish boiler across whose flue or flues conical water-tubes are inserted, so that the gases shall impinge against surfaces within which the water is circulating. The Field tubes, often applied to the upright or fire-engine boiler and to other internally fired types, consist of tubes closed at the outer end, and each containing concentrically within it a smaller tube. The heavier water descends in the inner tube, while the lighter hot water and steam ascend in the annular space between the inner and outer tube, thus causing a rapid circulation and a rapid transfer of heat.

Constituent Parts of a Boiler.—There are many appurtenances or parts of a boiler which are common to all the types. Such details, which are represented wholly or in part in nearly all boilers under the same names, are: (1) The *shell*, or external envelope. (2) The *furnace*, the chamber in which combustion takes place. (3) The *flue* or flues, the passages for the heated gases to the chimney. (4) The *bridge*, or rear wall of the furnace, which forms, with the shell of the boiler above it, the boundary of the *draught-area*. (5) The *ash-pit*, the bottom part of the furnace-chamber, which serves as a receptacle for the ashes and cinders, and also as an entrance for air underneath the grate. (6) The *grate*, which is composed of *grate-bars* or *fire-bars*, forming the bottom of the furnace on which the fuel is laid. (7) The *furnace door*. (8) The *ash-pit door*. (9) The *combustion-chamber*. This is an enlargement of the main flue in the rear of the bridge, formed by dropping the bottom of this flue. This part of the main flue is often called the combustion-chamber, under the assumption that the combustion of the volatile portions of the fuel is not completed in the furnace, and that an enlargement of this flue into a sort of chamber favors a more thorough mixing of the air and the volatile or combustible gases, and thus produces complete combustion. This is especially true where air is admitted by a special arrangement behind the bridge or through holes in the furnace door. When bituminous coal, or fuel containing a large quantity of volatile matter, is used, some such arrangement for burning the volatile matters should be made. (10) The *smoke-box* or smoke-connection is more important in the internally fired than in the other classes of boilers. (11) The *steam-dome* is a vertical chamber set upon the upper surface of the shell, and communicating with it freely through holes in the shell or through a single large aperture. Its object is to furnish a chamber in which the steam may be removed as far as possible from the liquid water, and brought to a quiescent state, so that any particles of water which are carried up with it may be separated by precipitation. In some boilers, especially those for marine purposes, this dome takes the form of an annular space, which is traversed by the smoke-stack or chimney, and is then called the *steam-chimney*. (12) *Water-room* and *steam-room*. The interior of the shell of the boiler is divided by the surface of the water into two spaces, called the water-room and steam-room, or water-space and steam-space; all the space occupied by water below the water-level being water-space, and the space or spaces above the water-level, including the steam-dome, being steam-room. The water-room of a plain cylinder boiler occupies about three-fourths of the whole space, and generally in other boilers about three-fourths of the internal capacity of the shell when the water is at its mean level. (13) *Man-holes*, *hand-holes*. It is important in the management of boilers to examine all accessible parts frequently, and accessibility to every part is a fundamental principle of construction, not only for cleaning, but for facilitating repairs. *Man-holes* are apertures left in the shell, and closed by strong plates which can be removed at will, the opening being large enough to admit a man. *Hand-holes* are smaller openings, generally near the bottom, which enable cleaning to be done by means of tools. (14) *Heating-surface*. In all boilers portions of the metal plates which form the shell, flues, or tubes, are exposed on one side to the heat of the furnace, or the heat of the gases in their course to the chimney, and on the other side to the contact of the water or steam, the transfer of heat being from the furnace and flues to the water through these portions of the structure. A heating-surface in a steam-generator may therefore be defined to be any surface which acts as a medium for the transfer of heat from the furnace or gases to the water or steam within the boiler. The efficiency of such a surface depends on the conducting power and on the difference between the

temperatures of the furnace or gases and the water, and the thorough and rapid circulation of the fluids and gases in contact with the surfaces.

Several appurtenances give efficiency and safety to the boiler, viz.: (15) The *feed-apparatus*, composed of a pump, an injector, or other device, with the necessary pipes for supplying water to the boiler. The injector, often called Giffard's injector, from Giffard, who first reduced it to a practical form, is a jet pump in which a jet of steam is changed by rapid condensation to a water jet. The latter, being much smaller and retaining the same velocity, concentrates its pressure on a much smaller area, and by the conversion of its energy into work is enabled to force other water into the boiler. (16) The *safety-valve*, a valve opening outward, and so adjusted and arranged that it will be opened by the internal pressure of the steam when that pressure exceeds a given amount per square inch. (17) The *steam-gauge*, an instrument which exhibits at all times to the eye of the engineman or stoker the pressure of the steam in the boiler. (18) *Water-gauges* and *gaug-cocks*, which are intended to show at any instant the level of the water within the boiler. (19) The *low-water detector*, an instrument attached to many boilers for the purpose of giving an alarm if the water falls below a given point.

Chimneys.—The chimney, in all cases in which the draught is produced by a simple chimney-draught, performs the functions of a machine, and its dimensions (its height and cross-section), taken in connection with the area of the grate and the surface of contact of the fuel exposed to the action of the air, are the principal elements on which not only complete or perfect combustion depends, but also the quantity of fuel burned in a given time. In boilers provided with any other means of draught, such as the steam-jet or the blower, the dimensions of the chimney are not so important. In almost all stationary and in many marine boilers the draught is produced solely by a chimney, which forms an indispensable and important part of the apparatus. The determination of the proper proportions between the heating-surface and the grate-surface depends on the initial temperature of the gases; and as the initial temperature varies with the rate of combustion or the height of the chimney, the height of the chimney indirectly enters into the consideration of this proportion. As is well known, the draught of a chimney is caused by a difference of pressure at the base of the chimney acting in an upward direction, due to the difference between the weight of the heated gases in the chimney and that of a column of the external air of equal height and cross-section.

Heating-surfaces.—The quantity of heat transmitted by any surface depends on the extent of the surface and the difference of temperature between the source of heat and the absorbent; or, in the case of steam-generators, the difference in temperature of the incandescent fuel or heated gases and the water in the boiler. The extent or amount of heating-surface is fixed with reference to the initial temperatures of the furnace and gases; or, since these temperatures are proportional to the rate of combustion, the extent of heating-surface will depend on the rate of combustion to be employed. The extent of heating-surface must evidently also be in proportion to the absolute quantity of fuel burned in a given time; or, what is the same thing, it must have a direct relation to the grate-surface.

Inasmuch as it is impossible to vary the heating-surface at will, after a steam-generator is constructed, it is customary to fix the extent of this surface according to average conditions of use, taking into account average rates of combustion. The following proportions represent as near as can be ascertained the usual rules of practice. The grate-surface being 1, the heating-surfaces are for—

Plain cylinder boilers.....	10 to 15, average 12
Cornish boilers.....	30 to 40, " 35
French cylinder boilers.....	25 to 40, " 33
Cylinder-flue boilers.....	17 to 25, " 21
Cylinder-tubular boilers (chimney-draught).....	25 to 30, " 28
Traction-engine boilers.....	" 32
Marine tubular and flue boilers—French, English, and American practice.....	" 35
Locomotive boilers.....	40 to 100, " 75

The rates of combustion per hour and per square foot of grate, in ordinary practice, are, according to Rankine—

Slowest rate in Cornish boilers.....	4 lb. per hour.
Ordinary rate.....	10 " "
Ordinary rate in factory boilers.....	12 to 16 lb. per hour.
Ordinary rate in marine boilers.....	16 to 24 " "
Locomotive boilers.....	40 to 120 " "

The amount of heating-surface required to evaporate 1 cubic foot of water per hour at 212° is for—

Plain cylindrical boiler.....	8.7 sq. feet.
Horizontal multitubular boiler (water-tube boiler).....	2.5 "
Marine tubular boiler.....	14.5 "
Cylinder fire (water-tube).....	11.7 "

For these the rate of combustion is such that the total heating-surface are sufficient to evaporate 3 lb. of water for 1 lb. of coal.

The following conclusions are deduced from Babcock's experiments. The boilers of various steamships on which experiments were made, with the results, are indicated by the names of the vessels:

Jones Hall.....	Marine tubular.....	19.6	12.0	11.5
St. Vincent.....	".....	18.9	10.5	12.5
Vesley Vess.....	".....	18.0	11.2	12.10
Princess Alice.....	".....	16.2	11.5	8.5
Waverley.....	water-tube.....	20.0	12.4	12.0
Union Pacific.....	fire-tube.....	15.5	11.2	8.0
Yankee.....	marine tubular.....	15.0	12.4	8.5
Shannon.....	marine tubular.....	12.0	11.1	11.5
Average.....				10.6

First column, heating-surface required per one indicated H. P.; second column, number of pounds of water evaporated per hour per pound of combustible; third column, combustible in pounds burned per hour per square foot of grate.

The practice of the Navy Department has been to allow 2 lb. of anthracite coal per hour to evaporate 1 cubic foot of water at 212°, under a pressure of 30 lb. per square inch, which requires two-thirds square foot of grate and 16½ sq. feet of heating-surface.

The quantity of water evaporated per pound of coal for the plain cylinder boiler, the cylinder-fire boiler, and the cylinder-tubular boiler, in the order given, is, under the most favorable circumstances, 7, 8, and 9 lb. of water for each pound of coal burned. The boiler of the railway locomotive is the only one in which the rates of combustion are frequently and greatly varied while in use; and in these boilers it is necessary to provide for very high rates of combustion by giving an extreme amount of heating-surface. The locomotive boiler, with ordinary rates of combustion, corresponds, in evaporative efficiency, to the ordinary marine tubular boiler.

Causes which affect the Efficiency of Evaporation.—These are, 1, those which influence the rate of combustion; and, 2, those which influence the rate of transfer of heat. Among the causes which influence the rate of combustion may be mentioned the temperature of the external air, the temperature of the chimney-pass, the presence of moisture in the air, the management of the fire, the quality of the fuel, and defective combustion. The principal causes which affect the transfer of heat are the rate of combustion, which determines the initial temperatures in the boiler; the temperature of the water in the boiler; the accumulations of incrustations and dust in the tubes; and generally all those circumstances which impair the qualities of the heating-surfaces. The management of the fire and the quality of coal are most important influences on the rate of combustion and economy of fuel.

Supply of Feed-water.—The supply of water to a boiler is of course indispensable to its performance. It is usually accomplished by an independent apparatus, a pump or an injector being employed. The capacity of the feeding apparatus should be such as to supply sufficient water not only for the highest rate of evaporation likely to be attained, but to supply all losses from priming, leakage, blowing off, etc. Care should be taken that the feed-water does not impinge on the plates or flues, as the sudden cooling at one point is liable to fracture the plates. Such fractures can not always be discovered when the boilers are inspected, and are always a source of danger. For land-engines a capacity of two and a half times the net feed-water required by the engine is the rule given by Rankine. Proper arrangements for regulating the supply to the boiler are required. Where steam is used for heating, the condensed steam is returned to the boiler by the action of gravity, the water being supplied from time to time by the attendant.

Feed-water heaters or economizers are devices by which the heat which would otherwise be wasted as rejected from the boiler setting or the engine is utilized to raise the temperature of the feed-water before it enters the boiler. They are therefore known as flue-heaters, when so placed as to avail of waste heat in the chimney flues, and exhaust-steam-heaters when the waste steam from the engine performs this same office. Where the feed-water contains mineral matter

which can be precipitated in the heater, an obvious advantage is secured by keeping this objectionable material out of the generator. Open heaters are those in which the exhaust steam comes into direct contact with the feed-water. In closed heaters either the steam passes through a coil of pipes on the other side of which is the water, or the water is in pipes surrounded by steam.

Boiler-explosions.—The disaster which is known as a boiler-explosion consists of two distinct steps, although one usually succeeds the other instantaneously. (1) There occurs a rupture of the shell or envelope caused by a pressure within the shell greater than it was able to withstand. (2) Through the orifice thus made there is a release of pressure, and the hot water remaining in the boiler forms steam-gas at this reduced pressure with a velocity which is comparable to the rapid formation of gas when a flame is touched to an explosive compound. It can be shown that when the water is under pressure there is stored a force in foot-pounds sufficient if released all at once to produce the phenomena of a most disastrous explosion, so that the study of an explosion is usually mainly concerned with determining the conditions which caused the relative overstrain and the initial rupture. This state of affairs may result because the boiler was too weak for its working pressure by reason of deterioration, old age, defective design, or bad adjustment of the working pressure to its strength. It may also occur because some sudden strain or unequal contraction produced a local superposition of strain which the metal at such weakened place was unable to resist.

Such excessive strains can also follow when, by the sudden opening of a large steam-valve permitting the escape of steam into a cold pipe, there is such a drop of pressure as to cause an shuddering almost concussive in its character, so that the reaction of the weight of water results in such superposition of strains as to cause the first rupture. This explains the frequency of rupture at the moment when steam is turned on and the work-day is about to begin. In the second place, it is surprising in how short a time the pressure within a boiler will increase if there is a constant rate of ordinary evaporation and no outlet for the steam.

The rate of increase of pressure may be found theoretically by means of a formula given by Prof. Zeuner in his work on the *Mechanical Theory of Heat*. Let T be the time, in minutes, which must elapse from the instant that all efflux of steam is prevented in a boiler to the instant when a dangerous or bursting pressure must follow; let W represent the weight of water in the boiler; t , the temperature of the water at a dangerous pressure; t_0 the temperature at the working pressure; Q the quantity of heat, in British units, transferred to the water per minute—then the equation

$$T = \frac{W(t - t_0)}{Q}$$

is approximately correct. This formula shows that the time will be proportional directly to the amount of water in the boiler, to the difference of temperatures t and t_0 , and inversely proportional to the quantity Q . The fluctuations of pressure will be less rapid in boilers which contain large quantities of water and have at the same time a low rate of evaporation. Such conditions are found especially in marine boilers, while the reverse is true for boilers containing small quantities of water and having rapid rates of evaporation, such as locomotive and fire-engine boilers. The fluctuations will also evidently be more rapid at high pressures than at low pressures, since at high pressures a greater change of pressure occurs with an equal difference of temperatures.

Safety-valves.—It is supposed that the gradual increase of pressure above discussed can never take place if the safety-valve is in good working order and if it have proper proportions. Engineers do not, in practice, place their trust in the safety-valve alone, and it is principally to their watchfulness and attention that the public is indebted for safety.

The theoretical area of orifice O for the efflux of a given quantity of steam from a boiler into the atmosphere, supposing this orifice to be a circular area, may be determined by first ascertaining the theoretical velocity of efflux, and multiplying this by a coefficient ascertained by experiments. The experiments made by R. D. Napier on the efflux of steam at different pressures and with different orifices have not only furnished the means of determining the coefficients of efflux, but for determining formulas for the area required for the discharge of a given weight of steam per second. An approximate formula given by Rankine is as follows: When the pressure in the boiler is equal to or greater

than five-thirds the external pressure, then $W = \frac{p_s}{70}$ where W is the number of pounds of steam discharged per square inch of area per second, and p_s is the boiler-pressure in pounds per square inch. Letting W_o represent the pounds of steam per second discharged through the orifice of area O , then $W_o = \frac{p_s}{70} \times O$, and therefore $O = \frac{70 W_o}{p_s}$.

An English empirical rule is that the safety-valve area shall have half a square inch for each square foot of fire-grate, or .025 of a square inch for each square foot of heating-surface. Another, quoted by Rankine, is as follows: Let A be the area of the piston, V its velocity in feet per minute, P the excess of pressure in the boiler above that of the atmosphere in pounds per square inch; then the area will be $\frac{A}{800P}$, nearly. Still another quoted by the same author is: " a = area in square inches = from $\frac{1}{16}$ th to $\frac{1}{8}$ th of the number of pounds of coal burned per hour, or $\frac{1}{8}$ th the area in square inches = $\frac{1}{16}$ th to $\frac{1}{8}$ th of the water evaporated per hour."

In all cases it is not only a matter of observation, but a theoretical law, that as soon as efflux begins there is a considerable diminution of pressure underneath the valve; and numerous devices have been proposed by which the opening of the valve shall not be influenced by the pressure in the orifice, but by the action of the pressure at a point remote from the orifice. Such valves are called pop-valves.

There are supposed to be, in some circumstances, sudden evolutions of steam in such quantities that no relief is possible through safety-valves. In regard to such cases, it can easily be shown that by reason of the high specific heat of water, as compared with iron, it is very difficult for any large quantity of steam to be made even from overheated plates, so that the disasters perhaps rightly attributed to low water are the result, not of excessive internal pressure, but of the strain from contraction when such overheated plates are suddenly cooled by contact with water.

The term "horse-power" of boilers is often used as a measure of the work which a steam-generator can do. Such use is liable to misunderstanding, inasmuch as it implies a rate of work, and a boiler ordinarily does no work, but merely supplies to a machine the means for doing it. The term has, however, acquired a conventional significance among engineers. It has been agreed that the commercial horse-power of a boiler shall be an evaporation of 30 lb. of water per hour from a feed-water temperature of 100° F. into steam at 70 lb. gauge-pressure. This is equivalent to 34½ lb. of water evaporated from a feed-water temperature of 212° F. into steam at the same temperature, which corresponds to 33,305 thermal units per hour. A boiler rated upon the above standard of evaporative capacity should be capable of developing that power with easy firing, moderate draught, and ordinary fuel, while exhibiting good economy; and should be capable of being driven to develop at least one-third more than its rated power to meet emergencies when maximum economy is not the most important object to be attained.

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F. R. HUTTON.

Steam-engine: a device or apparatus for converting into work-units the energy of heat, using the expansive force of the vapor of water as a medium. The steam-engine consists therefore necessarily of two parts—the engine proper, in which the expansive force is expended, and the generator, or boiler, in which the energy of a burning fuel is transferred to the water. (See STEAM-BOILER.) Essentially the same mechanism as is required by the steam-engine can be used with ammonia, ether, bisulphide of carbon, etc., as a vehicle for the heat. Water has the great advantage of being cheap, everywhere accessible, without odor, and with a vapor which is not combustible. It has further the great advantage that by reason of its low specific heat a given volume of the vapor of water will carry more heat than the same volume of any other medium at the same pressure.

The earliest notice of the use of steam as a motive power is in the *Pneumatica* of HERO (q. v.). After many trivial machines by various inventors, the first really useful steam-engine was made by Edward Somerset, second Marquis of Worcester, and described in his *Century of Inventions* (1663). It was designed to raise water. Thomas Savery improved this, and received a patent in 1698; his engine was the first to come into extensive use. Both these engines applied the expansive force of steam directly to the column of water; Savery's then condensed the steam, and by means of valves made use also of the atmospheric pressure. The invention of the piston is due to Denis Papin (1647–1712), but the first practical cylinder-and-piston steam-engine was made by Newcomen (see NEWCOMEN, THOMAS). JAMES WATT (q. v.) improved this engine by providing a separate vessel to serve as condenser and by making the engine double-acting. The first automatic valve-gear (1713) was the device of a boy named Humphrey Potter; this was improved in 1718 by Henry Beighton. For the invention and description of locomotive engines, see RAILWAYS and LOCOMOTIVE.

The unit for measuring the performance of steam-engines is the "horse-power," which was determined first by James Watt. The horse-power consists of 33,000 foot-pounds moved in one minute, and is a standard unit wherever the English foot and pound prevail. The horse-power in countries which employ the metric system is slightly less (32,549 foot-pounds). The performance of steam-engines is measured either on the revolving shaft of the engine by a measuring apparatus or dynamometer, or it is determined by the effort of the expansive force of the steam, measured in pounds of pressure exerted upon a known area in the cylinder of the engine, which product when multiplied by feet of distance, through which that pressure is exerted, will give a final product in foot-pounds, and measure the performance. That is: If P = the mean effective pressure per square inch of area in the organ receiving the expansive force of the steam, and A = the area, in square inches, of a disk, or piston, fitting steam-tight in a cylinder, then $P \times A$ = a total number of pounds. Furthermore, if L = the length of the traverse of the above movable piston expressed in feet, then $P \times A \times L$ will denote the foot-pounds in one traverse of the piston in the cylinder. If the piston makes a number, N , of traverses in a minute, the product $PALN$ will give the foot-pounds of performance per minute; N will usually be equal to twice the number of revolutions per minute. Finally, the horse-power of a steam-engine will be $PALN \div 33,000$.

It will appear from the above that two great types of engine can be designed of equal capacity in horse-power. The product LN is called piston-speed of an engine, and with a constant value for this product the length of the stroke may be long, and the number of strokes per minute small, or a greater number of strokes per minute may be made with a short length for each stroke. It is further clear that by making the product LN large we can correspondingly diminish the factor A , and by making N large both the diameter and length of the engine will be diminished. When both high rotative speed and high piston-speed are combined the engine becomes compact, is easily regulated, and is light. Such an engine, however, is not ordinarily so economical in the use of steam as a more moderate application of these principles permits, by reason of the large clearance volumes in the cylinder, and by the necessity of a copious lubrication.

The usual engine-cylinder has a circular piston traversing a cylinder whose length varies from the diameter of the piston up to twice its diameter. Steam is admitted alternately on each side of this circular disk or piston, and causes it to move first in one direction and then in the other. This most common form of a cylinder is shown in Fig. 1, which represents a longitudinal section of a cylinder, with its piston and piston-rod. Fig. 2 represents a section of the cylinder of the Corliss engine. It shows a differ-

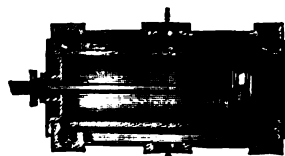


FIG. 1.



FIG. 2.

ent arrangement of openings for the entrance and exhaust of steam. Fig. 2 represents the piston with its packing-

flange. These flange serve to prevent the escape of steam past the piston. The motion which has done its work of driving the piston in one direction is permitted to escape from the cylinder, and is called exhaust steam. The motion of the piston is carried outside by a piston-rod through



Fig. 2—Horizontal stationary engine.

a device in the head of the cylinder so constructed as to permit the rod to slide in and out steam-tight. This apparatus is called a stuffing-box, and is arranged so that a fibrous and elastic material is forced against the rod by being compressed by a gland in an annular cavity. The end of the piston-rod which protrudes from the stuffing-box is guided by a cross-head which compels it to move in the axis of the cylinder by sliding between guides. In certain engines this oscillating movement of the cross-head is secured by a linkage without the use of guides. Such linkage is called a parallel motion. The cross-head carries a pin called the cross-head pin on which vibrates the connecting-rod, by which the motion of the cross-head in a straight line is converted into the continuous rotation of the crank, by whose means the main shaft of the engine is caused to rotate continuously in one direction by the alternating traverse or reciprocation of the piston in the cylinder. The type above described is much the most widely extended, and is considered the most efficient and economical.

Fig. 3 exhibits the mechanism of such a stationary steam-engine, by which the reciprocating rectilinear motion of the piston and piston-rod is converted into continuous rotary motion. In this illustration C represents the cylinder, C' the cross-head moving in guides, C'' the crank, C''' the connecting-rod, F the fly or band-wheel, S the steam-pipe. Fig. 4 represents generally the corresponding features of the Corliss engine.



Fig. 4—The Corliss steam-engine.

Attempts have been made to apply the expansive effort of the steam directly to produce rotation of the crank so as to get rid of the reciprocating motion and the weight of mechanism required for conversion of reciprocating into rotary motion. While the rotary engines offer considerable advantages from their compactness, the direct application of



Fig. 5.

power, the ease with which they are reversed, etc., they are not usually an economical type in consumption of steam by reason of leakage and the difficulty of using steam expansively.

Figs. 5 and 6 are sketches illustrating the rotary forms of engine as invented by Watt and Bramah respectively. In these engines the cylinders are truly cylindrical, but the pistons

revolve about the axes of the cylinders. Of many hundreds of devices of rotary engines these are the principal types. If the connecting-rod of a reciprocating engine be thrown out from its mechanism and the free end of the piston-rod attached to the crank, then the piston-rod must have an angular motion to provide for the play of the crank, and this compels the cylinder to have a motion of oscillation. The engine is then called an oscillating engine, the cylinder being mounted upon transoms on which it oscillates, the transoms being hinged so that steam may enter through one of them and be discharged to the other. While some large engines have been built of this design, the difficulties from leakage when wear has begun are objectionable to this type. The trunk-engine is a mechanism in which the connecting-rod is attached directly to the piston which slides in the cylinder in a straight line. To enable the angular motion of the connecting-



Fig. 6.

rod to pass out of the cylinder steam-tight, it is arranged to swing within a hollow cylinder or trunk whose diameter permits this angular motion without striking the sides and which passes out of the cylinder through a stuffing-box. As this arrangement makes the piston offer only an angular area to the steam on the trunk side, the trunk is often duplicated on the side opposite the crank to equalize the effort on the two strokes. Many illustrations of these trunk-engines are presented by the compact designs of monitors and other small naval vessels. A third type of engine results when the connecting-rod from the cross-head is brought backward at the side of the cylinder or part way to it to a crank at its back head or between the cylinder and cross-head. This type of engine is called a back-crank engine.

Engines may be grouped, according to the direction of the axis of the cylinder, as horizontal, upright, and inclined. The horizontal engine is much the most common because of the easy accessibility of all its parts, the ease with which its foundation can be made, and because all its parts lie close to the foundation. The vertical or upright engine has the advantage of having the piston bear equally over the entire bore of the cylinder without a tendency for the weight of the piston to wear the cylinder out of round. On the other hand, the weight of the reciprocating parts would make the effort on the up and down strokes unequal unless care be taken by special arrangements to neutralize this inequality. The upright engine appears in two forms: with the cylinder above the shaft, known as the inverted vertical, and with the cylinder below the shaft, which may be called the direct vertical. The inverted vertical is much the most usual because the revolving parts are close to the foundation, and the parts which are remote from it are those which have no motion. This is the prevalent type for the marine engine of screw-vessels where the revolving shaft must necessarily be close to the keel (Fig. 10). The direct vertical engine is not much used in the U. S.

In beam-engines a vibrating beam is introduced between the reciprocating piston and the revolving shaft. As distinguished from these, other engines are called direct-acting. In its most usual form the beam-engine is arranged to have a vertical cylinder from the top of which the piston-rod protrudes. The cross-head is connected by the short connecting-rod to one end of the oscillating beam, which is supported usually at its middle point upon a massive bearing. At the other end of the beam a long connecting-rod passes to the crank-pin, so that the alternating motion of the piston is converted by this means into the rotary motion of the shaft. By reason of the fact that in early engines of the beam type the long connecting-rod from the outer end of the beam was attached to the pump-rod of a mine or pit, this long rod in beam-engines is often called the pitman. Fig. 7 shows the mechanism of the American beam-engine as designed for large steamships and river-boats. In this sketch C represents the cylinder, C' the condenser, B the working- (or "walking") beam, C'' the connecting-rod, C''' the crank, A the air-pump, V valve-gearing. The beam-engine as used for pumping gives great convenience of attachment for the rods of the pumping-barrels, and its flexibility in a vertical plane has made it a very favored design for side-wheel vessels, particularly where the condition of shallow water prevented the attainment of vertical stiffness.

in the hull. Triangular beams have been used to enable a horizontal steam-cylinder to operate vertical pumps at a considerable distance below the level of the engine-room. The beam-engine also is convenient where more than one

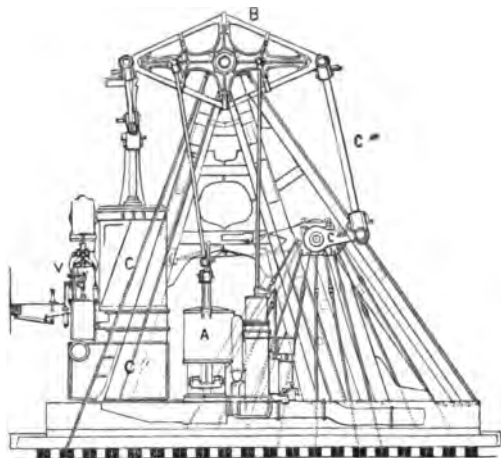


FIG. 7.

cylinder is to be used to produce motion upon one crank-pin. The *side-lever engine* is one in which the beam is placed below or at the side of the cylinder so as to bring the center of gravity low down in the hull of a side-wheel steamer and below a protective deck.

All reciprocating steam-engines may be classified according to the way in which the steam is employed in their cylinders. The steam may be permitted to flow from the boiler into the cylinder throughout the full length of the stroke of the piston. It must then escape as exhaust from the cylinder at the full pressure at which it entered and carrying with it all the heat which corresponds to that pressure. Such an engine is said to take steam at full stroke and to work without expansion in the cylinder or without cut-off. A second class of engine allows the steam to flow from the boiler into the cylinder at full boiler pressure for but a part of the stroke only. The admission of steam is then cut off by the proper valve mechanism, and the steam inclosed in the cylinder expands in the increase in volume as the piston moves under its action toward the end of its stroke. This increase in volume is accompanied by a fall in pressure and a reduction in temperature, so that upon exhaust a less weight of steam and a less number of units of heat are rejected from the cylinder than in the first case. Such an engine is called an *expansive-working engine* or a *cut-off engine*. The degree of expansion is the reciprocal of the point of cut-off expressed in terms of the length of the piston-stroke.

Again, the steam may be rejected from the cylinder at the pressure of the atmosphere, escaping as the vapor of water at 212° F., or slightly over. Such an engine is called a *non-condensing-engine*, because although the steam rejected passes back to water in the atmosphere at large, it is not condensed to water in connection with the engine itself. In the other type the steam is exhausted from the cylinder into a vessel, where it comes immediately into contact with a cool medium, and is thereby reduced back to warm water with the very great reduction of volume which follows such condensation, so that if the condensed water is continuously removed from the condenser a more or less complete vacuum can be maintained therein. Such an engine is called a *condensing-engine*, and has the advantage over the non-condensing-engine of a greater mean pressure in the cylinder for a given boiler-pressure and point of cut-off, from which results a smaller engine for a given power, or more power from an engine of given proportions. The heat in the steam is also utilized more completely, as the hot water which is caught in the condenser is pumped back again to the boiler at a higher temperature than the feed-water would otherwise have. An air-pump is used for draining the condensed water from the condenser. This, in many types of condensing-engine, is operated from the beam or cross-head of the main cylinder (Fig. 7). In recent practice it has been preferred to operate the air-pump independently with its own steam-cylinder. It can then be run at higher speed than the main

engine, the vacuum in the condenser can be created before the main engine is started, and the air-pump can be located where it may be found most convenient. The advantage of the attached air-pump is that the large engine-cylinder is usually more economical than the small detached one. By putting the condenser at a height over 32 feet in the air, with a pipe running down into a reservoir or well, in which it is at all times sealed, it will be apparent that gravity acting upon the water in the condenser and its descending pipe will compel the water to stand in the pipe at a height at which the barometric pressure of the atmosphere will just balance the column. In other words, a Torricellian vacuum prevails in the condenser. By causing the water to meet the exhaust steam at this height condensation is continuous, and all that is necessary is to provide by the principle of induced currents or otherwise for the removal of air which will enter the condenser by leakage and from the steam and water. Such condensers are called *gravity-condensers*. Two great types of condensers are used. In the first the steam meets the condensing water directly and cools it by contact; the cold water or injection enters the condenser in a jet by atmospheric pressure, which gives to this type of condenser

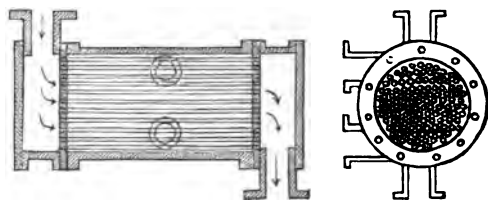


FIG. 8.

the name of *jet-condenser*. In the other type the steam is condensed by contact with a surface of brass tubes which are kept cold by the circulation through them of the condensing water (Fig. 8). The condensing water enters the tubes at one end, as shown by the arrows, and is discharged at the other, while the steam is admitted around the tubes. A mode of packing the ends of the tubes by ferrules of compressed pine wood is shown in Fig. 9. This device, the invention of Horatio Allen, and others like it have contributed to render the surface-condenser more perfect in its operations. In the jet-condenser a less quantity of water is required and the air-pump handles it all. The steam and condensing water are intimately mixed. In the surface-condenser arrangement the condensed steam is pure distilled water and does not become mixed with the condensing water, which can be impure and unsuitable for use in the boilers. The air-pump handles only the water condensed from the steam, and special pumps, called *circulating-pumps*, are required to circulate the cooling water around the tubes. In sea-going vessels surface-condensation is almost universal, the salt water from outside of the hull being circulated through the condenser and overboard, while the pure distilled water from the air-pumps is used over and over again in the boiler.

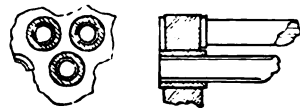


FIG. 9.

Another difference which can serve as a basis for classification of steam-engines is brought about by the way in which the alternating traverse of the piston is affected by the pressure of steam. If both strokes forward and back, or upward and downward, of the piston are produced by the pressure of steam upon its area, the engine is said to be *double-acting*. Where steam drives in one direction only the engine is called *single-acting*. By far the greatest number of engines are double-acting. What is called the *Cornish engine* is one of the best known of the single-acting engines. In this design, which is mainly used, and is at its best, for pumping, the steam enters the cylinder from the boiler, and by its direct pressure and after cut-off by its expansion the piston is driven in one direction. When this stroke is completed a valve is opened by which an equilibrium of pressure is established through a side pipe between the top and bottom of the cylinder around the piston. The piston then yields to the action of gravity and returns to its initial position without the use of fresh steam, so that one stroke forward and back is accomplished by a single admission of steam. The Cornish engine appears in two forms: In the first, the piston is connected to the massive

piston-rods of a mine-shaft, or to the heavy plungers of a water-work pumping-engine, by means of a beam, so that the working stroke which lifts the weight of the rods or plungers is the down-stroke of the piston, and the piston-rod passes out of the top of the cylinder. In the second type, which is known as the *Hull Cornish engine*, the piston-rod is attached directly to the rods or plungers, over which the cylinder is placed, so that the piston-rod goes down to the lower head, and the working stroke is the upward traverse of the piston. The Cornish engine has an fly-wheel, and the rapidity of its stroke is controlled by the flow of steam or of water through the valves. It is this peculiarity, which permits the use of a long column of moving water to be the controlling feature of the velocity of the piston, that made this type of pump a popular form in early days. The objections to the system are the great bulk of the cylinder with comparatively small power, the massive foundations required, and the danger from accident to the engine if the pump-barrel should fail to fill, whereby the engine would make an over-stroke, since there is no crank to regulate the length of the stroke. The Cornish engine is usually designed to have its steam-valve operated by a catamaran. The catamaran consists of a small cylinder fitted with a plunger. The pump-rod at their working stroke lift the plunger in the catamaran-cylinder, and the latter is filled with water. A weight upon the catamaran-plunger tends to make it descend, but the speed of its descent is controlled by a valve upon an outlet-pipe whose position, by impeding the outflow of water, controls the time in which the cylinder will empty. The descent of the plunger, when near the bottom, opens the admission-valve of the main engine, and thus causes a stroke to be made. The plunger of the catamaran-cylinder being moving independent of the main engine will cause the latter to make strokes intermitting with periods of rest. For relative types of engines two single-acting cylinders can be attached to the shaft with cranks at opposite phases, the two producing the same effect as a double-acting engine, with the gain that the pressure is always in one direction, and there should be no lost motion.

Another great principle of classification of engines is determined by the fact that the expansion of the steam in the cylinder may take place in a single cylinder, or be made continuous in two or more cylinders. This difference divides engines into simple, compound, and multiple expansion. In the simple engine the steam does its work upon one stroke of the engine, and then escapes as exhaust either into the atmosphere (non-condensing) or into a condenser, where it is released to water and causes a vacuum (condensing). A simple engine may have more than one cylinder, but if each cylinder takes steam direct from the boiler, and that steam is rejected at exhaust without doing additional work in another cylinder, such engine is not a compound engine. In the compound engine the steam enters a cylinder of a certain volume from the boiler and works in it as in a simple engine. The exhaust steam from this cylinder passes into a second cylinder of larger volume (usually three or four times that of the first), where it acts as a driving pressure, and from which it is exhausted when the stroke is completed. It will appear, therefore, that the driving steam for the second cylinder is a back-pressure on the exhaust side of the first cylinder, but as the areas are different the net effect is positive to produce motion of the larger cylinder. If the first cylinder has no cut-off, but takes steam full stroke from the boiler and without expansion, it is obvious that the final volume of the steam is as many times greater than its initial volume as the capacity of the larger cylinder is greater than the smaller, so that an expansive working of the steam is secured, although the first cylinder has a constant propelling effort from the beginning to the end. In a simple engine this expansive effect could be produced only by cutting off admission early in the stroke, whereby the propelling effort would have to be in excess at the beginning of the stroke in order that, at the end, when the pressure had fallen, there might still be sufficient propelling effort to overcome a constant resistance. The compound engine, moreover, by distributing the range of temperature between the initial and final pressures of the steam, when the number of expansions is considerable, in more than one cylinder, causes a diminished loss of heat, both by radiation and conduction of the walls of the cylinder with the steam. The transfer of heat by both these processes is greatest and most rapid when the difference of temperature is greatest. By keeping this difference of temperature low or having it distributed in two cylinders, the total loss is

less than it would have been in the larger cylinder if the latter had been used alone in a single engine. The principle of the compound engine was first proposed by Jonathan Houlden for the single-acting engine in 1781. It was reintroduced by Arthur Woolf for the double-acting engine in 1804. It was applied to some considerable extent, to beam-engines by McNaught about 1845, but really secured its modern development by the application of the principle to marine practice by John Elder, of Glasgow, in 1854.

When the expansion is made continuous, as in the compound engine, through three cylinders, the engine is called *triple expansion* (or *tri-compound*); when the expansion is continuous in four cylinders the engine is called a *quadruple expansion*, or the general name of multiple expansion is given to an engine having the expansion continuous in more than two cylinders. It is the continuity of expansion and not merely the number of cylinders which gives the engine its name. It is often inconvenient in engines of great power to construct a single large cylinder of volume sufficient to secure a sufficient increase of volume to attain the desired range of pressures and the ultimate low temperature. It is usual to call the cylinder which receives the steam directly from the boiler the high-pressure cylinder; the last one in the series, from which the exhaust steam escapes, is called the low-pressure cylinder; if the expansion is continuous in three cylinders the middle one between the high and low pressure cylinders is called the intermediate cylinder. If the steam passes through four cylinders continuously there will be two intermediate cylinders, called respectively the high-pressure intermediate and the low-pressure intermediate. In a multiple-cylinder engine, in which the steam expands from one cylinder into two others, and again such as the same pressure, such two cylinders of equal pressure are designated as the first and second intermediate, or the first and second low-pressure, as the case may be. When two pistons of unequal diameter working with steam of continuous expansion, are arranged upon the same piston-rod, the engine is called a *triple-engine*; when the small cylinder is vertically over the larger in an inverted vertical engine, the name *triple-engine* has been given to it. The cranks of a two-cylinder compound engine (sometimes called a bi-compound) can be arranged so as to be parallel to each other, so as to be 180 degrees apart, or so as to be 90 degrees apart. In the first two arrangements the steam can pass directly from one end of the smaller cylinder in the same or opposite end of the larger; in the third case, when the cranks are quartering, a receiver must be provided into which the steam from the high-pressure cylinder shall pass while the low-pressure piston at its dead point at the end of its cylinder offers no volume to receive the steam discharged from the preceding one. Such engines are therefore called *receiver-compound engines*, and when arranged, as they usually are in stationary practice, so that their two cranks are on opposite ends of the driving-shaft, compelling the steam to cross over a short passage between the cylinders, the engine is called a *cross-compound engine*. This receiver type and the cross-compound form offer the advantages possible from introducing into the receiver a device called a re-heater, reheating or regenerating the steam in its passage from one cylinder to the other. The advantages of economy and from securing ability to use high pressures for the entering steam have been the great reasons for the wide increase in the development of the multiple-expansion engine, both condensing and non-condensing.

A classification of the steam-engine finally, with respect to the uses to which its developed power is to be applied, would be almost an enumeration of all the foregoing types in their different forms. A rough classification might be first into engines for propulsion and engines for stationary uses. The engines for propulsion, on land are the locomotive and the traction engine, and on the water the type of marine engine of transatlantic and naval practice, and the type of beam-engine used more for coastwise traffic and in shallow waters where the paddle-wheel is the means of propulsion.

The locomotive and the traction engine consist of an internally fired boiler (see *STEAM-BOILER*) supported upon wheels, and carried by a frame in which the effect of the cylinders through the wheels gives the desired motion. The wheels receiving the effect of the steam are called driving-wheels, and are four, six, eight, or ten in number, dependent upon the desired traction or hauling power of the machine; this latter is, under ordinary circumstances, one-fourth of the weight borne on such driving-wheels, and the diameter of the cylinder and its stroke is usually proportioned so that

the power of the cylinders shall be able to cause the driving-wheels to slip. Ability to start heavy trains is secured by giving a relatively small diameter to the driving-wheel, while very high speed requires a relatively larger diameter of the wheel, inasmuch as the circumference of the driver measures the space through which the engine will move forward in one revolution, which corresponds to two traverses of the piston. If the driver is too small for a high speed the number of revolutions per minute will become excessive.

In the traction-engine for hauling upon common roads, where the speed is relatively low, it is usual to reduce the speed of the driving-wheels from that of the engine-shaft by intermediate gearing. The driving-wheel also needs to have a tire of great breadth to distribute the weight of the boiler and engine over a large area of yielding roadway. The tires are also usually corrugated or roughened to give adhesion. The traction-engine must have a very efficient means for steering it to enable it to make the sharp turns required in ordinary roads, and it is furthermore usually so designed that by throwing out the intermediate gearing from connection with the traction-wheels, the steam-engine proper can be used as an agricultural engine for threshing, milling, and other similar purposes.

The marine engine of transatlantic practice is usually an inverted vertical compound or triple-expansion, double-acting reciprocating engine. The cylinders are supported on massive cast-iron or cast-steel frames shaped something like a letter A, while the revolving shaft is below the cylinder and between the frames so as to secure immersion for the

a long stroke and a long connecting-rod without taking up valuable deck-room desired for cargo space in vessels of little depth of hull. On the other hand, when conditions necessitated such exceeding shallowness of hull, due to very light draught of water, that the concentrated weight of the vertical cylinder and the overhead beam became impracticable, there was developed a type of horizontal engine with long stroke and small diameter of cylinder, so that the weight of the engine might be distributed over a long length of the hull. The rapid current and tortuous channel of Western rivers suggested also the advisability of making the paddle-wheels on the two sides operate by separate cylinders, with a further advantage in distributing the weight of the engine. Furthermore, for towing on such rivers a type of steamer with the water-wheel at the stern has been developed, the wheel driven by cranks at each end of the shaft which are operated by long connecting-rods, one at each side. Great advantage has followed, where absence of ice makes the practice possible, from arranging the floats of paddle-wheels so that they will enter the water and leave it perpendicularly. The radial float tends to lift the vessel as it strikes, and to lift the water as it leaves; the perpendicular or feathering paddle produces all its effect in propulsion, without wasting a lifting effort. Feathering is secured by connecting the floats by a system of linkage which appears in several different forms.

For land engines and stationary practice probably the five most widely extended uses which involve the largest units are for pumping, for electric lighting and power, for mill and manufacturing purposes, for hoisting and air-compressing

in mining, and for driving the roll-trains of iron and steel works.

For pumping, in addition to the Cornish engine, mentioned above, the two great types most usual are the beam-engine and the direct-acting pumping-engine. The older form of beam-engine was a single cylinder condensing-engine with overhead beam. The beam gives most convenient attachment for connecting-rods and plungers. More recently the compound and triple-expansion

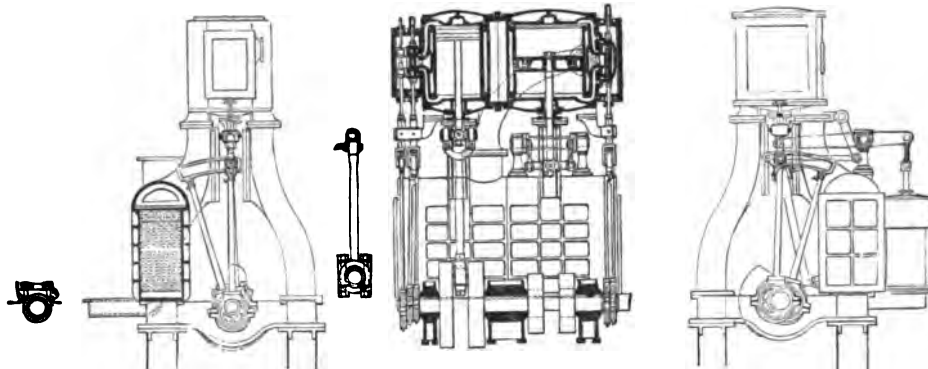


FIG. 10.

screw or propeller at the stern (Fig. 10). In the triple engine the cranks stand at angles of 120 degrees from each other, securing a good distribution of the turning effort upon the shaft. The cross-heads of the first and last cylinders usually operate the air-pump, by which the surface-condenser is freed from the condensed steam, while detached circulating pumps force the water of the ocean through the tubes to cool them. Injury to the valves by which the ocean water for condensation enters the engine has been the occasion of some noteworthy disasters to transatlantic vessels. The turning effort of the engine-shaft is transmitted from the engine to the propeller through a long shaft provided with the necessary bearings, and, in particular, a massive thrust-bearing, upon which is imposed the resistance to endwise motion which the reaction of the screw exerts as the vessel is forced forward. The thrust-bearing accommodates a series of collars, or enlargements of the shaft, whose area and number are proportioned so as to keep the pressure per inch of surface below that at which lubrication becomes difficult or impossible.

For the side-wheel vessel the necessity for having the center of the water-wheel shaft elevated above the water a distance nearly equal to the radius of the wheel has made the beam-engine and the inclined direct-acting engine the type most frequently met. Oscillating cylinders have been used in the past, but are not likely to be selected for large designs in the future. The inclined engine in the earlier practice was a simple condensing-engine; it has been made more recently compound and triple expansion. The advantage of the inclined type is that the center of gravity of the engine is low; the advantage of the beam type has been the flexibility which that construction permits, and that it secures a high piston-speed with a relatively small number of revolutions imposed by the large paddle-wheel, and allows

tion types have come forward, with either the beam below the cylinders or employing a beam of angular type, to various points of which are attached the rods to the fly-wheel shaft and to the pumps. An objection to the use of the fly-wheel in massive pumping-engines is its tendency alternately to accelerate and retard the flow of water in the main as the varying crank angle permits the piston to change its velocity. The direct-acting pumping-engine has no fly-wheel, but is so constructed that it can not stop when its stroke is completed by the expedient of having the valve which distributes the steam in the cylinder operated by another or an auxiliary engine, which latter receives its steam by the action of the piston of the main engine. This arrangement makes it impossible for the engine to stop with both steam passages covered by the valve. If this second or auxiliary steam-engine is made also to be a pumping cylinder, the type of direct-acting pump known as the duplex pumping-engine results. This type prevails very largely, and besides the advantage of having no fly-wheel and no dead center, it offers the advantage of keeping the column of water always in motion, while a moment's pause at the end of the stroke of each cylinder permits the valves in that cylinder to seat themselves quietly before the return stroke begins. In some recent designs the horizontal type has been selected with fly-wheel and vertical beams.

For electric-light and power stations, and for electric railways, the type of horizontal engine, simple or compound, has been much used, the power being distributed among a large number of small units. In more recent practice, with larger units, the inverted vertical type, compound and triple expansion, has been extensively introduced, in many cases the revolving armature for the dynamos being continuous with the revolving shaft of the engine.

For both mill and manufacturing purposes the horizontal

engine in tandem, cross-compound, or triple-expansion form has been by far the most widely distributed. The fly-wheel of such engines is usually made with a broad face, so as to be used as a belt or band wheel from which the power could be taken off to different driven shafts as required. The engines for cable-railway practice are usually of this type, but instead of flat belts, round ropes bearing in grooved pulleys are much more generally applied.

For hoisting-engines in mines and for elevator service it is usual to reduce the speed of the engine-shaft to that of the shaft which carries the hoisting-drum by means of toothed wheels or gearing; this permits the use of cylinders of smaller diameter operating at a high speed with the corresponding advantages. In air-compressing and blowing engines the horizontal and vertical type are very usual, the steam and air pistons being upon the same rod, and two connecting-rods from a cross-head between the two cylinders being coupled to crank-pins on the fly-wheel shaft. These air-compressing and blowing engines require a heavy fly-wheel by reason of the fact that the resistance is least at the beginning of each stroke, so that energy must be stored in them if the engine is working expansively, to be given out at the end of the stroke when the effort of the expanding steam is the least. For rolling-mill engines both horizontal and inverted vertical engines are used, in most cases connected directly to the train of rolls. The great variation in the resistance met by the rolls requires a very massive fly-wheel construction.

The requirement that the piston in the engine cylinder shall admit steam alternately upon its one side and the other, and shall at the same time discharge exhaust steam from one end while receiving live steam from the boiler at the other end, has given rise to a great many different types of mechanism for this purpose. The simplest type is a single valve, sliding upon a flat surface made at a convenient place on the side of the cylinder. The valve is caused to slide by means of a crank or eccentric, usually upon the revolving shaft, and so important is this function in the operation of an engine that space must be taken for a full description of the fundamental forms.

Fig. 11 represents a section of an engine-cylinder by which the action of the common D slide-valve (so called from

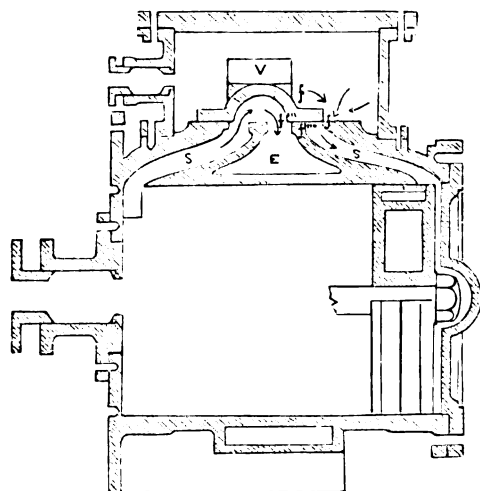


FIG. 11.

the shape of its section) may be explained. In this section V represents the valve, situated in a rectangular box or casing, which is in full communication with the boiler when the engine is running. This box, called the *steam-chest*, situated on the side of the cylinder and forming part of it, is constantly full of steam at nearly the boiler-pressure when the engine is in motion. S S are passages called steam-passages leading from this chest to the ends of the cylinder; E, a passage called the exhaust-port leading to the open air or to the condenser. The ports are long rectangular openings in a plane surface on the side of the cylinder. The valve V has such form and dimensions that it covers all these ports when in its neutral or middle position, and is caused to slide back and forth just enough to uncover alternately the steam-ports S S, the amount of this sliding, even in the largest engines, in which the valve may have a super-

ficial area of several square feet, being only 3 or 4 inches. In small engines the extent of sliding in one direction may be only a fraction of an inch. This movement of the valve to the right and left is produced by means of an eccentric or small crank and a special connected rod attached to the valve, by which its motions are made to correspond in point of time with the motions of the piston; but the eccentric and main crank being keyed to the shaft in different positions, these motions, although taking place in the same times, will not at each moment correspond in direction or velocity.

It will be seen from the figure that the piston is at the end of its stroke, and its return to the opposite end depends on its receiving the impulse of steam admitted from the steam-chest just at this moment to drive it back. It will be observed, also, that the valve has been moved from its central position, covering all the ports, already sufficiently far to open the steam-port on the right a small amount, and steam is already admitted and fills the narrow space to the right of the piston. Thus the full boiler-pressure, or nearly so, is already acting on the right of the piston to drive it back. The condition of things on the left of the piston at this moment is quite different. The steam which has been confined in that part of the cylinder to the left, and which by its expansive action has driven the piston toward the right, is free to pass from this space into the atmosphere back through the steam-port S through which it came, but not into the steam-chest—the port S leading through the hollow of the valve to the exhaust-port; and this opening is by the movement of the valve already larger than the opening for admission on the right. The phenomena which take place while the piston moves from the right to the left are as follows: The valve completes its excursion to the left, and returns, so as to shut off the supply of steam on the right of the cylinder, while the piston is still in motion to the left. After the supply is cut off, the confined steam continues to act by its expansion alone, no more being admitted. The fraction of the stroke at which this occurs depends on the dimensions of the valve and the arrangement of the mechanism by which it is moved. It may happen, also, that by the same movement of the valve on its return to the right, and while the piston is still moving to the left, the exhaust-passage is closed so as to confine a portion of the steam in the left-hand part of the chamber, to act as a sort of cushion. This will occur at the moment the inner edge of the hollow part of the valve on the left reaches the inner edge of the steam-port. As the valve continues to move to the right, the outer edge of the valve on the left approaches the edge of the steam-port, and at a certain instant opens that port, letting new or "live" steam from the boiler into this end of the cylinder, which mingles with the exhaust steam already confined there as a cushion. This phenomenon usually takes place but an instant before the piston reaches the end of its stroke, in order that it may meet not only a cushion of exhausted steam, but of steam at full pressure from the boiler.

Fig. 12 represents on a larger scale a section of a simple

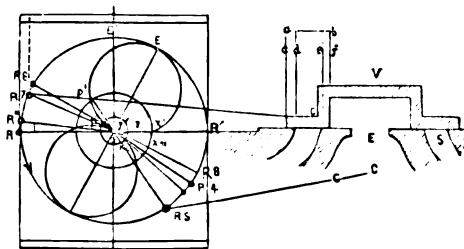


FIG. 12.

slide-valve and the cylinder ports, the valve being in its middle or neutral position, covering all the ports. The projection of the outer edges of the valve beyond the edges of the steam-ports, so that the ports are more than covered by the valve, is called the *outside lap*. It exercises an important influence on the distribution of the steam. The projection of the inside edges of the hollow part of the valve over the inner edges of the steam-ports is called the *inside lap*; it is always relatively small, and often does not exist to an appreciable amount.

The adjustment of the single slide-valve with a single eccentric, when once made, can not be easily changed while

Governor Cut-offs.—Devices for cut-offs adjustable by the governor are very numerous. The old combination of the governor and throttle-valve is not a cut-off. Its action is to diminish or increase the pressure in the cylinder as the speed of the engine is increased or lessened, and thus diminish or increase the work per stroke; but a diminution of the initial pressure in the cylinder and the pressure throughout the stroke entails waste of heat and power, and is therefore only admissible where these considerations are not regarded as important. In stationary engines employed for many purposes it is not only important in point of economy that this waste should be avoided, but the character of the work may be such that variations of speed, to any considerable degree, are to be avoided. The action of the governor in causing a complete cut-off of the steam at any point of the stroke depends primarily upon the speed of the engine by which it is moved (see GOVERNORS), and secondarily upon its connection with the valves which close the steam-ports. The power of the governor is not sufficient, generally, to move these valves directly, and hence its action consists in nearly all cases in throwing into or out of gear mechanism driven by the engine itself; by which the requisite movement of the valve is produced. One mode consists in a sudden disconnection of the mechanism which moves the valve, which is then driven back so as to cover the steam-port by means of a weight or spring. The closing of the valve is thus almost instantaneous—a matter of importance both in the opening and closing of the valves. The Corliss engine furnishes an instance of this kind of cut-off. Fig. 17 repre-

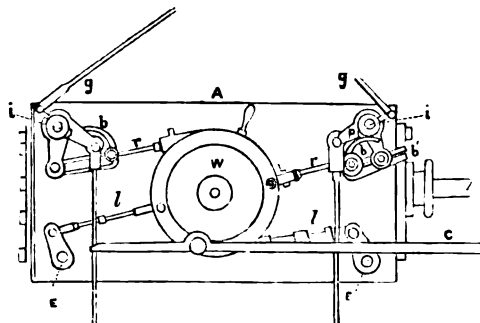


Fig. 17.

sents a section of the cylinder of a Corliss engine, with its four valves—the exhaust-valves and the steam induction-valves. The cut-off mechanism is exhibited in this figure, in which A represents a side elevation of the cylinder. The steam-valves move about axes projecting at *i i*, the exhaust-valves about axes at *E E*. *W* is a plate mounted on an axis projecting from the side of the cylinder. It performs the part of a "rocker" simply, being moved backward and forward by the eccentric-rod, *c*. The lever-arms of the lower or exhaust valves are connected with this "wrist-plate" by two links, *l l*, which are permanently adjusted, so as to cause the exhaust to take place at the proper moment. The upper corresponding lever-arms for the induction valves have the form of bell-cranks, to one arm of which a weight is attached by a long vertical rod, shown in the drawing. The links, *r r*, attached to the wrist-plate are not permanently jointed to the bell-cranks, but the ends of these links or bars slide along the ends of the bell-crank; a notch in the sliding end catches the arm on the return motion and draws it back, opening the valve. The disengagement of this notch is effected by a bent piece, shown at *b*, which, as the link, *r*, is drawn back, strikes a small protuberance, *p*. The position of this small protuberance depends only on the governor. The governor-rods, *g g*, are attached to the ends of levers which move plates or rings embracing the axes, *i i*, and on these plates the protuberances are made. When the hook or bent piece strikes the protuberance, the notch is disengaged, and the weight, acting on the valve, closes it. The cutting off of the steam is thus instantaneously effected.

Another example may be given to illustrate the use of a cam-motion controlled by the governor. Fig. 18 represents a section of the cylinder of such an engine; *V V* the valves, which are balanced poppet-valves. These valves are double—that is, they have two conical seats—and when they are closed, the steam-pressure acting on both sides of the valve, it is nearly balanced. The stems of these valves extend to a position near the middle of the cylinder, and are there

actuated by a cam, *C*, being alternately opened by the cam. When the cam in its revolution releases either valve, it is carried back promptly by a spring. The cam slides vertically on a rod, the vertical motion bringing a new arc of

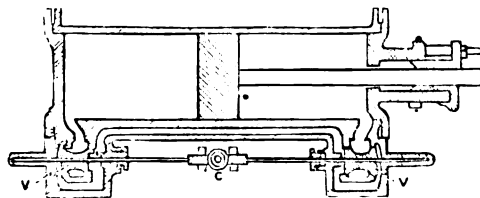


Fig. 18.

the cam into action. This vertical motion is controlled by the governor. Other efficient devices might be mentioned which are deservedly popular, but these are sufficient to illustrate the principle. The Stevens cut-off, so common on U. S. river-steamers, has poppet-valves, the vertical valve-stems having strong toes or projections attached to them which are lifted by corresponding toes or arms attached to the rock-shaft. This cut-off is not controlled by the governor, but is adjustable by the engine-driver. The Ryder cut-off is one in which by an ingenious device the governor performs the work of moving the expansion-valve unassisted by the engine.

Fly-wheel.—The fly-wheel is an important and essential appendage to the steam-engine under many conditions.

A stationary engine with a single cylinder requires a moving mass between the piston and the working-point, which by its alternate accelerations and retardations will store up and give out energy in such a manner as to keep the power, reduced to or at the working-point, nearly constant. As an example, the rolling-mill is perhaps the most striking. The useful work to be performed is in this case the driving of a heavy plastic bar or plate of iron or other metal between rolls—an operation not continuous, but occurring only at intervals. With a single-cylinder engine of the ordinary type the pressure of the steam on the piston at any instant is not usually sufficient to overcome the great resistance offered; by the interposition of a heavy fly-wheel, however, the action of the engine produces gradually a high velocity of revolution in the fly-wheel, causing an accumulation of energy. When the metal enters the rolls, this accumulated energy is given out; and even if the steam were suddenly shut off, the fly-wheel would carry the metal through the rolls. This is accomplished, however, only at the cost of a loss of velocity in the fly-wheel, which loss must again be restored by the engine. Again, when the resistance is sensibly constant, as when an engine is driving a shop or factory, the power of the engine is nothing at the dead-points, and is a maximum at nearly mid-stroke. If there were no moving mass to store up and give out energy, the engine must cease working at the first dead-point; for at that point the piston, which is the working-point, comes to a stop and begins to return on its course. When, in addition to the above considerations, the action of the steam on the piston is not constant, but diminishes gradually from the time it is cut off, the necessity for the fly-wheel to keep up a uniform or nearly uniform motion in the shaft is still greater; or, rather, the conditions on which its dimensions depend become more complicated. In cases where the energy of the fly-wheel is required for a short period of time to perform nearly the whole useful work, as in the case of a rolling-mill, its dimensions can not be theoretically estimated with certainty. Precedents and experience must then be the chief guides to the engineer. The dimensions suitable for a given engine, in which the resistances are supposed constant, may, however, be determined from theoretical considerations, at least with the aid of experiments made to determine certain constants which enter the formulas. It is impossible to establish a perfect uniformity of motion in the crank-shaft of an engine, because the mass, which by alternately gaining and losing energy preserves a uniform velocity during certain periods of motion, can only act by itself gaining or losing velocity momentarily at intervals of those periods; but under given conditions the variations of velocity may be made as small as is desirable.

The space available permits only a brief discussion of the theory of the action of steam in the steam-engine.

A certain quantity of steam enters the cylinder at each stroke of the piston, depending on the cut-off or degree of expansion. During this period the piston is actuated by

the full pressure of the steam in the cylinder, generally a little less than that in the boiler, and performs a quantity of work represented in foot-pounds by the product of the pressure multiplied by the volume traversed during the period of full pressure, or $p_1 V_1$. After the steam is cut off it continues to act on the piston by its expansive force, but with a constantly diminishing pressure, to the end of the stroke. It is usually assumed in practice that the diminution of pressure takes place during this part of the stroke, according to the law that the pressure is inversely proportional to the volume; and on this supposition the mean pressure throughout the whole stroke is determined by the formula—

$$p_m = p_1 \frac{(1 + \log. r)}{r},$$

p_m being the mean pressure, r the ratio of expansion; the logarithms being taken in the Napierian system. As the piston returns, a certain back or negative pressure is unavoidable, due to the resistance offered by the steam that is being expelled from the cylinder. That pressure can not be determined from theoretical considerations, but it is approximately known from experience.

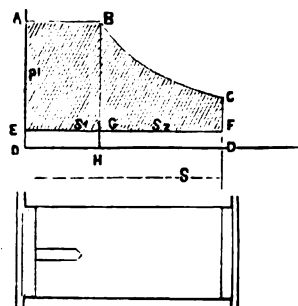


FIG. 19.

In engines in which the grade of expansion may be varied at will, the power of the engine will correspondingly vary. The engine making n revolutions per minute, the distance passed over by the piston per minute will be $2nS$, which varies in practice from 200 to 800 feet. The formula is evidently a purely mechanical one—i. e. the force of the steam is treated as though it were any other force subjected to like variations, and acting upon the area of the piston. Questions of the quantities of heat do not enter. The action of this force is usually illustrated by a diagram as follows (Fig. 19): Let $OD = S$ represent the length of stroke of the piston; $AB = S_1$ the distance passed over by the piston before the steam is cut off. The ratio of expansion will be $\frac{S}{S_1} = r$, and that will be equal to the ratio of the volumes $\frac{V}{V_1}$ of the steam at point of cut-off and at the end of the stroke. Let $OA = p_1$ represent the initial pressure of the steam in pounds per square inch; then $p_1 A \times 144$ will represent the total force on the piston $= P$. The work performed during the travel from O to H or A to B will be represented by PS_1 , or $A \times p_1 S_1 \times 144$. The area of the rectangle $OABH$ will then represent this work. The work performed during the travel from H to D will in the same manner be represented by the area $HBCD$, on the assumption that the curve BC is an equilateral hyperbola. This area will be equivalent to $PS_1 \log. r$, and the sum of these two areas representing the whole work of the steam during one stroke,

$$PS_1(1 + \log. r).$$

It is assumed, further, that on the return of the piston the steam that filled the cylinder is discharged at a constant pressure, and that the fall of pressure at the end of the stroke, as well as the rise of pressure on the entrance of the steam, takes place suddenly while the piston is at rest. The area of the rectangle $OEDF$, subtracted from the sum of the areas given above, will then give an area, $EABCF$, which represents the work performed. The area $EOFD$ is represented by $p_2 V_2$, the value of p_2 being assumed.

The "efficiency" of a machine is a term used to designate the ratio of the disposable or theoretical work to the useful work. This is the usual mode of estimating the loss of effect in employing any machine. If the disposable work is estimated in the cylinder of the steam-engine in the theoretical manner above indicated, calling W the disposable work and W' the real work, the efficiency will be $\frac{W}{W'}$, a fraction always less than unity, because, on account of friction, there is always in any machine a certain amount of useless or ineffective work. There are generally also other causes of loss, so that the efficiency of a machine becomes still less.

The efficiency of machines can be determined, therefore, only when the disposable work W and also the useful work W' can be determined.

In estimating theoretically the power of an engine furnished with a steam-jacket, it is impossible to assume with certainty the actual conditions of the problem. It is not known, for instance, precisely what quantity of heat will be furnished by the steam-jacket, nor what relative quantities of vapor and water will be found in the cylinder at the beginning of the expansion. It is usually assumed that enough heat enters the cylinder from the jacket during the expansion to prevent the condensation which would occur if no heat were added—i. e. if there were no steam-jacket; that the curve of expansion is the curve of quantity of vapor constant, and that the steam is saturated and dry at the beginning of the expansion. The curve of expansion is then represented by Rankine by the formula

$$PV^{1.05} = P_1 V_1^{1.05} \text{ or } P = C_1 \frac{1}{V^{1.05}} = C \frac{1}{V^{1.1}},$$

and the mean forward pressure is given by the formula

$$p_m = p_1 \left(17 \frac{1}{r} - 16 \frac{1}{r^{1.1}} \right),$$

r being the ratio of expansion. The mean effective pressure ($p_m - p_2$) is then known when p_2 is assumed.

The application of purely theoretical rules to the expansion is complicated by an important secondary phenomenon which can not well be submitted to analytical investigation. The cylinders of ordinary engines are made of cast iron, which takes up and gives out heat as a sponge takes up and gives out water. On this account, the expansion line of actual engines differs so much from any theoretical line that can be drawn that it is only from experiments with the indicator that the effect of this interchange of temperature between the iron cylinder and the mixed steam and water can be determined.

The use of the steam-jacket, or annular casing enveloping the cylinder with hot steam from the boiler, is an economizer of heat, not because condensation during expansion by the adiabatic curve is in itself a loss of heat, but because the presence of liquid water in the form of cloud, or in any other form, in the cylinder facilitates and renders more rapid the interchanges of heat with the metal of the cylinder and the hot steam entering from the boiler. Thus the initial pressure is diminished and the final pressure is increased in a way that can not be estimated theoretically. As nearly all engines work expansively, it is therefore generally impracticable to ascertain theoretically, except as a mere approximation, the quantity of work which an engine under given conditions is actually exerting. The only true resource is the indicator.

The following table gives the quantity of vapor required per horse-power per hour for an ideal engine:

Pressure in atmospheres.	Pounds of water or vapor per horse-power per hour.	
	Non-condensing-engines.	Condensing-engines.
1½	78.9	15.6
3	38.3	12.9
4	26.7	12.0
5	23.2	11.5
6	21.0	11.0
8	18.3	10.4
10	16.7	10.0

The efficiency of a steam-engine in actual use may be ascertained by comparing the quantity of steam actually used to give one horse-power per hour with the quantity given by the above table for the same initial and terminal pressures of the steam. For instance, a non-condensing-engine may give a horse-power per hour with a consumption of 35 lb. of water or steam at a pressure of 6 atmospheres—a common performance. The theoretical quantity required in a perfect engine, according to the preceding table, for the same initial pressure is 21 lb. The efficiency of the engine under these circumstances, measured by the standard of steam required, is $\frac{21}{35} = 0.6$. Ordinary boilers of the best type may evaporate 9 lb. of water for 1 lb. of coal burned, the maximum of evaporation of the boiler being about 13.5 lb. of water per pound of coal. The efficiency of the boiler is then $\frac{9}{13.5} = \frac{2}{3}$. Multiplying these efficiencies together, we have the efficiency of the boiler and engine equal to $0.6 \times \frac{2}{3} = 0.4$.

The efficiency of the apparatus, measured by the ratio of the work in foot-pounds accomplished to the number of

foot-ponds of work, which are equivalent to the heat evolved in the combustion of fuel, gives a different result. A non-condensing engine that requires 25 lb. of water per horse-power per hour will require a consumption of about 4 lb. of coal per horse-power per hour, of which only about six-tenths are available, the other four-tenths being waste heat of the boiler, heat required to produce the draught, etc. One horse-power per hour is equivalent to 1,980,000 foot-ponds per hour of actual work. The available heat of combustion of 4 lb. of coal is about 24,000,000 foot-ponds. The efficiency of the whole apparatus on the basis of the heat which is imparted to the water by the combustion of the fuel will be $\frac{1,980,000}{24,000,000} = .08$, approximately.

In condensing engines a corresponding calculation will give an efficiency of .17, a horse-power per hour being produced by 15 lb. of coal in some instances. The efficiencies of the non-condensing and condensing engines approach each other as the initial pressure increases.

It may be stated, as a general conclusion, that the use of a compound with a single cylinder under ordinary circumstances results in an important saving of fuel, especially for high degrees of expansion; that in the compound engine, with the larger cylinder jacketed, there is a saving in economy over a single cylinder jacketed, even with the same steam pressure and degree of expansion in both. This last conclusion, although derived from what appear to be convincing and satisfactory experiments, is perhaps not universally accepted by engineers, the subject being one about which there is still considerable discussion. Large cylinders are more economical in expenditure of fuel for a unit of power than small ones, and slow-speed engines generally less economical than high-speed engines. An engine using steam at high pressures, other things being equal, is more economical than one using steam at low pressure. In regard to the degree of expansion to be allowed in designing an engine, it is to be observed that the point of cut-off with a given pressure determines the mean pressure in the cylinder; and if the speed of the piston be fixed the size of the cylinder is determined.

There is still a want of precise and definite rules for ascertaining the most economical degree of expansion in every given case; and hence a theoretical calculation of the dimensions of the cylinder of an engine to be constructed is a problem which involves some degree of uncertainty as to maximum economy. In a paper presented to the American Society of Civil Engineers by Dr. C. E. Emery, M. E., in 1874, giving an account of experiments made by him for the U. S. Navy Department, the following formula is given, based on the experimental data for the most economical ratio of expansion in a single cylinder:

$$r = \frac{p+37}{22}$$

in which r is the ratio of expansion, p the initial pressure above the atmosphere. For example, taking p equal to 5, 10, 25, 40, 60, 80, 100, the values of r will be 1.9, 2.1, 2.8, 3.5, 4.4, 5.3, 6.4, respectively. Dr. Emery states that these ratios are "nearly correct for single engines of large size, with details of good design, too small for single engines of ordinary construction, and too small for the better class of compound engines." The final performance of an engine can only be satisfactorily tested by the use of the indicator and dynamometer, with condensation of the steam and measurement of the consumption.

LITERATURE.—1. Historical: Stuart's *Descriptive History of the Steam Engine* (5th ed. London, 1827); R. L. Galton, *The Steam Engine and its Inventors* (London, 1881); Thurston's *History of the Growth of the Steam-Engine* (New York, 1890). 2. Descriptive: Farrow's *Treatise on the Steam Engine* (London, 1827); Fiedgold's *The Steam-Engine* (1828); Clark's *Railway Machinery* (1853); Bérard's *Treatise on the Steam-Engine* (10th ed. London, 1868); A. R. Seaton, *A Manual of Marine Engineering* (11th ed. London, 1895); A. Knap, *A Practical Treatise on the [Stationary] Steam-Engine* (3d ed., New York, 1894); D. R. Clark, *The Steam-Engine* (London, 1900). 3. Systems of the Steam-Engine: Rankine's *Manual of the Steam Engine* (13th ed. London, 1891); Caterhill, *The Steam-Engine Considered as a Thermodynamic Machine* (3d ed. London, 1890); Thurston's *Manual of the Steam Engine* (New York, 1892); J. H. Ewing, *The Steam-Engine* (Cambridge, 1894). 4. Text-books: Holman, Perry, Peabody, Jamieson, Ewing, Wood. P. B. HUTTON.

Steamer-duck | See DUCK.

Steam-hammers, hammers which are raised by the direct action of steam on a piston in a steam-cylinder, as distinguished from hammers which are raised by other mechanical means, receiving their power from a steam-engine through the intervention of belts and pulleys or gearing. A heavy mass of iron constitutes the hammer, or "tip," as it is called. This tip slides freely in guides or ways in the frame or upright of the hammer. On top of this frame is placed a cylinder fitted with piston, piston-rod, and valve, after the manner of a steam-engine. The piston-rod, extending downward through a stuffing-box in the bottom cylinder-head, terminates in its attachment to the tip or hammer. Steam admitted under the piston raises it and thus lifts the hammer; upon the opening of the exhaust and escape of the steam the hammer falls with a force due to its weight, less the friction of the piston, piston-rod, and escaping steam. This form of hammer was at first made single-acting only, that is, the steam is used only beneath the piston, but hammers are now commonly made double-acting, the pressure of the steam above the piston in the down stroke assisting the action of gravity, thus causing the hammer to strike a more rapid and more powerful blow.

The first practical steam-hammer, it is generally stated in English treatises, was invented and constructed by James Nasmyth, of the Bridgewater Foundry, Patricroft, near Manchester, England. He had proposed the construction of such a hammer for forging the paddle-wheel shafts of steam-going steamers in 1857. It is also claimed that the steam-hammer was invented by François Bourdon, in France, in 1839; and one was built from his designs by the Croust iron-works in 1841. Earlier patents upon steam-hammers were taken out in England, by James Watt, in 1794, and by William Dorell in 1806, but there is no reason to believe that these patents were ever worked.

Nasmyth's first hammers—single-acting only—were worked by hand, but his engineering manager, Robert Wilson, hit upon a plan of operating the valve automatically; and he also, it is believed, first applied the balance principle of valve to the steam-hammer.

Steam-hammers have more cause to deteriorate in use than almost any other machine tool, inasmuch as the severe shocks to which they are submitted while in use tend to destroy their parts. In the earlier hammers the piston-rod seems to have been the part which gave the greatest trouble, and many inventions were made to remedy the defect.

Robert Morrison, of Newcastle-on-Tyne, in 1852 patented a steam-hammer in which the piston-rod was the hammer, and the blow was imparted by the end of the piston-rod properly protected by a shoe or hammer-face. He made the piston-rod very large and of wrought-iron, welding the piston to the middle of this long rod, and guiding it by stuffing-boxes in the upper and lower cylinder-heads. To prevent the bar from turning, he cut a flat on the rod above the piston-head, and guided it by a corresponding shape in the top cylinder-head. Hammers for heavy forgings are constructed with double uprights, large-sized hammers with a long stroke, leaving a wide spread of base between the legs of the upright to give room for the work-



FIG. 1

man to handle the iron being forged. The anvil-face is usually set at 15 inches above the floor-level. Fig. 2 shows a double upright hammer of the Morrison type. These large hammers are not made self-setting, as it is found to be more

advantageous to work them by hand. In light work, such as drawing out bars of steel, an automatic valve-motion is of the utmost importance. Fig. 1 shows the form of a single upright hammer as used for light forging. A hammer weighing 300 lb.—i. e. the hammer-bar, or part which strikes the blow, weighing 300 lb.—should make at least 300 blows per minute to work economically in light forging. An important feature in these rapid-running steam-hammers is the separation of the exhaust-passages in the slide-valve, so that the exhaust from the space below the piston escapes through a passage which does not communicate with the exhaust-

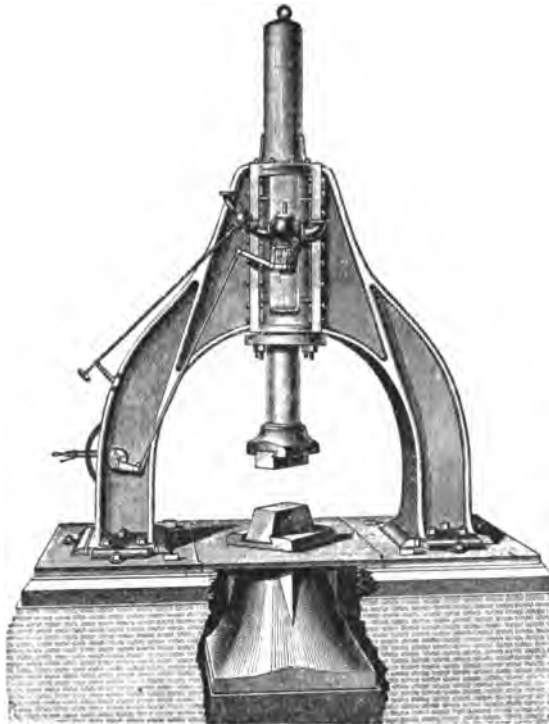


FIG. 2.

passage from the space above the piston. In the exhaust-passage from below the piston is arranged a throttle-valve, which when partially closed chokes the exhaust escape, and thus, suspending the escape of steam as the hammer descends, materially diminishes the force of the blow, and yet, inasmuch as the upper exhaust-passage is open, the hammer rises as quickly as when working with full exhaust. This is of advantage in working steel, as the force of the blow can be lessened at will without materially slowing the speed or rapidity of blows.

In setting steam-hammers it is important that the foundations should be of the most substantial character. It is usual to make the anvil-block separate from the hammer, and to place it on a separate foundation which is underlaid with some thicknesses of wood, say with two layers of closely fitted timbers at least 24 inches in thickness. This gives a degree of elasticity to the anvil and preserves the foundation. The anvil for iron-forging hammers should not be less than five times, and for steel-forging ten times, the weight of the hammer. The direct-acting steam-hammer has numerous rivals in iron making and shaping, such as helve and other power-driven hammers, which are found useful in many lines of manufacture; drop-presses, used for drop-forging; driven rolls; and, finally, hydraulic forging-presses. The steam-hammer forges the metal into the required shape with repeated blows and well-directed skill on the part of the workman. In hydraulic forging the red-hot metal may be made to flow in a solid state into metal moulds, and driven into them by plungers operated by hydraulic presses; but the hydraulic press may also be used to compress metal between a flat movable block and an anvil, thus becoming a direct competitor with the steam-hammer. The first cost of hydraulic apparatus, however, limits the extent of its introduction, and the steam-hammer will probably long continue to be one of the most extensively used forms of apparatus for forging iron and steel.

The largest steam-hammer in the world was built in 1891 at the Bethlehem, Pa., steel-works. The weight of tup, piston-rod, and piston aggregates 125 tons. The cylinder is 76 inches in diameter, and the stroke is 16½ feet. The anvil-foundation contains twenty-two blocks of cast iron, averaging 70 tons each, resting upon steel slabs supported by white-oak timbers. The mass of iron and steel in the foundation weighs 1,800 tons.

Revised by WILLIAM KENT.

Steam-vessels: ships propelled by steam. The possible adaptation of steam for the propulsion of ships seems to have occurred to Roger Bacon in the thirteenth century. It has been stated that Blasco de Garay, of Spain, in 1543, propelled a vessel by steam, but La Fuente, the Spanish historian, found that de Garay made (1540-43) trials with paddles on ships furnished by Charles V., but in every case the paddles were moved by men. Suggestions as to the use of steam, none of which were carried out practically, were made by Salomon de Caus (*Les Raisons des Forces mouvantes, avec diverses Machines tant utiles que plaisantes*, Paris, 1615) and the Marquis of Worcester (*Century of Inventions*, London, 1663). The earliest practical effort appears to be that of Papin, who in 1707 applied his steam-engine to the propulsion of a model on the Fulda river at Cassel. Newcomen had in the meantime brought the steam-engine itself to a working condition; and in 1736 Jonathan Hulls patented a marine steam-engine which he proposed to employ in a vessel to be used as a tugboat. About 1763 William Henry, of Pennsylvania, built a small model steamboat, which he tried with success on the Conestoga river; the experiment is notable as having furnished the hint to the efforts made later by Robert Fulton. During the last quarter of the eighteenth century the problem of steam-navigation had begun to engage many minds in Europe and the U. S. In France the Count d'Auxiron and M. Perier made experiments in 1774-75, and the Marquis de Jouffroy, upon a larger scale and with better success, in 1776-83. In the U. S. James Rumsey, of Maryland, was similarly engaged, and in 1786 built a boat which was propelled upon the Potomac by steam at the rate of 4 miles an hour by means of a jet of water forced out at the stern. He built a boat in London with which a successful experiment was made on the Thames in 1792. Meanwhile John Fitch experimented on the Delaware river. His first boat, built in 1786, was propelled by paddles moved by a steam-engine; at first a speed of only 3 miles an hour was attained, but improvements increased that speed to 8 miles. It is noticeable that in his boat he employed side-wheels, with a screw-propeller at the stern. In 1788 Miller, Taylor, and Symington built a boat which consisted of two connected hulls driven by a single paddle-wheel between them, which obtained a speed of 5 miles an hour on Dalswinton Loch. They built a larger vessel in 1789 with a steam-engine of 12 horse-power, which attained a speed of 7 miles. In 1801 Symington built a boat for towing, which drew vessels of 140 tons at the rate of 3½ miles an hour. About 1790 Robert Fulton left the U. S. for England, where he turned his attention to mechanics, and especially to steam-navigation. He made experiments in France, which were only partially successful, but he secured the confidence and aid of Robert R. Livingston, the U. S. ambassador, and in 1806 returned to New York, bringing with him a Boulton & Watt steam-engine, for which a hull was built. This vessel, named the *Clermont*, made a trial trip to Albany, Aug. 7-9, 1807, returning on the two following days, her average running speed being 5 miles an hour. The *Clermont* was 130 feet long, 18 feet beam, 7 feet deep, with a burden of 160 tons. She soon began making regular trips between New York and Albany, and for all practical purposes must be considered the first steamboat adapted for the conveyance of passengers and freight. Fulton and Livingston obtained from New York the monopoly for using steam-vessels in the waters of the State. John Stevens, of New York, was even earlier than Fulton an experimenter in steam-navigation. In 1789 he had perfected his plans for a steam-vessel, and in 1804 and 1805 built small vessels which showed that his plans were sound. The *Phoenix*, his first steamboat, completed in 1807, followed hard upon Fulton's *Clermont*. Prevented by the monopoly of Fulton and Livingston from navigating the Hudson, he sent his boat by sea to the Delaware, upon which she was afterward employed, and in this voyage demonstrated the problem of the possibility of the use of steam-vessels upon the ocean. Steam-vessels in the U. S. were thus an assured success. Fulton and his coadjutors soon placed a fleet of them upon the

[Hudson river and Long Island Sound, while Stevens and his sons placed their steamers upon the Delaware and the Connecticut, and upon the Hudson after Fulton's monopoly had expired. The first steamboat in Great Britain was the Comet, 40 feet long, built in 1812 for the navigation of the Clyde; but before this time Fulton and Livingston had begun to build steamers at Pittsburg, Pa. Upon all navigable rivers and smooth waters of the civilized world steamboats were rapidly introduced, and their use upon the ocean followed. As early as 1819 the steamer Savannah made the voyage from Savannah, Ga., to Liverpool, England, in twenty-two days, and thence to Russia. From that time the development in ocean steamships has been steadily toward larger steamers, including the famous Great Eastern. The Lucania, of the Cunard Line, a screw steamship of steel, 620 feet long and having a gross tonnage of 13,000 tons, crossed the Atlantic from Queenstown to New York in 5 days 7 hours and 23 minutes (Oct. 21-26, 1894).

Revised by MARCUS BENJAMIN.

Stearic Acid [*stearic* is from Gr. *στεάριον*, tallow]: the most abundant of the solid fat-acids; obtained in the saponification of all the fats containing stearin, and especially of beef's tallow, mutton suet, hog's lard, etc. The so-called stearic acid (or stearin) of commerce is a mixture of stearic and palmitic acids. This commercial stearic acid is produced by the treatment of neutral fats by superheated steam or by alkalis. See SOAP.

Saponification of fats by water alone, at a high temperature, was patented by R. A. Tilghman, of Philadelphia, Jan. 9, 1854, and about the same time (Apr., 1854) by Berthelot, who announced that he had resolved the neutral fats with water in closed vessels at a temperature of 428° F. Tilghman specified the preferred temperature of melting lead, 625° F., but names also the melting of bismuth, 518° F., and to promote the reaction caused the mixture of water and fat to traverse small tubes of wrought iron heated in a fire to a pressure of 90 or 100 atmospheres. Tilghman's process, as originally set forth in his patent, was never introduced in practice. The very high temperature employed destroyed the glycerin and contaminated the stearic acid. As subsequently modified, it has been used with success, but, as the courts have decided, not within the limits of the patent. Melsens, of Brussels, almost at the same time with Tilghman took out in Belgium a patent for the use of water slightly acidified by sulphuric acid to act on fats under pressure at a temperature of 356° to 392° F. The presence of a small quantity of sulphuric acid—1 to 10 per cent. of the fat used—favors in a remarkable degree the evolution of the fatty acids. Melsens's method was put into successful operation at Antwerp almost immediately, using a peculiar form of digester, lined with lead, holding a ton of tallow, to which was added 50 per cent. of water, and in six hours the decomposition was complete at a temperature of 356° F. (ten atmospheres), and the fatty acids obtained were very satisfactory.

The possibility of decomposing the fats by water under high pressure was distinctly recognized by Chevreul, who pointed out the perfect analogy between the fats and the compound ethers, which are decomposed when heated in close vessels in contact with water.

George Wilson in 1852 revived the method of decomposing fats at a high temperature, and subsequently distilling off the acids and glycerin separately by a current of superheated steam, originally conceived by Chevreul and attempted by Bussy and Le Canu in 1825, and more successfully by Dubrunfaut in 1841. In 1855 Wilson exhibited to the jury of the Paris Exposition of that year the results of his method on palm oil by means of water and heat alone, distilling off both glycerin and fatty acids in a way to obtain all the products in a state of chemical purity. To this end the oil is heated in a still to the temperature of 550 to 600° F., and then a stream of subdivided, superheated steam passes through it of a temperature of 600° F. Below 550° F. the saponification and distillation of the products is slight; at about 600° F. the distillation is more rapid, but is then accompanied with the production of acroleins. It is by this process that Price's glycerin is produced. This process works well only on palm oil, and is in fact only a slight modification of the previous process of Dubrunfaut. The complete success of the hot-water process was achieved only in 1857 by Wright and Fouché—French patent of 1857, American in 1859. This requires particular mention.

Wright and Fouché's apparatus by hot water alone produces complete decomposition of fats into fat-acids and

glycerin by a continuous and automatic commingling of water and steam with the fat at a pressure and temperature of ten to twenty atmospheres for a period of twelve to twenty hours. No lime is used; water at the temperature named is the sole chemical agent; and the glycerin produced is of excellent quality; the stearic and palmitic acids (after expressing the oleic acid) are white, fine-grained, hard, and free of odor.

Revised by IRA REMSEN.

Ste'arin [from Gr. *στεάριον*, tallow] ($C_{18}H_{34}O_2$) = $C_{17}H_{33}O_2$: a glyceride or ether of glycerin, as shown by the formula *tristearin*. In commercial parlance, *stearin* is a term applied to the impure stearic acid obtained by the saponification of fats in the preparation of star candles. Tristearin is the natural form of stearin in the hard fats of both kingdoms.

Stearns, LEWIS FRENCH, D. D.: theologian; b. at Newburyport, Mass., Mar. 10, 1847; nephew of President William A. Stearns; graduated at Princeton College 1867; studied theology at Princeton, in Berlin, and Leipzig, also in the Union Theological Seminary, New York, where he graduated in 1872. He was pastor of a Presbyterian church at Norwood, N. J., 1873-76, and Professor of History and Belles-Lettres at Albion College, Michigan, 1876-79; Professor of Systematic Theology in the Congregational Seminary at Bangor, Me., 1880, until his death. His inaugural discourse at Bangor (June 1, 1881) attracted much attention for its marked ability. In July, 1891, he read before the Congregational International Council in London a paper of very high merit on the *Present Doctrinal Tendencies of American Congregationalism*. His principal works were the *Lectures on the Evidence of Christian Experience*, delivered at the Union Theological Seminary, New York, in 1890, and subsequently published, and a posthumous volume, *Present Day Theology*. D. Feb. 1, 1892.

GEORGE P. FISHER.

Stearns, WILLIAM AUGUSTUS, D. D., LL. D.: fourth president of Amherst College; b. at Bedford, Mass., Mar. 17, 1805, the son and grandson of Congregational clergymen; graduated at Harvard College 1827; studied theology at Andover, and after teaching a short time at Duxbury was ordained to the ministry, and installed pastor of the Congregational church at Cambridgeport Dec. 14, 1831. In 1854 he accepted the presidency of Amherst College, which he held till his death June 8, 1876. Besides valuable addresses given during his connection with the college he published several sermons, with papers in the *Bibliotheca Sacra*, *Biblical Repository*, and *New Englander*, a work on *Infant Church Membership* (Boston, 1844), and *Life and Select Discourses of Samuel H. Stearns* (1846).

Ste'atite, or Soapstone [*steatite* is from Gr. *στεάριον*, *στειάριον*, tallow, fat]: a kind of stone which receives both its names from its unctuous quality. It is a compact form of talc, and is an impure hydrated silicate of magnesia. It has some use in the porcelain manufacture. A soft white sort is the French chalk of the toilet and of the tailors' shops. Powdered steatite is employed as a lubricant, and is an ingredient in several kinds of steam-packing. Steatite is easily cut into figures, which are then hardened by fire and colored to imitate more costly stones. Steatite is employed in making stoves and foot-stoves for use in cold weather, since it retains heat for a long time. It is abundant in many parts of the U. S. and other countries.

Stebbins, HORATIO, D. D.: pulpit orator; b. at Hampden, Mass., Aug. 8, 1821; educated at Exeter Academy and Harvard College; graduated at the latter in 1848, and from Harvard Divinity School in 1851; received degree of D. D. from Bowdoin College in 1856; pastor of Unitarian churches at Fitchburg, Mass., and at Portland, Me., where during the civil war he made a civic reputation which led to his call in 1864 to the Unitarian church in San Francisco (where he has since remained) as the successor of Thomas Starr King, who had done the Union cause great service with his voice and pen. He has been actively engaged in educational work and in social reforms; has published sermons and addresses and several orations.

JOHN W. CHADWICK.

Steckel, LOUIS JOSEPH RENÉ: engineer; b. at Wintzenheim, Alsace, in 1844; studied engineering and architecture at Quebec; engaged 1861-62 on Gaspé and St. Lawrence road surveys; appointed in 1863 draughtsman of public buildings Ottawa; in 1870 on permanent engineering staff, Public Works Department, Canada; in 1873 assistant engineer on canal, harbor, and river works, Dominion of Canada,

and in 1880 was appointed chief clerk engineering branch, Public Works Department. He is author of *Geometrical Solutions of Difficult Problems in Land Surveying* (1866); *An Essay on the Liquid Contracted Vein*; and various technical reports.

NEIL MACDONALD.

Stedman, EDMUND CLARENCE, LL. D., L. H. D.: poet and critic; b. at Hartford, Conn., Oct. 8, 1833; studied at Yale College; became in 1852 editor of *The Norwich Tribune*, in 1853 of *The Winsted Herald*; settled in New York in 1855; in 1860 was employed upon *The New York Tribune*; was an editor and war correspondent of *The New York World* 1861-63; contributed to *The Atlantic Monthly* and other magazines; was in 1863 in the attorney-general's office at Washington, and has been since 1865 a stockbroker in New York. He is the author of *Poems Lyric and Idyllic* (1860); *Alice of Monmouth, and other Poems* (1864); *The Blameless Prince, and other Poems* (1869); and *Hawthorne, and other Poems* (1877). His *Poems* were collected in a single volume in 1873. He delivered his narrative poem, *Gettysburg*, in 1872 at a meeting of the Army of the Potomac, and his *Ode at Dartmouth College* 1873. Since 1873 he has devoted himself largely to critical work; *Victorian Poets* (1875; 13th ed. with supplementary chapter in 1887) was followed by *Poets of America* (1885), and by *The Nature and Elements of Poetry* (1892), originally delivered in 1891 at Johns Hopkins University as a lecture series on the Percy Turnbull memorial foundation. In 1891 he succeeded James Russell Lowell as president of the American Copyright League. In 1888-90 he edited, with Ellen Mackay Hutchinson, an important *Library of American Literature* in eleven volumes, and in 1895 he brought out *A Victorian Anthology*.

Revised by H. A. BEERS.

Steel [O. Eng. *stēle*; O. H. Germ. *stahel* (> Mod. Germ. *stahl*); Icel. *stál*; cf. O. Pruss. *stakla*. Russ. *stal* is loan-word from Germ.]: a term comprising several modifications of iron. It is necessary to define the term "steel" at some length, since the old classification very inadequately describes the modern cast, malleable compounds of iron, carbon, and metalloids used for structural purposes, and constituting at least three-fourths of the metal now made by steel processes. The old term "steel" referred to the cast malleable product of iron and so much carbon (from $\frac{1}{2}$ to $1\frac{1}{2}$ per cent.) that the metal would harden when heated to redness and quenched in water; it is used almost exclusively for cutting tools. The homogeneity of this metal is, however, an equally distinguishing quality, and is due to its having been poured into a mould while in a fluid state, so that the slag might separate by gravity, and the metal might become solid and crystalline. Wrought iron, on the contrary, while having similar chemical properties, and sometimes as much carbon, consists of pasty masses from which the slag is rarely quite expelled by the pressure that sticks them together; it is therefore laminated in structure. As the soft compounds and those largely varying in chemical constituents came gradually to be produced by casting processes, it was natural and convenient to enlarge the term "steel" to cover them; and the use of the term was at the same time rendered legitimate and scientific by basing the classification on one of the grand characteristics—structure due to casting—rather than on ingredients, as heretofore, especially since structural qualities were constantly increasing in importance. It is found practically convenient to distinguish between all the cast malleable compounds, whether hard or soft, by affixing the name of the metalloid chiefly incorporated, such as chrome steel, manganese steel, and the like, or the percentage of carbon, or both. It is important to know the amount of carbon in structural steels, and this may be readily determined. The general usage of commerce, as well as of works, is rapidly fixing this enlarged definition. As this article is intended to refer to those compounds of iron which are generally known and sold as steel, such as Bessemer rails and open-hearth boiler-plate, as well as tool-steel and spring steel, the definition must for these purposes be as follows: Steel is a compound of iron which has been cast from a fluid state into a malleable mass. The terms "pot" or "crucible" steel, "open-hearth steel," and "Bessemer steel" are convenient for distinguishing processes of manufacture, but they do not necessarily distinguish between steels which differ either chemically or mechanically.

Nature and Composition of Steel.—From the preceding definition it will be observed that the grand structural characteristic of steel, to which it largely owes its value for all

uses, is homogeneity due to fusion; also, that its chemical constituents and the characters due to them are very various. The important chemical qualities of tool-steel are: (1) The tempering quality, which is due, first, to the presence of say $\frac{1}{2}$ to $1\frac{1}{2}$ per cent. of carbon; second, to the mechanical mixture of this carbon with the metal by means of slow cooling from a red heat, which makes the metal comparatively soft, so that it can be cut with the ordinary tools; third, the extreme hardening of the metal, when, by means of sudden cooling, the carbon is chemically dissolved in the iron. (2) An important condition of tool-steel is its freedom from ingredients, such as phosphorus, which induce brittleness. Excepting some modern steels, in the manufacture of which nickel, manganese, tungsten, chromium, titanium, and some other metalloids are employed, the best tool-steels have but a few hundredths of 1 per cent. of any ingredient except carbon, silicon, and iron.

The more important qualities of structural steels vary with their precise uses. In general, great resistance to static strains, or to those gradually applied, is accompanied by comparative brittleness and unfitness to resist strains suddenly applied. High resistance, resilience, hardness, and brittleness increase, up to certain limits, with the amount of impurities, chiefly carbon, contained in the metal. Low resistance, softness, ductility, and toughness become more marked, within certain limits, as the impurities become less; but too little as well as too much impurity makes steel weak and unsuitable for structural purposes. It requires what is called body to give it resistance to either static or sudden strains. This body is imparted by carbon, manganese, silicon, phosphorus, and by other ingredients; but too much of either of them, or of certain compounds of them, weakens the metal. While it is known, generally, that the substances mentioned may to a certain extent replace one another as body-giving elements, and that some of them appear to neutralize others (for instance, that manganese restores the ductility of steel made brittle by phosphorus), comparatively little progress has yet been made in definite and formulated knowledge regarding the mechanical effects of chemical mixture in iron and steel.

The Manufacture of Steel.—(1) *The Crucible Steel Process.*—This is the oldest and simplest. It at first consisted in melting wrought iron with carbon in clay crucibles. Thus Indian "wootz" is made, containing as much as $1\frac{1}{2}$ per cent. of carbon, so that it requires decarburization before it can be forged. In the present manufacture other ingredients besides carbon, chiefly manganese, are added. Sometimes substances intended to combine with and remove the impurities in the wrought iron are introduced, but generally these impurities remain in the steel. The finest steel must therefore be made from wrought iron which has been purified by reworking with pure fuel, and which was originally made from pure ores. The melting-point of wrought iron is so high that it has been usual to carburize it by cementation (see FURNACE) in order to fuse it at a convenient temperature in crucibles. This cemented or blistered bar was the steel of commerce until Huntsman melted it in a crucible in 1770, producing a true cast steel. The use of the Siemens furnace and the modern improvement of crucibles render the melting of wrought iron practicable and cheap. The cheaper grades of crucible steel are largely made from Bessemer steel rail-ends, crop-ends, and other scrap. This material, being made directly from cast iron, without that purification from silicon and phosphorus to which wrought iron could have been subjected in puddling, produces an inferior steel to that made from the purest wrought iron for purposes, like tool-steel, requiring both hardness and toughness. By melting wrought iron and a little cast iron together, especially cast iron containing manganese, the cheaper grades of steel are produced. The impurities of the cast iron remain in the steel. Although crucible steel has been cheapened by using the materials mentioned, and by means of the gas-furnace, the less refined grades of steel are made at so much less cost and with so much greater uniformity by the open-hearth process, and within certain limits by the Bessemer process, that the crucible process is becoming gradually confined to the finer grades of tool-steel; and here it must probably long retain its superiority, chiefly because it can begin with a highly refined iron, from which especially phosphorus, silicon, and sulphur have been more or less completely eliminated.

The quantity of steel made by the crucible process is relatively small. The two processes which produce the bulk of the metal for rails, structural material, wire, nails, plates,

bogies, the plates, etc., are the open-hearth or Siemens-Martin process and the Bessemer process. Until the invention of Thomas and Gilchrist the only raw material available for these processes was such as contained only a small quantity of phosphorus, 0.10 per cent, being the limit for pig iron. Since all of the phosphorus in cast-iron goes into the iron produced in the blast furnace, this restricted the steel-maker in his selection of ores and pig iron. Thomas and Gilchrist ascertained that if there is substituted for the usual silica or "acid" lining of the Bessemer converter or open-hearth furnace a refractory lining consisting of a mixture of calcium silicate and bar, or of magnesia, a high phosphorus charge can be used. These latter linings are called "basic," in contrast with the older "acid" linings. Since their introduction it is the usual practice to distinguish between the "acid" and the "basic" open-hearth processes and the "acid" and "basic" Bessemer processes. The principal distinction in the two lies in the use of raw material, which must be low in phosphorus in the case of the acid process, and may or must be high in phosphorus in the case of the basic process. In the open-hearth furnace appliances are practically the same in either, the only difference being that the lime additions lead to the handling of a larger quantity of slag. In the basic Bessemer process the pig iron used must conform to certain specifications as to chemical contents. Silicon must be low, so that the life of the lining is not abridged by fluxing away in contact with the silica formed. From 14 to 2 per cent. of phosphorus is necessary in the basic Bessemer pig, so that its combustion during the blowing may furnish the necessary heat. Lime additions must be made, and the charging equally of the vessel is reduced through the room occupied by the greater amount of slag made. This slag is ground to an impalpable powder, and as such is used in agriculture as a substitute for phosphates, an important industry having been thus established.

(2) *The Open-hearth (or Siemens-Martin) Process.*—The melting of the ingredients of cast steel in large quantities and simply on the open hearth of a reverberatory furnace, rather than in small quantities and expensively in crucibles, having been often unsuccessfully attempted, was patented in a more scientific form by the eminent metallurgist Heath in 1845, and was then experimentally carried out with limited success. The Siemens regenerative gas-furnace, by means of the intensity and uniformity of its heat, first furnished practical conditions to the open-hearth process about 1862. It was also demonstrated by Messrs. Martin that the addition of manganese at a certain stage was necessary in the production of sound and practically malleable steel. The Siemens open-hearth steel furnace and its operation are fully exhibited and described under *FRASER*. The hearth or bed of the furnace consists of a shallow iron tank, ventilated below to prevent the concentrated heat of the hearth and the regenerators from endangering the structure, and lined with a very refractory material, usually silica, nearly pure, and just fusible enough to set into a solid mass. The red-hot air and gas, entering and burning at, say, the right-hand end of the furnace, play upon the materials placed on the hearth, and pass down into the regenerators at the left end, where they give off their heat to a checkerwork of brick-ticks. The current being reversed after some thirty minutes, the air and gas enter at the left end through the newly heated regenerators and pass out at the right end.

The design of furnaces undergoes some modifications when natural gas is used as a fuel, the Lusk furnace being the type most widely adopted in the U. S. An important modification of the ordinary open-hearth furnace has been introduced by H. H. Campbell, of Steelton, Pa., who has placed the entire hearth on rollers, which permit of tilting the furnace. This presents important advantages in charging and in tapping the charge. A plant of six of these furnaces, working 30-ton charges, is in operation at the works of the Pennsylvania Steel Company, three being basic and three acid furnaces.

The materials employed are various, and consequently the process varies, although the decarburization of pig iron is always a part of it. In order to obtain a sufficiently intense oxidation there must be a slight vacuum of air; the flame is therefore oxidizing, and would seriously waste wrought iron or the ingredients usually melted in crucibles. A bath of cast iron, which on account of its carbon can be melted without serious loss, is first necessary; in this is immersed and protected the more readily oxidizable materials for the production of steel. The amount of cast iron

varies from 10 to 25 per cent. of the total charge. For fine steels it should be as small as possible, so as to introduce the least amount of phosphorus, silicon, etc.

The more common process is known as the scrap process, and this again is divided into (1) the fusion of pig and scrap wrought iron or steel charged together, the former melting while the latter is heated preparatory to melting; (2) the dissolving of either hot or cold scrap in a bath of pig previously melted; (3) the dissolving of wrought iron sponge in a cast-iron bath. The operation in all these cases is chiefly the melting of the decarburized iron forming the bulk of the charge and the oxidation of the greater part of the carbon and silicon in the waste cast iron, and also in the basic process of the phosphorus. A portion of the iron is also oxidized, and this oxide of iron makes the product un-malleable or red-short. To remove the oxygen something must be added which has a greater affinity for it than iron has; for instance, manganese. The latter is easily and cheaply introduced in the form of pig iron called "spiegel-eisen," which contains 10 to 20 per cent. of manganese, or of an artificial ferro-manganese containing as high as 80 per cent. By using an excess of manganese any desired proportion of it remains in the steel. If the decarburization of the cast iron and the dilution of the carburized and uncarburized portions of the charge are carried only to such an extent that a highly carburized product remains, less manganese is needed to make it malleable, and this may be supplied by melting a manganese-rich pig iron with the charge. Dissolving scrap in the bath is the most common process; the scrap is fed to a little at a time, so as not to chill the charge and cause it to set on the bottom of the furnace, and also to maintain uniformity in the temperature and working of the furnace. To save part of the stress on the steel furnace, an auxiliary furnace is employed in some works to heat the scrap and spiegel-eisen before charging them into the bath.

In the production of boilerplate and of steels to be subjected to blows and vibration while in tension, for which the open-hearth process is largely used and well adapted, about 20 per cent. of the best Bessemer pig, containing less than 0.10 per cent. of phosphorus, and preferably not over 1 per cent. of silicon, is employed, the remainder of the charge being charged blooms made from Bessemer iron, or puddle-iron made by the boiling process, so as to free it as much as possible from phosphorus. For cheap steels, especially those in which hardness without great resistance to impact are required, a less pure pig and any wrought-iron scrap, such as old rails, may be employed. The phosphorus imparted by the latter may be rendered harmless by employing a rich ferro-manganese at the close of the process, thus adding a large amount (4 to 1 per cent.) of manganese and only 0.10 to 0.15 per cent. of carbon.

To ascertain when the charge is so far completed as to be ready for the manganese, samples are dipped out of the bath and tested from time to time. The decarburization is accurately denoted by the lengthness of the sample and by the appearance of its fracture. As soon as the manganese is thoroughly diffused through the bath the charge is tapped out and cast. In many cases the manganese is added to the charge after it has been tapped into the ladle. The open-hearth furnace is made to hold from 10 to 50 tons, the more usual capacity being from 20 to 25 tons. The time of the operation is from eight to eleven hours.

The pig-and-ore process, as developed by Siemens, consists in decarburizing a bath of pig iron by iron ore, and then adding ferro-manganese in the usual manner. The iron in the ore is added to the bath and a little limestone is thrown in to facilitate its separation. The theory is to use ore enough to make good the waste of the iron by oxidation. Although pig and ore may be employed alone with success, there is usually 10 or 15 per cent. of scrap made in rolling and forging, and this scrap is returned to the steel furnace. Sometimes 25 per cent. of scrap is added. The process thus partially takes the character of the pig-and-scrap process, although the use of ore as a rapid decarburizer of the large amount of pig employed gives it a distinctive character. The pig and scrap are first melted, the time being four or five hours. During this period an inch or more of slag forms over the bath. Then the ore is lumps up to 3 or 4 inches in diameter, is charged a little at a time until the bath is nearly ready for the manganese, when it is allowed to stand so that the iron may work out of the ore and slag. After the charging of the ore begins there are two distinct periods: First, the rising of the slag. This increases in weight, but much more in volume, and is covered with large

and heavily moving blotches or bubbles. Second, the boiling of the metal, when the slag settles and becomes thinner and the whole surface of the bath is covered with a lively spouting of the metal and slag, sometimes of the metal through the slag. These periods represent the following operations: (1) The silicon in the pig, having at this temperature a higher affinity for oxygen than the carbon has, is burned out first, partly by the flame, which is somewhat oxidizing, and partly by the oxygen in the ore. Thus slag is rapidly formed and also thickened by the release of the silica and other impurities in the ore. (2) When the silicon of the pig is nearly consumed its carbon begins to burn freely and to throw off carbonic oxide, which makes the now hotter and thinner slag boil violently.

(3) *Bessemer Process.*—The chemical part of the Bessemer process may be generally stated as the oxidation by means of air-blasts of the carbon and silicon (in the acid) or of the carbon and phosphorus (in the basic) in melted crude cast iron so as to make it malleable. During this reaction a certain quantity of iron is also oxidized. This is reduced by adding manganese pig iron, which reintroduces the necessary amount of carbon and also adds manganese, whose presence is useful in the subsequent rolling of the steel.

The Bessemer process as first performed, and as still practiced to a very limited extent abroad with irons rich in manganese, consists in applying the blast until all but one-fourth to one-half of 1 per cent. of the carbon is burned out, and then casting the product. Stopping the blast at this point, however, is very uncertain; hardly any irons contain the right amount of manganese for this treatment and the process has certain mechanical objections. Hence the nearly universal practice is to blow the iron until all the carbon is exhausted—a point readily determined; but the product now, as in the open-hearth process before described, contains so much oxide of iron that it is red-short and crumbles in working. To reduce this oxide of iron, manganese, which has a stronger affinity for the oxygen than the iron has, is added by running into the converter melted spiegeleisen, which is a pig iron containing 10 to 20 per cent. of manganese, or by otherwise adding ferro-manganese to the charge. Any desired amounts of carbon and manganese are also thus added to the product. No phosphorus is removed from the iron in the acid Bessemer process. Only the carbon and the silicon are oxidized. It is therefore important to start with pig irons having a little less phosphorus, sulphur, and copper than the steel may safely contain; but it is not usually practicable to use irons low in silicon, for the oxidation of this element produces the high temperature necessary to keep the mass fluid. Manganese is to a certain extent a substitute for silicon in this respect, and always a valuable ingredient, but the greater part of the irons of the world do not contain it in important quantities. Usually a pig containing from $1\frac{1}{4}$ to $2\frac{1}{4}$ per cent. of silicon is required. This will heat the charge to such a degree that 10 to 15 per cent. of scrap may be worked with the pig-iron charge. If there is more silicon than this the charge becomes too hot. One reason why silicon has greater heating power than carbon (it is stated by Akerman to have nine times as much) is because the product of its combustion, slag, remains in the converter, while the product of the combustion of carbon goes out in gaseous form, and carries much heat with it.

A standard American Bessemer plant of a type to which many existing works belong consists (1) of a melting department. The furnace and working-floor are shown in plan by Fig. 1; sections of these floors and the furnaces are shown by Fig. 2. There are hoists at *a* for coal, etc., and at *b* for iron; four cupola furnaces and their platforms and blowing machinery; two ladles, *K*, standing on scales, for weighing the melted iron; and spouts, *M*, *N*, Fig. 2, for conducting it to the vessels or converters; two reverberatory furnaces for spiegeleisen, and their spouts. (2) The converting department, shown in ground plan by Fig. 1 and in cross-section by Fig. 2. It contains two 5-ton to 7-ton vessels, *N*, in which the melted iron is treated by air-blasts. Such a vessel is illustrated by Fig. 3. Also a ladle and a hydraulic ladle-crane at *E*, Fig. 1, by means of which the steel is received from the vessels and poured into the ingot-moulds, which stand upon a depressed part of the floor called the pit. Three other hydraulic cranes swing over the pit to set the ingot-moulds and remove and load the ingots. Two of them swing over the vessels to assist in their daily repairs. The water and air pressure reservoirs are surmounted by a platform *d*, Fig. 1, standing upon which boys, by turning valves, admit water to the cranes and air to the vessels by

means of underground pipes. All the constant operations of hoisting, lowering, and blowing are conducted from this platform, which overlooks the entire converting department. (3) The engine department, which is not illustrated. It

FIG. 2.

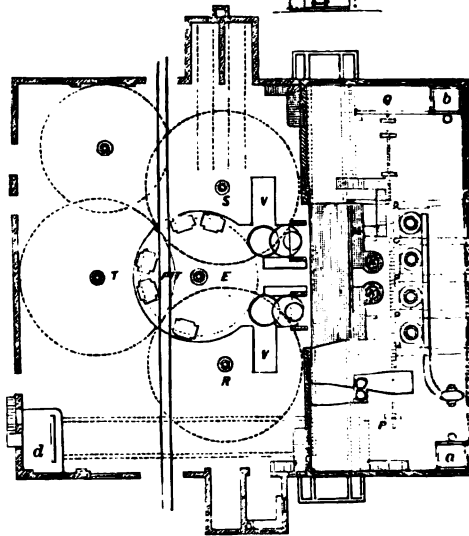
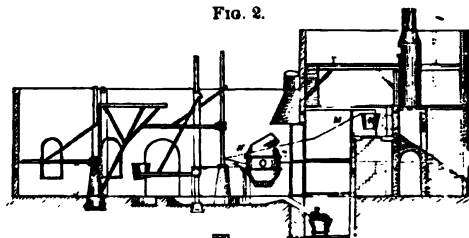


FIG. 1.

contains a blowing-engine, usually a double engine, capable of delivering air at 25 lb. pressure per square inch. The water-pressure machinery for actuating the hydraulic machinery consists of a pair of duplex pumps.

The recent tendency in the U. S. has been to do away with the troublesome casting-pit. In one conspicuous case this is accomplished by pouring the steel into a ladle suspended from an overhead traveling crane. The steel is poured into moulds standing on cars, constituting a train, so that the whole charge can be hauled out of the converting-house by a locomotive soon after it is cast.

A growing practice in Europe and in the U. S. is to dispense entirely with the remelting of the pig iron in cupolas. The molten pig iron as it is tapped from the blast furnace is run into ladles mounted on cars. It is cast into a large vessel holding 100 to 150 tons of molten metal, called the mixer. From this mixer the iron is tapped whenever required, and in the quantities needed, into ladle-cars, from which it is poured into the converters direct. This is called the direct process.

In the older process, the pig iron, having been hoisted to the charging platform, is put, with, say, 10 per cent. of coal, into one of the cupolas and melted. When some 18,000 to 30,000 lb. (whatever charge is determined on) have run into one of the ladles, *K*, the latter is turned over by means of a worm-wheel, thus pouring the iron into the spout, which leads it to one of the vessels, the simplest form of which is shown in Fig. 3. A vessel that will convert a 6-ton charge is 8½ feet in external diameter and 15 feet high. It is made chiefly of ¼-inch to ½-inch iron plates, and lined nearly a foot thick with refractory material. At one end it has an 18-inch opening, called the nose; at the other a tuyere-box, communicating with the blowing-engine. From the tuyere-box 12 fire-brick tuyeres, each perforated with 12 ⅜-inch holes, project through and are imbedded in the lining. A tuyere is shown in section by *A*. These tuyeres last but 10 or 15 heats, and are arranged in such a manner as to be readily renewed. The vessel is mounted on trunnions, and turned by a hydraulic cylinder by means of a rack and pinion. When the charge enters for the process the tuyeres are turned up as at *C*, so that the iron will not run into

them. The blast is then admitted, and the tuyeres turned down so that the metal will flow over them, and be pierced by the entering columns of air. The cubical contents of the vessel is eight to twelve times that of the charge of iron.

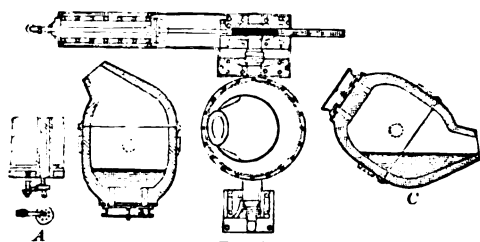


FIG. 3.

in order to give room for ebullition. The vessel lining is heated red hot and the fuel discharged before the iron is turned in. The iron is now subjected to 144 streams of air, three-eighths of an inch in diameter, at 15 to 25 lb. pressure, for about twenty minutes. Most of the silicon is first burned out, the result being slag, and a comparatively dull flame at the converter-mouth. When the carbon begins to burn freely the volume and brilliancy of the flame increase; and as the surging mass grows hotter, and boils over in splashes of fluid slag, the discharge is a thick, white, roaring blaze, and the massive vessel and its iron foundations tremble under the violent ebullition. Toward the close of the operation the flame becomes thinner, and it suddenly contracts and loses illuminating power when decarburization is complete. The determination of this period is the critical point of the process. Ten seconds too much or too little blowing injures or spoils the product. At the proper instant, as determined best by the spectroscope or by colored glasses, but usually by the naked eye, the foreman turns down the vessel and shuts off the blast. The charge of spiegeleisen is then run in, when another flaming reaction occurs. The vessel being still further depressed, the steel runs into the ladle, pure, white, and shining, from under its coating of red-hot slag. A blanket of slag, most useful in preserving its temperature, follows it into the ladle. The metal is then let into the ingot-moulds and, after the exterior surface of the steel has crystallized, the mould is removed, and the ingot is ready for reheating and rolling.

For the basic process the converter is lined with a mixture of highly calcined dolomite (magnesian limestone) and tar, either by ramming it into place or building it up of brick made from the mixture. A certain amount of calcined lime is charged with the iron, further additions being made as required. When the carbon has been blown out, the slag is poured off and a brief period of blowing, called the after-blow, follows, during which the last portions of the phosphorus in the metal are eliminated, passing into the slag.

The ladle-crane (Fig. 4) is a radical departure from the nearest kindred practice. The ladle, instead of swinging from a crane-chain, as in a foundry, is rigidly held in a fixed orbit. This feature was original with Bessemer, and to it he added the old ladle with a pouring-nozzle in its bottom, regulated by a movable stopper (1 and 2). This consists of a loam-coated rod, *a*, armed at its lower end with a round-ended fire-brick or plumbago stopper fitted to the concave top of a fire-brick nozzle. The stopper is raised and lowered by a lever, *o*, in the hand of the workman. Thus the heavy steel is discharged pure, while the lighter slag and impurities are left at the top. Pouring steel into moulds over the rim of a ladle, as in foundries, would make excessive scrap from spilling and chilling, and is wholly impracticable. The vertical motion of the crane is necessary in pouring from the vessel, to keep the ladle close under the nose, thus preventing too great a fall of the stream, and consequent slopping. The ladle is also tipped by a worm and worm-wheel, *h*, to regulate the position of the nozzle over the moulds and to turn over the ladle for heating and repairs. The hydraulic crane generally used in works in the U. S. is also illustrated by Fig. 4, and consists of a cylinder open at the top only, and requiring chiefly vertical support from the solid pier on which it rests. The ram passes through an upper stuffing-box and through a top support in the roof of the building. The jib is placed between these supports, so that the lateral strain on the ram is comparatively small. The ram is stepped upon a column of water which is substantially frictionless.

When the steel is intended for rails—and sometimes 33 per cent. of that made in the U. S. is so used—the charges are so regulated as to cast either five or six ingots, and a little over as a margin for chilling and spilling. Each ingot

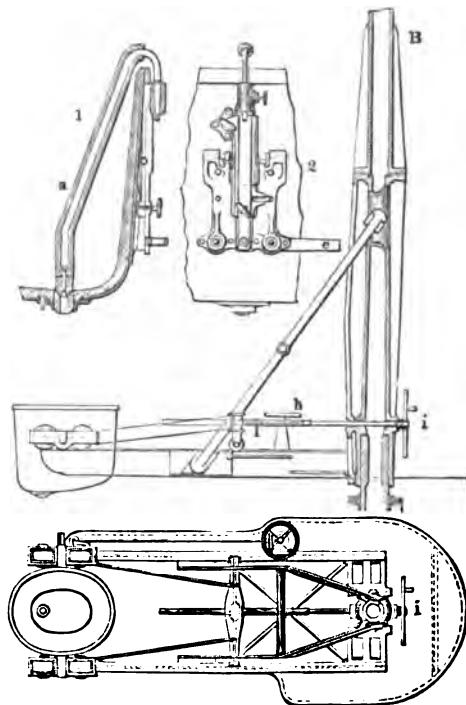


FIG. 4.

makes three or six rails. The ingots are removed hot to the blooming-mill, and if any heating-furnace is ready, they are charged into it directly, thus saving much heat. They must be allowed to crystallize, however, before rolling. If the interior of an ingot is still pasty from the heat of conversion, it will go to pieces in the rolls. Ingot for three to six rails each are used, instead of ingots for single rails—first, to save a repetition of manipulations in working. This must be done by machinery to be done cheaply, and a machine can handle a big ingot as quickly as a little one. Second, the extreme top of an ingot is unsound, and must be cut off and reconverted; the number of scrap ends is reduced to two for three to six rails. The practice is growing in the direction of large ingots and large reductions for all purposes; and the counterpart of this—to cheapen cost—is handling by steam and reducing rapidly by heavier rolls and hammers. See also ROLLING-MILLS.

Since about 1870 open-hearth and Bessemer steel have practically displaced puddled iron in the manufacture of rails, wire, plates, structural shapes, tin plate, and cut nails, and has made heavy inroads into its field, in bars and other shapes.

The production of crucible steel in the U. S. was 72,586 gross tons in 1891, 84,709 tons in 1892, and 63,613 gross tons in 1893. The production of open-hearth steel was 579,753 tons in 1891, 669,889 tons in 1892, and 737,890 tons in 1893. The production of Bessemer steel was 3,247,417 tons in 1891, 4,168,435 tons in 1892, 3,215,686 tons in 1893, and 3,579,101 tons in 1894.

The total production of basic steel in the world was 3,638,556 tons in 1893, Germany contributing thereto 2,344,754 tons. Of the total productions of basic steel in the world in 1893, 2,808,241 tons was Bessemer and 830,315 tons was open-hearth steel.

Great Britain produced in 1893 1,493,354 gross tons of Bessemer steel ingots and 1,456,309 tons of open-hearth steel ingots. Germany made 2,171,138 metric tons of manufactured steel in 1893. Belgium produced 273,058 metric tons of steel ingots in 1893; France produced 814,977 metric tons of ingots in the same year; Sweden has a record of 82,422 tons of Bessemer and 76,556 tons of open-hearth steel ingots in 1892; and Austria reports 509,734 metric tons of Bessemer and open-hearth ingots in the same year. The production of Russia in 1892 was 365,484 metric tons. Spain made

78,413 metric tons in 1891, and Italy 56,543 metric tons in 1892. A small quantity of steel is also produced in Canada.

See *The Metallurgy of Steel*, by Henry M. Howe (New York, 1890); *Baerman's Treatise on the Metallurgy of Iron* (London); *Percy's Metallurgy of Iron and Steel* (London); and *Wedding's Eisenhüttenkunde* (Brunswick).

A. L. HOLLEY. Revised by C. KIRCHHOFF.

Steele, DANIEL, A. M., D. D.: minister and educator; b. at Windham, N. Y., Oct. 5, 1824; educated at Wesleyan Academy and Wesleyan University, where he graduated 1848; joined the New England Conference of the Methodist Episcopal Church 1849; was pastor until 1862; Professor of Ancient Languages 1862-69 and acting president of Genesee College 1869-71; and vice-president of Syracuse University 1871-72; since then has taught in school of theology of Boston University, and served in several pastorates. He has published *Commentary on Joshua* (1872); *Binney's Theological Compend Improved* (1874); *Love Enthroned* (1875); *Milestone Papers* (1878); *Antinomianism Revived, or a Refutation of the Doctrines of the Plymouth Brethren* (1885); *Commentary on Leviticus and Numbers* (1891); *Bible Readings* (1892); *Sermons and Essays* (1892). ALBERT OSBOEN.

Steele, DAVID, D. D.: clergyman and professor; b. near Londonderry, Ireland, Oct. 20, 1827; educated at Miami University and the Theological Seminary of the Reformed Presbyterian Church, Philadelphia; principal of Cynthia Academy, Kentucky, 1857-58; Professor of Hebrew and Greek in Miami University 1858-59; pastor of the Fourth Reformed church, Philadelphia, since 1861; Professor of Hebrew, Greek, and Pastoral Theology 1863-75, and since 1875 of Doctrinal Theology in the Reformed Presbyterian Seminary, Philadelphia; was moderator of the General Synod 1868; delegate to the Pan-Presbyterian Council at Philadelphia 1880; president of the board of foreign missions in the Reformed Presbyterian church since 1883. Dr. Steele edited *The Reformed Presbyterian Advocate* 1867-77; and has published *The Times in which we live and the Ministry which they require* (1872); *Biographical Sketch of Rev. J. N. McLeod, D. D.* (1875); *The Apologetics of History* (1886); and discourses. C. K. HOYT.

Steele, FREDERICK: soldier; b. at Delhi, N. Y., Jan. 14, 1819; graduated at the U. S. Military Academy July 1, 1843, and was assigned to the Second Infantry; fought in the war with Mexico, gaining the brevets of first lieutenant and captain for Contreras and Chapultepec; served in California 1849-55, and on the Western frontier from 1855 until the outbreak of the civil war, when, as major of the Eleventh Infantry, he was engaged in Missouri, commanding a brigade in the actions at Dug Spring, Wilson's Creek, and retreat to Rolla. Appointed colonel Eighth Iowa Volunteers in Sept., 1861, and commissioned brigadier-general of volunteers Jan. 29, 1862, he commanded a division in the army of the Southwest until November, when promoted to be major-general of volunteers and assigned to the Thirteenth Army-corps, which he led in the Yazoo expedition and capture of Arkansas Post (Dec., 1862-Jan., 1863); transferred to the Fifteenth Corps, he was engaged in the Vicksburg campaign, when his division was sent to Helena, Ark., and captured Little Rock Sept. 10; in 1864 commanded the department of Arkansas, and on Nov. 29, 1864, went to the aid of Gen. Canby in the reduction of Mobile; was mustered out of volunteer service in Mar., 1867. For the capture of Little Rock he was breveted brigadier-general, and for meritorious services major-general U. S. army. In July, 1866, he was assigned to the colonelcy of the Twentieth Infantry, which he held at the time of his death, at San Mateo, Cal., Jan. 12, 1868.

Revised by JAMES MERCUR.

Steele, Sir RICHARD: author; b. in Dublin, Mar., 1672; educated at the Charterhouse, London, and at Oxford. In 1695 he enlisted as a private in the Life Guards, and in the same year published *The Procession*, a poem on Queen Mary's funeral. This was dedicated to Lord Cutts, who gave Steele a captaincy in his regiment, the Coldstream Guards. In 1701 he published *The Christian Hero*, a short manual of religious ethics, and in November or December of the same year brought out at Drury Lane his first comedy, *The Funeral*. This was followed by *The Lying Lover* (1703) and *The Tender Husband* (1705). About this time he became a member of the famous Kit-Cat Club, and married a widow, a Mrs. Margaret Stretch, who seems to have died in 1706. In May, 1707, through the influence of Arthur Maynwaring, he was appointed to the Government office of gazetteer. In Sept., 1707, he married Miss Mary Scurlock, of Llangun-

nor, Carmarthenshire, Wales. His letters to this lady were first printed in 1787. He was always in pecuniary difficulties; but such was his amiability that he always found friends to assist him, and was successively appointed to lucrative offices, among which were commissioner of the stamp office, surveyor of the royal stables, governor of the royal comedians, justice of the peace for Middlesex, and commissioner of forfeited estates in Scotland. In politics he was an ardent Whig. In 1713 he was returned to Parliament for Stockbridge, and was expelled in the following year on account of political articles written by him, but was knighted by the king, and returned to Parliament for Boroughbridge in 1715. In 1720 his patent as governor of the royal comedians was revoked, by which, according to his own statement, he suffered a loss of £10,000, and in the following year he brought out his successful comedy of *The Conscious Lovers*, which was dedicated to the king, who sent him a present of £500. His first wife, who died soon after their marriage, brought him a plantation in the West Indies, and his second wife was a Welsh heiress, but he squandered his large income in dissipation and unprofitable speculations, and being attacked with a paralytic stroke, which disabled him from literary work, he retired to his estate at Llangunnor, where he died Sept. 1, 1729. He was buried in St. Peter's church, Carmarthen. Several of Steele's political essays and pamphlets had a high reputation in their day, and his comedies were well received upon the stage. His chief fame rests upon his connection with *The Tatler* and *The Spectator*, almost the earliest of that long series of periodical works which occupy so prominent a place in English literature, although in these his part was much inferior to that of Addison, who had been his school-fellow at the Charterhouse. *The Tatler* (1709-11) contained 271 numbers; 188 were by Steele, 42 by Addison, and 36 by both conjointly. This was succeeded by *The Spectator* (1711-12), containing 555 numbers, of which 236 were by Steele and 274 by Addison. After the discontinuance of *The Spectator*, Steele, with the co-operation of Addison, started *The Guardian*, but Addison soon withdrew, and the work was brought to a close with the 176th number, of which 82 were by Steele. Steele started other papers, *The Englishman*, *The Lover*, *The Reader*, *The Theater*, and *The Spinster*, which were comparative failures; and he left two unfinished comedies, *The School of Action* and *The Gentleman*. His *Poetical Miscellanies*, original and translated (1714), possesses little merit. See *Memoirs of the Life and Writings of Sir Richard Steele*, by H. R. Montgomery (London, 1865), and *The Life of Steele*, by Geo. A. Aitken (2 vols., Boston, 1889). Also *Richard Steele*, by Austin Dobson (1886), who published his *Selected Works* in 1845.

Revised by H. A. BEERS.

Steel-engraving: See ENGRAVING.

Steell, Sir JOHN, R. S. A.: sculptor; b. at Aberdeen, Scotland, in 1804; studied art at Edinburgh and sculpture at Rome; made the seated statue of Sir Walter Scott which forms part of the monument in Edinburgh; produced the colossal statue of Queen Victoria placed above the Royal Institution, Edinburgh, and the bronze equestrian statue of the Duke of Wellington erected in 1850 in front of the Register House, Edinburgh. Others of his statues are of the Marquis of Dalhousie, and Hon. James Wilson at Cuttack; of Prof. John Wilson, erected at Edinburgh 1865; the Scottish National Memorial to Prince Albert; colossal bronze statues of Sir Walter Scott and of Burns for Central Park, New York; colossal statues of Allan Ramsay and Dr. Chalmers for Edinburgh; and monuments to the Forty-second and Ninety-third Highlanders in the cathedrals at Dunkeld and Glasgow. D. Sept. 15, 1891.

Revised by RUSSELL STURGIS.

Steelton: borough; Dauphin co., Pa.; on the Susquehanna river, the Pennsylvania Canal, and the Penn. and the Phila. and Reading railways; 3 miles E. of Harrisburg, the State capital (for location, see map of Pennsylvania, p. 5-6). It was laid out under the name of Baldwin in 1866, subsequently was known as Steel-Works P. O., and was incorporated under its present name in 1880. It contains the great plant of the Pennsylvania Steel Company, comprising several blast furnaces, rail and blooming mills, and bridge and construction works; several flour, saw, and planing mills; electric railways connecting the borough with Harrisburg; a model public-school building, erected by the steel company; a national bank with capital of \$75,000; and a daily and three weekly newspapers. Pop. (1890) 2,447.

(1800) 9, 350; (1805) with suburbs of Highland, Oserlin, New Cumberland, and New Market, over 10,000.

Editor of "Advocate."

Steeleyard, or Roman Balance: See WEIGHING-SCALES.

Steen, Jans, painter; b. at Leyden about 1690; a pupil of Nicolaes Knipfer at Utrecht, and afterward, at The Hague, of Jan van Goyen, whose daughter became his wife. In 1648 Jan Steen entered the corporation of painters at Leyden. He was absent from his native city for ten years, following it is said, the trade of a brewer at Delft; returned to Leyden in 1658 and continued the work of painter with that of tavern-keeper. He died at Leyden in 1679, and was buried Feb. 3. His work shows the influence of Frans Hals and Adrian van Ostade. His works are chiefly to be seen in the public and private collections in Holland. One example of his art, *The Music-master*, is in the National Gallery, London.

W. J. STILLMAN.

Steenskrup, Johannes, JONAHAS JAKOBUS SMITH; zoologist; b. at Vang, Norway, Mar. 8, 1813; Professor of Zoology at the University of Copenhagen until 1883. His principal works, which are characterized by elegance of style as well as originality of thought, are *Om Fjerskuldning og Udvaldt, gjenom valende Generationsordelse* (Copenhagen, 1842; translated from the German version as *On the Alterations of Generations* (1845); *Undersøgelser over Homophobidismens Tilværelse i Naturen* (Investigations in the Presence of Homophobidism in Nature, Copenhagen, 1846); and *Om Bille paa Naturen og Oldforskningens Betydning* (A Glance at Previous Studies of Nature and Archaeology, Copenhagen, 1862).

D. K. DUNN.

Steenwyck, Adriaen, ADRIANUS; architectural painter; b. at Steenwyck, in the province of Overijssel, Netherlands, about 1550; studied under Hans Vredeman de Brice; also at Antwerp in 1577, and then went in 1580 to Frankfurt-on-the-Main, where he died in 1608. His son, named Hendrick, also an architectural painter, was born at Frankfurt in 1580, both painted interiors of churches, halls, and rooms. The younger Steenwyck worked in Antwerp, but went in 1629 to London, where Van Dyke employed him to paint architectural backgrounds to some of his portraits. D. in London about 1649. The Louvre, the Belvedere at Vienna, and the National Gallery at London contain examples of the art of father and son. Herman Steenwyck, of Delft, and his brother Pieter are not to be confounded with the above mentioned—these were painters of still life.

W. J. S.

Steeple-chase: See HORSE-RACING.

Steevens, Thomas, SHAKESPEARE scholar; b. at Stepney, London, May 10, 1756; was educated at King's College, Cambridge; devoted himself to Shakespearean studies, and in 1786 published, in 4 vols. 8vo, *Twenty of the Plays of Shakespeare, being the whole number printed in Quarto during his lifetime*, etc., which led to his association with Dr. Johnson in an annotated edition published in 1773 under their joint names. Afterward, in conjunction with Isaac Reed, he prepared two new editions (1785 and 1793). His editions remained the standard for the text for almost fifty years. He also assisted in the preparation of the *Biographia Dramatica*, and furnished contributions to Nichols's *Biographical Anecdotes of Myerth*. D. at Hampstead, Jan. 22, 1800.

Revised by H. A. REES.

Steiffens, Henrik; philosopher; b. at Stavanger, Norway, May 2, 1773; educated in Denmark 1779-84, and studied theology and natural science at the University of Copenhagen; went in 1794 to Germany, and became, through the study of Schelling's writings and through personal intercourse with the author, a zealous adept of the new sensational science, the so-called philosophy of nature. He returned to Denmark (1802), where he exercised a decisive influence on his contemporaries. His principal works from this period are *Revisionen von Schellings naturphilosophischen Schriften* (1800); *Grundzüge der philosophischen Naturwissenschaft* (1800); *Anthropologie* (2 vols., 1822); and *Philosophie der Natur zur Beförderung der speculativen Physik* (1823-25). He continued his study of mineralogy and geology at Freiberg under Werner (*Geognostisch-physikalische Aufzeichnungen* (1810) and *Handbuch der Oryktognomie* (3 vols., 1811-19); was appointed Professor of Natural Science in 1804 at Halle, in 1811 at Breslau, and in 1831 at Berlin. D. in Berlin, Feb. 18, 1845. In religion he first turned from the stiff orthodoxy in which he was educated to the platform of Spinoza, which he found at Halle; then he became an ardent proponent among the Old Lutherans at Breslau; and finally,

at Berlin, he adopted Schleiermacher's religion of the feeling (*Von der jüdischen Theologie und dem jüdischen Glauben* (1824); *Wie ich wieder Lutheraner wurde und wie mir das Lutherthum ist* (1831)). He was also the author of several novels of a marked didactic character. His autobiography, *Was ich erlebte* (10 vols., 1840-45), was translated into English by William L. Gage under the title *The Story of my Career as Student at Freiberg and Jena* (Boston, 1861), and republished under the title *German University Life* (Philadelphia, 1874); *Nachgelassene Schriften* (1846), with a preface by Schelling). Revised by D. K. DUNN.

Steganocephalus [Mod. Lat., pl. of *steganocephalus*; Gr. *stegano*, covered, well covered; *cephalus*, head] an order of birds containing those which have all four toes connected with a web; synonymous with *Tidipalmidae*. It contains the gulls (*Scelopidae*), pelicans (*Pelecanidae*), cormorants (*Phalacrocoracidae*), darters (*Pelecanidae*), frigate-birds (*Fregatidae*), and tropic-birds (*Phaethonidae*). It is the equivalent of Huxley's *Diogenes-morphus*. See the articles on the various genera. F. A. L.

Steganocephala [Mod. Lat., Gr. *stegano*, covered + *cephala*, head] a group of extinct batrachians, like the salamanders in general appearance, but differing from all recent forms in the well-developed armor of bony plates which covered the skull and which usually extended over the lower surface of the body, and sometimes also covered the back. They first appeared in the Carboniferous and died out with the Triassic age. Some were small, others were veritable giants. The group is interesting to the naturalist since its affinities are apparently with the ganoids, and at the same time it is the ancestor of the batrachians of to-day.

J. S. K.

Stein, Otto, HERMANN FRIEDRICH KANT, HERRMANN; statesman; b. at Nassau-on-the-Lahn, Oct. 26, 1757; studied jurisprudence at Göttingen 1775-77; entered the civil service of the Prussian Government in 1780, and was made chief of the department of commerce, manufactures, and indirect taxation in 1804. Strongly opposed to the policy adopted by the president of the cabinet, Count Haugwitz, and by the king himself, he was dismissed Jan. 4, 1807, but recalled immediately after the Peace of Tilsit (July 20, 1807), and made president of the cabinet. In this position he developed an astonishing energy. His internal reforms were a complete reorganization of the Prussian state; Serfdom was abolished, and universal obligation of military service introduced; the material estates of the nobility were taxed, all citizens made equal before the law, a liberal municipal system established, and on the crown lands the system of peasant proprietorship was introduced. His final aim was to elevate the peasant class and to create a powerful and intelligent middle class, and, with the nation reorganized on this basis, to renew the contest with Napoleon. He had also a clear idea of what a united Germany meant, and was adverse to that division of the country into petty states which had given the history of the nation such a chaotic and anarchical aspect. But his career was suddenly stopped. An insidious letter, in which he criticised the policy of Napoleon and spoke of his own hopes and plans, fell into the hands of the French police, and was published in the *Moniteur* Sept. 8, 1806. On Nov. 24 Stein was compelled to resign, and on Dec. 16 Napoleon sent a decree from Madrid which outlawed him and confiscated his property. He went to Austria, thence to Russia, but once again he was at the head of the political affairs of Germany during the period between Napoleon's disaster in Russia and the Peace of Paris, when he actually was the leader of the diplomatic coalition against France. After peace had been concluded, his influence soon became comparatively small. The German princes hated him for his ideas of a German unity; the absolutists hated him for his ideas of a representative form of government; and he himself was unwilling to adopt the impracticable views of the radicals. He retired to his estate, and died at Kappenberg, Westphalia, June 29, 1851. Monuments have been erected to him in Nassau and in Berlin. See the biography by Perle, and Sadler's *Life and Times of Stein* (1879, 3 vols.). See also the *Erinnerungen von Heyn* (1891). Collections of his letters have been published, and are of great importance for the history of that time.

Revised by F. M. COLBY.

Stein'bok [from Dutch *steenhok*, and Germ. *steinbock*; *stein*, stone + *bok*, antelope]; any one of several species of the family *Bovidae*. (1) The German designation *Steinhock* (and hence the Dutch *steenhok*) was originally conferred on the ibex or bouquetin of Europe, a species of goat, and to that animal the name properly belongs. (See BOUVETIN.)

(2) The Dutch settlers of Southern Africa applied the name to a species of antelope peculiar to and not uncommon in that region, and it is now incorporated in the English vocabulary of animals in connection with it. The species is the *Nanotragus tragulus* (*Pediotragus campestris* of Gray). The steinbok is an animal of graceful and symmetrical form, with the head well proportioned, having a bovine nose and large muffle; the horns, developed only in the male and over the orbit, erect, elongate, and subulate; the legs long and slender; the feet destitute of side-hooflets; and the tail very short. The color is a fulvous ash above and on the sides, and white beneath. The length is generally rather less than 3½ feet, and the height at the shoulder somewhat more than 1½ feet. The species is most abundant on stony plains and in valleys, and especially on open flats, where large stones and clumps of trees are found. It is very swift, and progresses by great bounds. It is also very timid, and readily alarmed. It is much esteemed for its flesh.

THEODORE GILL.

Steinen, KARL, von den: ethnologist and traveler; b. at Mülheim-on-the-Ruhr, Prussia, Mar. 7, 1855. He studied medicine at Zurich, Bonn, and Strassburg, and ethnology at Berlin and Vienna; made a voyage round the world 1878-81, and was artist and naturalist attached to the German expedition to the Antarctic island of South Georgia 1882-83. In 1884-85, with two companions and a detail of Brazilian soldiers, he penetrated the unknown regions of Northern Matto Grosso, Brazil, discovered the head waters of the river Xingú, and descended it to the Amazon. A second journey to the upper Xingú was made in 1887-88. Dr. von den Steinen's works include *Durch Central-Brasilien* (1886), describing the first Xingú exploration; *Unter den Naturvölkern Central-Brasilien* (1894); and many scientific papers.

HERBERT H. SMITH.

Steinhell, LOUIS CHARLES AUGUSTE: genre, still-life, and portrait painter; b. in Strassburg, June 26, 1814; d. in Paris May 17, 1885; pupil of Decaisne; third-class medals, Salons, 1847 and 1851; second-class 1848; Legion of Honor 1860. His *Mother* (1847) is in the museum at Nantes.

Steinmetz, KARL FRIEDRICH, von: b. at Eisenach, Saxe-Weimar, Dec. 27, 1796; entered the Prussian army in 1813 as a lieutenant; fought against the French; became a captain in the regiment of Kaiser Franz in 1829; fought at the head of two battalions of the Second Infantry Regiment in Mar., 1848, in the streets of Berlin; was subsequently made governor of the academy of cadets at Berlin, and made his name illustrious as commander-in-chief of the Fifth Army-corps in the campaign against Austria in 1866. On June 27, 28, and 29, 1866, he made a stand at Nachod, Skalitz, and Schweinschädel with his corps and one brigade against three corps of the enemy, defeated them, drove them back, and took eleven guns and 6,000 prisoners. By this victory he made it possible for the second army to debouch, on which maneuver the success of the Prussian battle-plan depended. He received immediately the highest order, that of the Black Eagle, and the Diet voted him a national dotation. In the war against France in 1870 he was appointed commander-in-chief of the First Army, consisting of the First, Seventh, and Eighth Army-corps, but he held this position only for a short time, as he came in conflict with the supreme command—in what manner is not exactly known, but it seems as if the advance of the First Army on Aug. 6, and the measures taken by the general during the advance toward and around Metz on Aug. 14, 15, and 16, did not agree with the plans of von Moltke. In reality, the general now lost his independent command, his army being united to that of Prince Friedrich Charles, and the supreme command given to the prince. Nominally, however, Steinmetz remained a commander, subject only to the orders of the king, and thereby, as well as from the stubbornness of his character, arose disagreements between him and the prince. The result was that in Sept., 1870, Steinmetz was appointed governor-general of Posen and Silesia, and removed from the theater of war. He handed in his resignation, which, however, the king did not accept. He was made a general-field-marshal Apr. 8, 1871, and placed *à la suite*. D. at Landeck, Prussian Silesia, Aug. 4, 1877.

Stein'schneider, MORITZ: bibliographer; b. at Prossnitz, Moravia, Mar. 30, 1816; studied in Prossnitz, Nikolsburg, Prague, Vienna, Leipzig, and Berlin; teacher in Prague 1842; teacher in Berlin 1845; since 1859 director of the Veitel-Heine-Ephraimsche Stiftung in that city, and from 1869 to 1890 head of the Israelitische Töchter-Schule. He

received the degree of LL. D. from Columbia College 1887; the title of professor 1894. He has devoted himself especially to the non-theological literature of the Jews and Arabs during the Middle Ages. As a bibliographer and historian of Hebrew literature he is unsurpassed. Among his numerous works are *Catal. libr. hebr. in bibl. Bodleiana* (Berlin, 1852-60); catalogues of the Hebrew MSS. in the libraries of Leyden (1858), Munich (1875), Hamburg (1878), and Berlin (1878); *Jewish Literature* (London, 1857; *Index*, Frankfurt, 1893); *Zur Pseudepigraph. Lit.* (Berlin, 1869); *Alfarabi* (Petersburg, 1869); *Polem. und Apologet. Lit.* (Leipzig, 1877); *Bibliograph. Handbuch* (Leipzig, 1859); and *Hebräische Uebersetz. des Mittelalters* (2 vols., Berlin, 1893), a work which received the prize of the Académie des Inscriptions in Paris. See Berliner, *Die Schriften des Dr. M. Stein'schneider* (Berlin, 1886). RICHARD GOTTHEIL.

Steinthal: See OBERLIN, JOHANN FRIEDRICH.

Stellarton, formerly ALBION MINES: town of Pictou County, Nova Scotia; 3 miles from New Glasgow and 39 miles N. E. of Truro, on the Intercolonial Railway (see map of Quebec, etc., ref. 2-C). It is a thriving but dingy town which has grown up about the Albion coal and iron mines, the center of the chief mining district of the province. Petrolium is obtained in the vicinity. The town is the chief destination of the French immigrants to the province. Pop. (1881) 2,297; (1891) 2,410. M. W. H.

Steller's: a group of echinoderms, including the STAR-FISH (*Asteroides*) and (OPHIUROIDEA (*qq. v.*), in which the body is star-shaped.

Stellhorn, FREDERICK WILLIAM: theologian; b. in the kingdom of Hanover, Germany, Oct. 2, 1841. Emigrated to the U. S. in 1854; graduated at the institutions at Fort Wayne, Ind., and St. Louis, Mo.; pastor in St. Louis and DeKalb co., Ind., 1865-69; Professor of Hebrew, Greek, and Latin, Northwestern University, Watertown, Wis., 1869-74, and in Concordia College, Fort Wayne, 1874-81; since 1881 has been Professor of Theology, Capitol University, Columbus, O. In the Predestination controversy he parted from the Missourians and entered the Joint Synod of Ohio. He has been active as editor of the *Theologische Zeitblätter* and *Lutherische Kirchenzeitung*, as well as a contributor to *The Theological Magazine*. He has published a *Lexicon of New Testament Greek* (Leipzig, 1886), and begun a commentary on the New Testament, of which the volume on the Gospels has appeared. H. E. JACOBS.

Stellio [Lat. *stellio*, a newt with starlike spots on its back, deriv. of *stella*, star]: a genus of lizards of the family *Agamidae*. The best-known species is *S. cordylina* of the Levant. Strict Mohammedans kill it because they conceive that by the frequent bowing of the head it intends to insult their religion, mocking their own gestures at prayer. The Turks use its flesh and excrement in preparing a cosmetic.

Stem [O. Eng. *stenn*; Germ. *stamm*, a deriv. of Indo-Europ. root *stā-*, stand, and originally denoting the trunk of a tree]: a term of historical grammar denoting that part of a word which is left when the inflexional ending is removed. The stem may therefore be identical with the root; e. g. in Lat. *vōx*, Gr. *ῥῶξ*, or, in the Gr. verb *ἐλ-μ*, but the stem is more commonly formed by adding to the root a formative element called a suffix. Thus in Indo-Europ. *klutis* = Sanskr. *grutās*; Gr. *κλυτός*; Lat. *in-clutus*, *s* is inflexional ending, *kluto-* is stem, *clu-* is root, and *-to-* is suffix. Similarly we divide *φῦγ-ός*, *fūg-u-s*; *γῆν-ός*, *tōm-u-s*, *unc-u-s*, *dol-u-s*; *ἔγ-ω-s*, *stud-iu-m*; *τέκ-ν-ος*, *grā-nu-m*; *πῶ-τι-s*, *cu-ti-s*; *αἰχ-ῆ-α*, *hom-in-em*; Sanskr. *jān-as-as*, Gr. *γῆν-ε(σ)-ος*, Lat. *gen-er-is*, etc. The relation of stem to root in the verb is evidently parallel to that in the noun—an inheritance from a period prior to the development of a grammatical distinction between noun and verb; thus the *φερ-*, *φερο-* of *φέρει-ται*, *φέρονται* is to the *εσ-* of *εσ-τι*, or the *ει-* of *ει-σι* as the *λογο-* of *λόγος* is to the *φλεβ-* of *φλέψ*. Though the purposes of grammatical analysis are well served by this division of stem into root and suffix, it by no means follows that in every case the suffix was an originally independent word or element. On the contrary, the form of the stems is in many cases due to the influence of analogy, and in others to the retention of the fuller original form of the primitive word which has elsewhere suffered reduction by the loss of a vowel. (See Root.) The word stem as thus used in grammar is a translation or transfer of the German word *stamm*, meaning the trunk (of a tree) in distinction to the *wurzel* or root.

BENJ. IDE WHEELER.

Sten'dal: town and railway junction; in the province of Saxony, Prussia; on the Elbe; 36 miles by rail N. by R. of Magdeburg (see map of German Empire, ref. 4-E). It has a Gothic cathedral, manufactures leather, tobacco, woollen, linen, and cotton stuffs, and trades in corn and cattle. Pop. (1890) 16,473.

Stenoglossa [from Gr. *stenos*, slender + *glossa*, tongue]: a group of molluscs, embracing the *Rhachiglossa* and *Turloglossa* of the *Gastropoda*, in which the lingual ribbon is narrow.

Stenog'raphy [from Gr. *stenos*, narrow, close + *graphein*, write]: a generic term which embraces every system of shorthand writing, whether upon alphabetic, phonetic, or hieroglyphic principles. To those systems which are based upon the phonetic principle is given the name *phonography*; which therefore indicates a species of stenography. Some of the other names under which new stenographic systems have been introduced are *tachygraphy* (swift writing), *brachygraphy* (short writing), *semigraphy* (sign writing—that is, writing with signs), *cryptography* (secret writing), *ideography*, *zeigigraphy*, *polygraphy* (writing much—that is, voluminous writing), *radiography* (easy writing), and *thygraphy* (swift writing).

Stenography among the Greeks.—The great need of some method of representing in legible characters spoken words as fast as uttered was appreciated in the earliest times, and traces of shorthand writing may be found among the Greeks not many centuries later than the introduction and diffusion of the art of writing. The conclusion has been arrived at that among the Greeks Xenophon was the inventor of stenography, some method of which he employed in recording the *Memorabilia* of Socrates. Many references show that some style of writing briefer than that in common use was known at this time, though it is not clear that use was made of characters not found in the common alphabet. It has been suggested that certain references in the Bible to "ready writers" (Ps. xiv. 1) show that some system of brief writing was known to the Hebrews, but the passages relied upon to establish the proposition have only suggestive force.

Stenography among the Romans.—Among the Romans it is probable that the first efforts at brief writing were reflected in the representation of certain frequently recurring words by contractions in the ordinary spelling, as by their initial letters; thus: R. P. for *Res Publica*, P. R. for *Populus Romanus*, S. P. Q. R. for *Senatus Populusque Romanus*. The next step was the representation of certain frequently recurring terminations of words by arbitrary contractions or signs; and the next, the representation by arbitrary characters of words and phrases. Etruscan the poet is said to have invented and used (239-169 B.C.) a series of 1,100 arbitrary characters for the ready representation of words. The first attempt at any system of stenographic writing is variously attributed to Cicero and to his freedman Tiro. Certain it is that Tiro, by the use of a system which he had mastered if not invented (and which is said to have been improved by Macer), took down and thus secured the preservation of Cato's great oration against the proceedings of Caesar respecting the Catilinarian conspiracy, as well as Cicero's own orations respecting the same. Julius Caesar, Augustus, and Titus Vespasian are said to have been proficient in the art of shorthand writing; and this is clearly shown by many references in Horace, Ovid, and other writers. The following is an illustration of the Tironian system:

Tironian Notes.

✓ A C D E F G H I J K L M N O P Q R S T U V W X Y Z

Translation.

Quem posthūmū sūper dūm iūstū & ratiōnabīlīb; dīvīnū mīserīcōrdīā fāvēmū, & rāz eorū lōī adīstōrīo

Stenography among the French.—There are said to be still extant, in the characters of the Tironian system, an inventory and fifty-four charters of Louis the Pious, successor of Charlemagne, copies of which were republished at Paris in 1747; but, whatever use was made of stenography during the Middle Ages, few traces are found of it previous to the end of the eighteenth century. The first

work of importance to herald the revival of the art was an adaptation of Taylor's (English) system (1792) by Theodore Pierre Bortin. Since then half a dozen systems have been published, among which is that of Fayet, *Nouvelle Ecriture de Stenographie* (1832), but those in use by most of the practical reporters (1895) are the systems of Dupuy, de Prépeau, Aimé-Paris, and Guélin.

Stenography among the Germans.—The credit of the first introduction of shorthand into Germany (1606) is given to one Marhof. His system was rapidly followed by others. The systems generally in use are those of Gutschmager (1831) and Stolze, which have the merit of possessing to a great degree the slant of ordinary writing and the inclusion of many sharp angles, giving easy joinings, and distinguishing often by light and shaded characters.

Stenography in Great Britain.—Probably in no other nation have so many systems of shorthand been put forth as in England. The earliest of any prominence was that of Timothy Bright (London, 1588)—*Character, or Art of Short, Swift, and Secret Writing by Character*. Two years later appeared the system of Peter Dales, under the curious title *The Writing Schoolmaster, in three parts*. The more prominent of the succeeding systems were those of Willis (1602), Rich (1654-60), Mason (1672), republished with improvements by Gurney in 1753. Byrnes published his first work in 1739, and his universal English shorthand in 1767. Taylor's book appeared in 1792, Lewis's in 1815, and Harding's in 1823. Harding's system was an adaptation of Taylor, and Isaac Pitman was induced to take up shorthand by seeing this book. Between the publication of Bright's work in 1588 and Selwyn's in 1847, about eighty different textbooks appeared, nearly all of them of unphonetic systems. Isaac Pitman's system appeared in 1837. It was based upon phonetic principles; and, by reason of the simplicity of its consonants, and its copyright protection, made rapid strides in public use. He made use of Harding's pairing of the consonants and Good's use of hooks. Notwithstanding the general popularity of Pitman in England, the larger number of the legal and parliamentary official writers use (1895), with more or less modifications, the older systems, especially Gurney, Taylor, and Lewis. For his long and devoted service in advancing the phonographic art, Isaac Pitman was knighted in 1894.

Stenography in the United States.—Only a few purely stenographic systems have received even temporary encouragement in the U. S., and this is due to the striking superiority of such as have found favor as well as to their comparative earliness in the field. The first system introduced was that of Keyes A. Bayley (New York, 1831). This was followed by several American editions of Isaac Pitman's (English) system, by Andrews and Bayley, Booth, Paterson, and Benn Pitman (1853). Day and Statton brought out an unphonetic system in 1836, Thomas Townsend a phonetic one in 1837, and Charles Saxton an unphonetic one in 1842. Lindsey's tachygraphy (which is slow, and has the feature of writing in the vowels, and the merit of linearity) was introduced in 1854. Andrew J. Graham's adaptation was introduced in 1858, and rapidly found favor. The author undertook to provide a means of securing greater brevity by omissions, combinations, extended word and phrase signs, half-lengths, ticks, and other devices; and while many of his modifications and innovations were regarded as exceedingly valuable as time-savers, numerous practical writers believed that he had carried his ideas of abbreviation too far, and that a strict application of his system would result in the sacrifice of legibility to brevity. From the date of his first *Handbook of Standard Phonography* till his death in 1894 he published a large number of text-books and readers. Munson's system (introduced in 1890) is founded on that of Isaac Pitman, and has received a considerable degree of support. Its distinguishing features are the inversion of the original Pitman vowel scale and the use of small initial hooks on curved strokes for R and large ones for L, thereby avoiding the turning of a curved stroke for L and R hook, as in Fr, Vr, Thr, etc. Bishop (1887) employs a system of connectible, well-distinguished stroke vowels, treated in analogy with the treatment of the consonants, and claimed to give greater exactness and facility in representing any sound whatever used in speech, and to simplify the sciences by leaving less to mere memorizing and more to the application of fundamental principles. Other systems in the U. S. are Ogensby's and Burns's, both of which are adaptations from Pitman with considerable variations, the former exceedingly brief, and the latter being successfully prac-

ticed and taught by its author; and Longley's, a phonetic system. It is believed that Graham's modifications are used by more official court stenographers in the U. S. than all other adaptations of Pitman. The Bann Pitman, Graham, and Munson systems are probably more generally taught than any others, and each has a comprehensive dictionary.

Shorthand writers are employed as official reporters in both branches of Congress, in all the State Legislatures, and in nearly every important court in the country. Few newspapers now employ them for shorthand work alone, usually hiring an expert writer whenever a verbatim report of a lecture, sermon, trial, or other proceeding is wanted. The art of shorthand writing has become an invaluable promoter of general business activity, and has opened up a pleasant field of work for young men and young women. There is a constant demand for those possessing a knowledge of shorthand writing and a facility with the typewriter.

The more prominent systems in use in Germany, France, Great Britain, and the U. S. have proved equal, in the hands of experts, to the task of keeping pace with the most fervid oratory; but it must be acknowledged that the requirements of the art are so arduous that only those who have devoted years to the practice, and are, withal, specially adapted for the work, can ever hope to make themselves equal to the highest exactions of the profession. See PHONOGRAPHY.

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Revised by THEO. C. ROSE.

Steph'anus, or Stephens (Fr. *Estienne* or *Étienne*): a family of French printers, several of whom were also noted as scholars. HENRY STEPHENS, the founder of the house (b. about 1460; d. in 1520), established himself in 1502 as a printer in Paris, where his works became famous for the accuracy and beauty of their typography. He was aided, and afterward succeeded in business, by his three sons, the most distinguished of whom was his second son ROBERT (b. in Paris, 1503), who was eminent as a scholar, and in 1531 began the publication of his great *Dictionarium, seu Thesaurus Linguae Latinae*, of which he put forth three editions, the last in 1545, and which has been several times republished. He also published editions of the Bible, with notes which were censured by the Sorbonne because of their Protestantism, and indeed Stephens was a Protestant, but he was protected by Francis I., who had made him royal printer. After the death of the king the Sorbonne prohibited the sale of his Bibles, and he was obliged to take refuge in Geneva, 1551, where he continued printing and died Sept. 7, 1559. He published nearly a dozen complete editions of the Bible in Hebrew, Greek, Latin, and French, and numerous separate editions of the New Testament in various languages, besides many other very important works. The present division of the New Testament into verses was made by him and first introduced in his Greek-Latin Testament published at Geneva 1551. After he had taken refuge in Geneva, the business in Paris was conducted by his brother CHARLES (b. 1504; d. 1564), who was appointed printer to Henry II., and put forth numerous classical and scientific works.—HENRY, son of Robert (b. 1528; d. Mar., 1598), was especially eminent as a Greek scholar, and carried on his business at first in Paris, and afterward in Geneva. He almost ruined himself financially by the publication of his *Plato* (1578) and his immense *Thesaurus Linguae Graecae* (1572, 5 vols. fol., reprinted with additions, London (by Valpy), 1815–28, and again, Paris (by Didot), 9 vols. fol., 1831–65), for at that time Greek students were too few in number to afford purchasers for an edition. He subsequently traveled from place to place, visiting all the principal libraries, for the purpose of collecting materials for various works, which he procured to be

printed by others. Among these works is his *La Précellence du Langage françois* (1579).—PAUL, the son of Henry (b. 1566; d. 1627), carried on the printing business at Geneva for many years.—ANTHONY, the son of Paul (b. 1592; d. 1674), removed from Geneva to Paris, where for nearly half a century he conducted a printing-house, but with ultimate ill success. He died at the Hôtel-Dieu in Paris in utter destitution, and with him was extinguished this line of famous scholars and printers.

Revised by S. M. JACKSON.

Stephen, SAINT [*Stephen* is from Lat. *Stēphanus* = Gr. *Στέφανος*, liter., crown]: the first of all Christian martyrs. He was one of the seven deacons in the Christian congregation of Jerusalem. Charged by the Jews with speaking against the law and against God, he was stoned to death by order of the Sanhedrin. His history is given in chapters vi. and vii. of the Acts of the Apostles. His festival is held on Dec. 26, both in the Eastern and Western Churches.

Stephen I., SAINT: King of Hungary. See HUNGARY (*History*).

Stephen: the name of ten popes. Some historians, however, count but nine, from the circumstance that Stephen II. died three days after his election, Mar. 27, 752, before he had been consecrated. The following bearers of the name are the most noteworthy: STEPHEN I., Saint: pope from about 254 to 257 A. D.; is noted for his controversy with Cyprian as to the necessity of rebaptizing converted heretics. The councils of Carthage (255 and 256) having decided against the Roman practice of recognizing baptism by heretics as valid, Stephen broke off communion with the African Church.—STEPHEN III. (II.): pope from 752 to 757; suffered severely from the aggressions of the Lombards. After asking in vain for help against them from the Byzantine emperor, Constantine Copronymus, he went in person to Pepin le Bref, chief of the Franks, whom he crowned king on the condition that he should expel Aistulf, the Lombard king, from the exarchate of Ravenna and the Pentapolis and bestow these territories on the see of St. Peter. Pepin made two campaigns in Italy, but succeeded at last in forcing the Lombards to retreat from the above territories, which he then gave to the papal see, in spite of the protest of the Byzantine emperor, thereby laying the foundation of the temporal power of the pope.—STEPHEN VII. (VI.) (896–897) is most noticeable for his violence in respect to his predecessor Formosus, whose corpse he caused to be exhumed, stripped of the papal insignia, mutilated, and thrown into the Tiber, at the same time annulling all his ordinances, and even his consecrations.—STEPHEN X. (IX.) (1057–58) was a son of the Duke Gotelon of Lower Lorraine, and was elected pope through the influence of Cardinal Hildebrand, afterward Pope Gregory VII., who was the real master of the Church.

Stephen: King of England; b. in Normandy about 1100: son of Stephen, Count of Blois, by Adela, daughter of William the Conqueror. William, the only son of Henry I., was drowned in 1120, and the heir-presumptive to the crown was his daughter Matilda, who was married to Henry V., Emperor of Germany; but before the death of her father the emperor died, and she married Geoffrey Plantagenet, Earl of Anjou, without the royal sanction, which was held to invalidate her right to the succession. Upon the death of Henry I. (in 1135), Stephen claimed the succession, although he was not next in the line, even if Matilda was set aside, for he had an elder brother, Theobald, Count of Blois; he was, however, chosen by a party of the prelates and nobles, and his election was sanctioned by the pope. At first his government was fairly successful. He ingratiated the English by issuing a charter confirming the favorable laws of Henry I.'s reign. He made peace with the Scots, whose king, David, paid him homage, and when the war broke out again the English were victorious in the battle of the Standard. The entire reign, however, was filled with revolts and civil war. The cause of Matilda was taken up by a party in England, headed by her natural brother, Robert, Earl of Gloucester, and after a contest of several years Stephen was defeated and made prisoner at Lincoln Feb. 2, 1141. The rule of the empress was so unpopular that a revolt broke out, and her brother, the Earl of Gloucester, was defeated and captured, but was afterward exchanged for Stephen. The civil war now raged with varying fortunes for ten years. In 1153 Prince Henry Plantagenet, son of Matilda, arrived in England at the head of a considerable force; but before a decisive action took place, the barons on both sides entered upon an armistice, and finally concluded the treaty of Wallingford by which Stephen should retain the crown during his

life, and that after his death Henry should succeed him. Stephen survived this treaty only a few months, and with him ended the line of Anglo-Norman Kings of England. D. Oct. 23, 1154.

Stephen, Henry Jones; jurist; cousin of Sir James and Sir George Stephen; b. in England in 1787; was called to the bar at the Inner Temple 1818; became commissioner of bankruptcy; was a distinguished practitioner at the London bar, and became sergeant-at-law 1827. D. at Clifton, Nov. 28, 1864. Author of a *Treatise on the Principles of Pleading in Civil Actions* (1824; 8th American ed., Philadelphia, 1836); of a *Summary of the Criminal Law in its present state* (1844); and of *New Commentaries on the Laws of England* (4 vols., London, 1841-45). In the preparation of three subsequent editions of this great work the author enjoyed the assistance of his son, James Stephen, LL.D.; b. in England in 1829; called to the bar at the Middle Temple 1846; became Professor of English Law and Jurisprudence at King's College, London; recorder of Poole, registrar of bankruptcy at Leeds, and circuit judge at Lincoln. He issued later revised editions of his father's *Commentaries*, also *Questions for the editions*, and was author of treatises on *Due Diligence* (1851) and *The Common-law Procedure Act* (1860). Revised by F. STURGES ALLEN.

Stephen, Sir James Fitzjames; jurist; b. at Kensington, London, Mar. 3, 1829; educated at Trinity College, Cambridge (B. A. 1852), and was called to the bar at the Inner Temple in 1854; traveled circuit, and became recorder of Newark-on-Trent 1859-68; succeeded Sir Henry J. S. Maine as legal member of the legislative council of India 1869; with the assistance of two others he drew up and passed through the council a code of criminal procedure, which, with considerable modifications, was re-enacted as the code of 1882; prepared, and finally passed, the Indian Evidence Act of 1872. He returned to England in 1872, where he undertook the codification of the English law of evidence (which he never completed), and of English substantive criminal law, the resulting code being reported too late for the code of 1879, and subsequently dropped from the Government measures; in Dec., 1875, was appointed Professor of Common Law by the Inns of Court, and a member of the council of legal education and law reporting; was made Knight Commander of the Star of India in 1877, and appointed a judge of the Queen's bench division, which office he retained until he was stricken with insanity in 1891. D. in London Mar. 11, 1894. He wrote besides his great work, *History of the Criminal Law of England* (which is far more than a mere legal treatise; 3 vols., 2vo., 1893), a *Digest of the Law of Evidence* (1876); *Essays of a Barrister* (1892); *Liberty, Equality, and Fraternity* (1873); *Digest of the Criminal Law* (1877); and many monographs on legal subjects. See *Law Times* (Mar., 1894). F. STURGES ALLEN.

Stephen, Leslie, LL.D.; author; b. at Kensington, London, Nov. 28, 1832; son of Sir James Stephen and brother of Sir James Fitzjames Stephen. He was educated at Eton, King's College, London, and Trinity Hall, Cambridge (B. A. 1854), of which last he was a fellow. In 1864 he went to London and engaged in literary pursuits; edited *The Cornhill Magazine* 1871-72, resigning to take charge of the important *Dictionary of National Biography*. The first twenty-six volumes of this (1885-91) were issued under his supervision, and he was then succeeded in the editorship by his collaborator, Sidney Lee. In 1889 he held the Clark lectureship on English literature at Cambridge. He married Harriet Marion, younger daughter of William M. Thackeray. Among his writings are *The Playground of Europe* (1871); *Free Thinking and Plain Speaking* (1873); *Hours in a Library* (1874-76); *History of English Thought in the Eighteenth Century* (1876); *The Science of Ethics* (1882); *An Apologist's Apology* (1896); besides biographies of Pope, Swift, Johnson, and Henry Fawcett, and an edition of *Poetical Works* in ten volumes (1892). H. A. REES.

Stephen Báthori, *Bathory*; King of Poland; b. in 1532 of a celebrated Hungarian family; was Prince of Transylvania, and in 1576, after Henry of Anjou's abandonment of the Polish throne, was elected King of Poland. He put the Jesuits at the head of the new university which he founded at Wilna, and gave them many other preferences, but their efforts to induce him to put down the Reformation in Poland were in vain. In military respects he was successful, and humiliated the Russians several times, forcing them out of Livonia, which was then reannexed to Poland. D. at Gdansk, Dec. 12, 1596.

Stephens; a family of French printers. See **STEFANUS**.

Stephens, Alexander Hamilton, LL.D.; statesman; b. near Crawfordsville, Ga., Feb. 11, 1812; graduated at the University of Georgia 1832; admitted to the bar 1834; entered upon political life 1836 as member for Tallapoosa of the State House of Representatives; was successively re-elected to the same office until 1840; declined an election 1841 (the next year was chosen State Senator by the same constituency). In 1843 he was elected member of the House of Representatives of the U. S. That office he occupied until 1850, when he voluntarily retired to private life. The compromise measure passed by the Congress of 1850 had no bolder, abler, or more eloquent champion than Stephens. He was chosen a delegate to the State convention of that year—the convention which established the celebrated "Georgia platform." In 1855 he united with the Democrats to defeat the Know-nothing party. In the presidential campaign of 1860 he was placed at the head of the Douglas-Johnson electoral ticket. He was a delegate to the State convention of 1861 which passed the ordinance of secession. That measure he earnestly opposed by speech and vote, but, while he advised against the policy of secession for existing grievances, he maintained the right of a State to secede peacefully from the Federal Union for sufficient cause. When a majority of the convention passed the ordinance of secession, he readily acquiesced in their decision. He was a member of the Confederate provisional congress; was chosen vice-president of the provisional government of the Confederate States; was appointed commissioner to the convention between their government and the State of Virginia; was elected by the people, without opposition, to the vice-presidency of the Confederacy under the permanent constitution, as it was styled; and, when in Feb., 1863, the fortunes of the Confederacy were desperate beyond the reach of hope, he was placed at the head of the commission on the part of the Confederate States government in the famous Hampton Roads conference. After the downfall of the Confederacy he was arrested and confined a prisoner of state in Fort Warren for five months; he was released on his own parole in Oct., 1865. In Feb., 1866, the General Assembly elected him, by a large majority, against his wishes, to the office of U. S. Senator, but Congress ignored the restoration of Georgia to the Union under the presidential proclamation of Andrew Johnson, and he was not allowed to take his seat in the Senate. He was elected to the 43d, 44th, 45th, 46th, and 47th Congresses, in each case without more than nominal opposition; inaugurated Governor of Georgia Nov. 4, 1882. He belonged to the Jeffersonian school of American politics, and among the cardinal articles of his political creed were State rights, State sovereignty, local self-government; he always advocated the largest liberty of the citizen compatible with the attainment of the two prime objects of government—viz., protection to property and preservation of order. He wrote a *Constitutional View of the War between the States* (3 vols., 1867-70); a *School History of the United States* (1870-71); and a *Compendium of the History of the United States* (New York, 1883). D. at Atlanta, Ga., Mar. 4, 1883.

Revised by C. K. ADAMS.

Stephens, Ann Sophia (Winterbotham); novelist; b. at Derby, Conn., in 1813; became the wife of Edward Stephens in 1841; soon after they went to Portland, Me., where in 1835-37 she edited *The Portland Magazine*, and in 1846 compiled *The Portland Sketch-book*, a volume composed of the writings of natives or residents of that city. In 1837 they removed to New York, her husband subsequently receiving an appointment in the custom-house. She edited and contributed to various periodicals, and wrote many tales and novels, and some fugitive poems. A uniform edition of her works has been issued (new ed. 23 vols., Philadelphia, 1896). Among her most successful novels are *Fashion and Famine* (New York, 1854); *The Old Homestead* (1855; 2 vols., Philadelphia, 1869); *Mary Deveret* (1860); *The Rejected Wife* (1863); *Silent Struggles* (1865); *Mabel's Mistake* (1866); *Wives and Widows* (1866); *Married in Haste* (1870); *The Reigning Belle* (1872); *Ballad and Bondage* (1875); and *Phemie's Experience* (1874). D. at Newport, R. I., Aug. 30, 1886. Revised by H. A. REES.

Stephens, Gossow; archaeologist; b. in Liverpool, England, Dec. 18, 1812. After spending several years in Stockholm he was in 1851 appointed acting Professor of the English Language and Literature at the University of Copenhagen, and four years later permanent professor; resigned in 1866. He has been several times decorated and is an

honorary member of a number of scientific societies. His chief work is *The Old Northern Runic Monuments of Scandinavia and England* (London and Copenhagen, 3 vols. fol., 1866-84). As a collection of plates and transcriptions, this work is invaluable, but many of the readings and criticisms have since been effectually disproved by Wimmer and others. He has also published a number of monographs and texts, English and Scandinavian, a translation of Tegnér's *Frithiof's Saga*, and a melodrama, *Revenge, or Woman's Love*.
D. K. DODGE.

Stephens, JOHN LLOYD: jurist, traveler, and author; b. at Shrewsbury, N. J., Nov. 28, 1805; graduated at Columbia College 1822; studied law and practiced in New York. In 1834-36 he traveled in Europe and the East; published *Egypt, Arabia Petraea, and the Holy Land* (2 vols., 1837), and *Greece, Turkey, Russia, and Poland* (2 vols., 1838). In 1839 President Van Buren appointed him special commissioner to negotiate a treaty with Central America. The civil war in that country prevented him from accomplishing his purpose; but in company with an English artist, Frederick Catherwood, he traveled in Central America and Southern Mexico, making a special study of the ancient ruined cities. Returning to New York he published *Incidents of Travel in Central America, Chiapas, and Yucatan* (2 vols., with fine illustrations by Catherwood, 1841). The results of a second journey, also with Mr. Catherwood, were embodied in *Incidents of Travel in Yucatan* (2 vols., 1843). These two works attained a wide circulation, and gave for the first time good popular descriptions of the wonderful Central American cities. Mr. Stephens was a delegate to the convention for revising the constitution of New York, 1846. In 1847 he took an active part in the organization of the first Atlantic steam-navigation company. After the discovery of gold in California he entered, with characteristic energy, into the scheme for a rail route across the Isthmus of Panama; was one of the first presidents of the Panama Railway Company, and personally superintended the construction. From exposure on the isthmus he contracted a disease of which he died in New York, Oct. 10, 1852.

HERBERT H. SMITH.

Stephens, WILLIAM: president of the colony of Georgia; b. on the Isle of Wight, England, Jan. 28, 1671, son of Sir William Stephens, lieutenant-governor of that island; graduated at Cambridge; studied law at the Middle Temple; sat in Parliament 1696-1722; settled at Charleston, S. C., about 1730; was appointed secretary of the colony of Georgia 1737; became president of the county of Savannah 1741, and governor of Georgia 1743-50. D. in Georgia in Aug., 1753. He was the author of *A Journal of the Proceedings in Georgia* (London, 3 vols., 1742). His biography was written by a son under the title of *The Castle-builder, or the History of William Stephens of the Isle of Wight* (2d ed. London, 1759).

Stephenson, GEORGE: engineer; b. at Wylam, Northumberland, England, June 9, 1781, the son of a poor colliery laborer. He was in childhood an engine-boy; became a fireman, and in time was placed in charge of an engine, which he studied until he had mastered its construction so as to be able to take it apart and put it together again. Accident gave him an opportunity of putting in motion a steam-engine which needed repairs, and in 1812 he was made engine-wright at Killingworth Colliery. The problem of constructing a locomotive steam-engine was then engaging many minds, and he was in 1814 the first to construct one which proved satisfactorily operative. He originated the steam-blast, which was introduced into his second locomotive, built in 1815, and in that year devised a miner's safety-lamp, for which a large prize had been offered by colliery-owners; but Sir Humphry Davy having simultaneously invented his safety-lamp, this prize, valued at £2,000, was awarded to him, £100 being awarded to Stephenson by the committee; a separate subscription of £1,000 was raised in 1817, which was presented to Stephenson, and his lamp is still in use in some English collieries. Stephenson then turned his attention to improvements in railways as well as engines. The first railway built by him, opened in 1822, 8 miles long, was so successful that in the next year he was appointed engineer of the railway authorized to be constructed between Stockton and Darlington, and in 1825 of the Liverpool and Manchester line, which was begun in 1826. He had in the meantime set up an establishment at Newcastle-upon-Tyne for the manufacture of locomotives, and on Oct. 6, 1829, his engine, named the Rocket, attained

an average speed of 14 miles an hour, and for a short distance was driven at the rate of 29 miles. (See RAILWAYS.) During the next fifteen years he was actively engaged as a railway engineer and contractor in England and on the Continent, still carrying on his great locomotive-factory at Newcastle, and also engaging in coal-mining and lime-works. He passed the closing years of his life at his seat, Tipton Park, Derbyshire. D. Aug. 12, 1848. He retained during all his life, in speech and manners, much of the rustic simplicity belonging to his early life, and declined the honor of knighthood. By common consent he has received the title of the father of railways, and in 1862 a colossal bronze statue was erected in his honor at Newcastle-upon-Tyne. See Smiles's *Life of George Stephenson* (1857; new ed. 1874).
Revised by R. H. THURSTON.

Stephenson, ROBERT: engineer; son of George Stephenson, engineer; b. at Willington Quay, near Newcastle-upon-Tyne, Oct. 16, 1803. He had little opportunity to obtain an education when a boy, and in 1819 he was apprenticed to a coal-viewer; but as his father's circumstances improved he gave his son the best education within his means, and in 1822 sent him to the University of Edinburgh, where he remained six months studying chemistry, mathematics, and geology, after which he assisted his father in railway surveying and in the locomotive-works at Newcastle. In 1824 he went to South America, where for three years he superintended the working of the Columbian Mining Association. He then returned to England, where he aided his father, partly in laying down the line of the Liverpool and Manchester Railway, but more especially in the locomotive-works; and to him chiefly belongs the honor of the practical development of the details of the locomotive and the railway. He was appointed engineer of the London and Birmingham Railway, which, built almost wholly under his direction, was opened in 1838, and from this time he was employed in similar undertakings at home and abroad. He constructed several of the most stupendous iron railway bridges in the world, including the high-level bridge crossing the Tyne at Newcastle, the viaduct over the valley of the Tweed at Berwick, the Conway tubular bridge, the Britannia tubular bridge crossing the Menai Straits, the Victoria tubular bridge over the St. Lawrence in Canada, and those crossing the Nile at Damietta, Egypt. In 1847 he was returned to Parliament for Whitby. He received the great gold medal of honor from the French Industrial Exposition of 1855, and was president of the Institute of Civil Engineers from 1855 to 1858. He published a *Description of the Locomotive Steam-engine* (1838); *Report on the Atmospheric Railway System* (1844); and *The Great Exhibition, its Palace and Contents* (1851). D. Oct. 12, 1859. He was buried in Westminster Abbey, where a memorial window has been placed to his memory. See Smiles's *Life of George Stephenson* (new ed. 1874), and *Life of Robert Stephenson*, by J. C. Jeaffreson and W. Pole (2 vols., 1864).
Revised by R. H. THURSTON.

Stepniak, SERGIUS MICHAEL DRAGONOFF: author; b. at Gadatch, government of Poltava, Russia, 1841; member of a semi-noble family descended from the Cossacks of Little Russia; studied at Kieff 1859-63; published in that time in the Little Russian dialect some works which were prohibited by the Government in 1862; became docent in ancient history in the University of Kieff 1865; professor 1870; removed from his chair 1873 by the Government; exiled in 1876 on account of his criticisms on the system pursued by Count Tolstoi, one of the Ministers of Justice; settled in Geneva 1877, and published a review, *Gromada*, in the Ukraine dialect; settled in London 1885. He has labored to establish equal political rights for all people in Russia, and has declared against socialism as well as absolutism. Among his principal works are *The Turks Within and Without* (Geneva, 1876); *La Russia Sotterranea* (Milan, 1881; Eng. trans. *Underground Russia*, 1883); *Russia under the Tsars* (Eng. trans. 1885); *Tyrannicide in Russia* (1881); *Historical Poland and the Muscovite Democracy* (1881); and *The Career of a Nihilist*, a novel (1889). He has contributed numerous papers to the magazines and reviews.
C. H. THURBER.

Steppe: the name given by the Tartars to the plains of Central Asia. They are usually covered with grass, and correspond in their aspects and relations to the prairies of the U. S. and the llanos and pampas of South America. See PLAIN.

Steppe-murRAIN: See RINDERPEST.

Sterculia'ceæ [Mod. Lat., named from *Sterculia*, the typical genus, from Lat. *Sterculus*, the patron deity of manuring, deriv. of *ster'cus*, dung]: a family of exogenous trees, shrubs, and herbs, mostly tropical. Many of the trees are of prodigious size, such as the baobabs and those of the genera *Bombax* and *Ceiba*. Many produce abundantly a substance called silk-cotton, which resembles true cotton, but will not spin well. The wood is often very light and soft. The family contains medicinal plants, and produces some excellent fruits, some gums, a few valuable bark-fibers, and a number of useful timber-trees; but its most important product is chocolate, from the oily seeds of *Theobroma cacao*. The flowers or fruits of certain species are putrid, whence the botanical name. Revised by L. H. BAILEY.

Stere: See METRIC SYSTEM.

Sterelmin'tha [Mod. Lat., Gr. *στερεός*, solid + *ἐλμιν*, *ελμινθος*, a worm]: a name given to some of the PLATHELMINTHES (q. v.), in allusion to the absence of all cavities in the body.

Stereo-chemistry: a branch of chemistry that has to deal with the relations which the atoms bear to one another in space. The ordinary methods of investigation of chemical compounds lead to certain conclusions in regard to the connections existing between the atoms in a molecule. Thus when water is expressed by the formula $H-O-H$, no attempt is made to tell anything about the arrangement in space of the two atoms of hydrogen and the atom of oxygen. The formula expresses the view that each of the two atoms of hydrogen is linked to the atom of oxygen, but the question whether they are on the same side or on opposite sides, above or below, is not touched. Yet it is certain that if these atoms exist and are united in the molecule they must be arranged in space, and a formula that does not take into consideration the three dimensions of space is certainly incomplete. Up to within a comparatively short time no facts were known that justified any speculation concerning the space-relations of atoms, but it appears that the time has come when such speculation is profitable, and facts are constantly being brought to light that can not be explained without its aid.

The investigations of Pasteur on the different varieties of tartaric acid form the basis of stereo-chemistry. Pasteur found that racemic acid, which can easily be made, can be converted into ordinary tartaric acid and a new variety of tartaric acid, and when these two varieties of tartaric acid are mixed in solution they form racemic acid. Ordinary tartaric acid, when examined with the aid of a polarizing apparatus (see POLARIZATION), is found to turn the plane of polarization to the right, while the new variety obtained by Pasteur turns the plane to the left, and racemic acid is optically inactive—that is to say, it has no effect on polarized light. No explanation of these facts was offered until many years later. Meanwhile other cases similar to that studied by Pasteur were discovered, and chemists came to see more and more clearly that their theory of chemical constitution required an extension in order to accommodate it to the facts. At about the same time, and independently, Van't Hoff and Le Bel made a suggestion with reference to these cases that has proved to be of great value. The main idea is this: The atom of carbon, which, as is well known, has the power to unite with four univalent atoms or groups, is supposed to exert its four affinities from a center toward the angles of a tetrahedron—that is, symmetrically in space. Suppose all four atoms or groups that are in combination with the carbon atom to be of one kind, then but one arrangement of them in space is possible. So also if three are of one kind and one different, or two of one kind and two of another, they can be arranged in but one way around the central carbon atom. When, however, all four atoms or groups are different, then two arrangements in space are possible. The difference between the two arrangements is that which is observed between either one and its reflection in a mirror. Imperfectly the two arrangements are shown in the accompanying figures, in which C represents the carbon atom

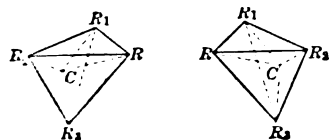


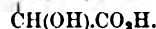
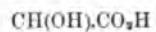
FIG. 1.

FIG. 2.

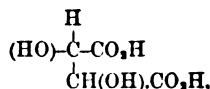
and R, R₁, R₂, and R₃ represent four different radicals or atoms.

A carbon atom which is thus in combination with four

different atoms or radicals is called an *asymmetrical carbon atom*. The proposition of Van't Hoff and Le Bel is that the presence of such an atom in a compound makes possible a kind of isomerism that is due to the arrangement of the constituents in space. In the case of the tartaric acids there are in fact two asymmetrical carbon atoms present. The constitution of these acids is represented by the formula

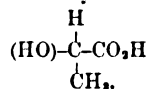


It will be seen that each of the two carbon atoms that are represented as being in combination with each other is asymmetrical, a fact that is more clearly brought out by writing the formula thus:



Accordingly, this compound presents the conditions necessary for the two arrangements in space—one right-handed, the other left-handed, corresponding to the action of the two varieties of tartaric acid on polarized light.

The same general statements hold true for the lactic acids, which are represented by the formula



There are two varieties of ordinary lactic acid which are apparently analogous to the two optically active varieties of tartaric acid, and, further, there is a third variety corresponding to racemic acid, and formed by the union of the two active varieties. The relations between the inactive racemic acid and the active tartaric acids, and between the inactive lactic acid and the two active varieties are not understood. It can only be said that in each case the molecule of the inactive substance must consist of at least one molecule of each of the two active varieties.

Investigation has shown that the asymmetrical carbon atom gives to the compounds in which it is present the property of optical activity and the power to form peculiar isomeric varieties which can not be accounted for by the ordinary theory of constitution. Much progress has been made of late years in the study of the phenomena of stereo-chemistry. Perhaps these phenomena are best illustrated in the field of the sugars, the remarkable studies of Emil Fischer in this field having led to the discovery of a large number of new sugars, the existence of which it appears to be impossible to explain without the aid of the principles of stereo-chemistry.

Werner and Hantzsch have extended the ideas of stereo-chemistry to some classes of compounds containing nitrogen, with interesting results.

IRA REMSEN.

Stereochrome: See FRESKO.

Stereoscope [from Gr. *στερεός*, solid + *σκοπεῖν*, to view]: an instrument to aid the eyes in obtaining binocular combination of two similar, or nearly similar, pictures. As long ago as the time of Euclid (B. C. 300) it was known that when a near object is regarded with both eyes the aspect is different to each eye separately. No practical application of this was made to the study of binocular vision until 1838, when Sir Charles Wheatstone constructed perspective drawings of a geometric solid as seen by each eye separately when held at a fixed distance in front of the face. The width of each drawing was made a little less than the distance between the pupils of the two eyes. In order that one of them should be seen only by the right eye and the other only by the left, Wheatstone looked through a pair of tubes; and the visual effect was found to be that of an apparently solid body in space. In order to obtain this effect more conveniently and to use larger pictures he constructed the first reflecting stereoscope. A pair of plane mirrors, *m p* and *m q* (Fig. 1), were fixed upon a frame at right angles to each other, one pair of edges being in contact at *m*. Light from the pictures, *a b* and *a' b'*, was reflected into the eyes, R and L, so that the combination appeared to be at A B.

Wheatstone's invention did not become popularized because of the difficulty of constructing accurate perspective drawings to use with it. If two such conjugate drawings be placed beside each other in the same plane, the corresponding edges, *a* and *a'* (Fig. 2), being on the right and representing one of the remoter points of the object pictured,

while c and c' represent one of the nearer points, it can be easily proved geometrically or ascertained by careful measurement that the interval between c and c' is and must be less than that between a and a' . The rays from c and c' after reflection appear to the eyes to have come from some point, C , nearer than A or B if the arrangement is such as to produce the least discomfort to the eyes. It was natural for Wheatstone to conclude that the localization of each point in the binocular field of view is determined by the intersection of the

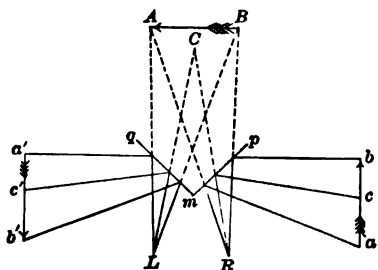


FIG. 1.—Diagram of Wheatstone's stereoscope.

visual lines reflected into the eyes. This theory of binocular perspective was long held and is still frequently expressed or implied.

Prior to the invention of Wheatstone's stereoscope, James Eliot, of Edinburgh, constructed a pair of conjugate perspectives of a landscape, but not until 1839 did he construct an instrument for viewing it. This was merely a small box open at the two ends, with a partition along the middle, equivalent to a pair of tubes. About the same time the art of photography was introduced by Talbot and Daguerre. In 1849 Sir David Brewster improved upon Eliot's form of box stereoscope by putting at the eye end a pair of semi-lenses of glass with thin edges opposed. In connection with this he devised the double camera for taking photographically the pair of pictures composing the stereograph. The stereoscope and camera were carried by him to Paris during the following year. Here the stereo-

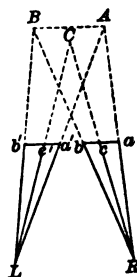


FIG. 2.

scope was popularized by Duboscq, who made these instruments and stereographs for it in great number and with various modifications.

The form of open stereoscope commonly in use in the U. S. was devised in 1861 by Dr. Oliver Wendell Holmes. In this the box is discarded, but the pair of semi-lenses is retained, being fixed at one end of a shaft on which slides the stereograph-holder.

If the pair of conjugate pictures be transposed, that originally intended for the right eye being put on the left, the effect is reversion of relief, foreground points appearing in the background. Without such transposition or use of the stereoscope the same result may be attained by muscular crossing of the visual lines. By relaxing the muscles of the eyeball the right eye may be directed to the right picture and the left eye to the left. The visual lines then may often become divergent, but the localization in the field of view is perfect. This fact disproves the theory of stereoscopic perspective held by Wheatstone and Brewster. The apparent distance and size of the binocular image are much affected by the degree of strain imposed upon the muscles which control the eyeballs and the crystalline lens. The object of the stereoscope is to attain the binocular image with the least possible disturbance of the conditions of natural binocular vision.

The bibliography of this subject is included in that of VISION.

W. LE CONTE STEVENS.

Stereotyping and Electrotyping [*stereotyping* is deriv. of *stereotype*, from Gr. *στερεός*, fixed + *τύπος*, impression, type]: the art or process of making metal plates, reproducing in facsimile the surface of engravings or type set up as for direct printing. Stereotypes are plates of type-metal of the same composition throughout; electrotypes have a facing, usually of copper, deposited by electricity.

I. STEREOTYPING.—Before the invention of stereotypes a work to be printed at intervals, as occasion demanded, had to be kept continually in type (at considerable risk of error creeping in) or else reset for each edition. About 1725 the plaster process of stereotyping was invented by William Ged, a goldsmith (b. in Edinburgh, 1690; d. 1749). In 1731 a company formed by Ged contracted with the University of

Cambridge to print Bibles and prayer-books by stereotype, but after the printing of two prayer-books the contract was abandoned, owing partly to the hostility of pressmen to the innovation. Ged returned to Edinburgh, and in 1736 completed an edition of Sallust, which was printed in 1744. Few other attempts at stereotyping were made till 1793, when William Carey, the missionary, devised the method of letting the form of type fall face downward on a surface of hot lead at the point of solidifying, and then repeating this process with the matrix so formed, the result being a true reproduction of the original form in stereotype. Firmin Didot, of Paris, modified this plan by using types of a harder alloy, (30 parts of lead, 80 antimony, 80 tin, and 10 copper); a form of such type was pressed into a surface of pure lead, and the matrix thus obtained was attached to the hammer of a stamping-press and brought down upon a roll of type-metal about to solidify, thus flattening it out and forming a stereotype plate suitable for printing.

The method of Herhan, another French printer, was to set up the form in copper matrices in intaglio and take a cast in type-metal therefrom, thus procuring a cameo impression at one operation.

Stereotyping was introduced into the U. S. by David Bruce, of New York, in 1813. The first work stereotyped in America was the New Testament in 1814. The process of curving stereotype plates to adapt them to a cylinder printing-press was patented in England by Cowper in 1815, but was not very successful till applied to the Hoe perfecting-press. There are three leading methods of stereotyping—plaster, clay, and papier-maché; but only the last-named is now much employed. The metal used approaches type-metal in composition, and the plates after being used may be remelted and the metal used again.

Plaster Process.—For this the type is set up with shoulder-high spaces and quadrats. The surface is thinly and evenly oiled with a brush and the form is then inclosed in a rectangular frame termed a flask. Plaster-of-Paris mixed with water is poured upon it, forming a mould corresponding to the face of the form. When this has sufficiently hardened it is withdrawn and dried in an oven until all the moisture is driven off. The mould, laid face downward upon a casting-plate (floating-plate), is then placed within a casting-tray, which has a lid with openings at the corners. The whole is heated to about 400° F. while suspended by a crane over a pot of molten metal, and then gently lowered into the bath until the metal just flows into the corner openings, forming a thin plate which fills up all the cavities in the face of the mould. After being immersed eight or ten minutes the tray is lifted out and lowered upon a stone so arranged that the face of the plate is cooled first, and as shrinkage takes place more metal is added. The pan is then opened and the cast is separated from the mould and fitted to a block so as to make it type-high for printing.

The Clay Process (or Clay-and-Plaster Process).—For this the form is locked up with high furniture and slugs and placed on the bed of a special press, the face of the type being brushed over with benzine or naphtha and covered with a cloth. A plate covered evenly to the depth of $\frac{1}{4}$ inch with a mixture of equal parts of ground French clay and plaster-of-Paris moistened to the consistency of mortar is turned down over the type, and a partial impression taken; then, after opening the press to remove the cloth and any surplus clay, a complete impression is taken, imbedding the type in the plastic material to the desired extent. The mould is then removed and hardened by drying, and after being heated to the temperature of molten metal is inclosed on three sides by an iron wire, to which, over the face of the mould, a sheet of metal is clamped, as in a moulder's flask. The metal is poured into the open edge, and after cooling the mould is removed from the cast by washing. Curved plates for the Hoe press were cast from moulds made by using on the press a sheet of steel of the desired curvature spread flat and carrying the clay on what was its concave side. After the impression was taken the sheet was released and resumed its normal curvature, bending the plastic mould with it. The finished stereotype appeared as if taken from a type a little more condensed one way than that actually employed.

The *papier-maché* process was invented by Genoux in 1829 and introduced into Great Britain by Wilson, of Scotland, in 1832. It is far more expeditious than any other (by Hoe machines in 1895 plates could be made in six minutes), the type used suffers no perceptible injury, curved plates can be made with the same facility as flat, and a large number

of plates can be used from the same matrix; this process has therefore been adapted by all large daily papers. The material for a paper-matrix matrix is formed by spreading paste over a sheet of moderately thick unsized paper and covering it with successive sheets of tissue-paper, each carefully rolled down smooth by means of a heavy iron roller. The whole is usually saturated with water, although some prefer using the matrix softened only by what moisture there is in the paste. The type matter is imposed in an ordinary chase and inclosed with type-high bearers, these having the inside top edge grooved out, making a bolster for the sheet of paper-matrix which is then laid upon it, tissue side next the type. The face of the type is sometimes slightly oiled, and the surface of the sheet treated with powdered French chalk, but this is found to be unnecessary in most kinds of newspaper work. If the work is done by hand in the old way a thin cloth is moistened and laid on the back of the sheet, which is then thoroughly beaten into the form with a stiff brush. Much better and quicker work is done by machinery, however. In this method the form, covered by the sheet and a blanket, travels backward and forward under a large roller, and is then conveyed to a drying-press, where it receives strong pressure while resting on a large chest filled with steam under pressure. The matrix thus becomes dry and hard very quickly, and as it is held under pressure during the process, there is none of the roughness or distortion often produced in one taken from the form in a partially soft condition. After being taken from the drying-press and removed from the form, the matrix is exposed for half a minute to a strong heat, either in an oven or the flame of a gas-jet, to expel any remaining moisture. The edges of the matrix are then trimmed, and it is placed face up on the bottom of a casting-box, flat or cylindrical according to the shape of the plates to be made. It is inclosed on three edges by the sides of the box, which are as high as the stereotype plate is to be thick, and the fourth edge, over which the metal is to be poured, is covered by a thin sheet of steel or old matrix to prevent metal running under the matrix; the lid of the box is then fastened down and molten metal is poured in at the uppermost open side, a two-handed ladle being usually employed in conveying it from the furnace. The plate is made considerably longer than the matrix at the open end in order to allow for the shrinkage as the metal cools. On being removed from the box this end is cut off, and the plate is trimmed and shaved down on the reverse side in order to bring it to the exact thickness required, all being very rapidly done by machinery.

The *chalk-plate process* is a method of producing drawings on plates to be used in a printing-press, and is similar in principle to stereotyping proper. A sheet of metal is covered thinly with a soft material, like chalk, about $\frac{1}{4}$ of an inch thick, and the drawing is transferred to this surface, after which the chalk is scraped away where the lines show, leaving the steel bare. The plate is then put in an ordinary casting-box, and used as a matrix. The cast is trimmed square, and made exactly type-high; it may then be locked in its place in the form, and treated just as an engraving, a paper-matrix being made from the whole.

II. ELECTROTYPING.—The method of producing casts by means of electricity, as explained in the article *ELECTROTYPE* (p. 73), is much employed in making plates for printing, especially from engravings and for bookwork, as electrotypes give a clearer impression and are more durable than stereotypes proper. A wax mould is first made from the engraving or type (set with shoulder-high spaces) and powdered graphite is spread over its surface so as to make it a conductor of electricity; copper may then be deposited on it by the ordinary process of electroplating. The first plates successfully used for printing were made by Joseph A. Adams, a wood-engraver of New York, who made casts from wood-cuts in 1839-41, some engravings being printed from his electrotypes plates in the latter year. In his process finely pulverized tin was added to the graphite for facing the moulds. The effect of this in the sulphate of copper solution was to cause a rapid precipitation of the copper by the substitution of copper for the tin; the latter being seized by the oxygen of the solution while the copper was deposited upon the graphite. The film was afterward increased by the electric current. In Silas B. Knight's modification of this process, now in universal use, fine iron filings are dusted upon the wet graphite surface of the mould, and then a solution of sulphate of copper is poured upon it and gently stirred in with a brush. A film of copper is formed immediately over the entire surface, the acid leaving the copper

and combining with the iron, forming a sulphate of iron, which floats away as more copper solution is poured on. Machinery has been devised for increasing greatly the rapidity and accuracy with which electrotypes plates can be made. The process in detail is as follows: Pure wax is melted in a kettle surrounded by a steam-chamber, and is then poured into a shallow moulding-case which has been previously heated so as to make the wax firmly adhere to it. As soon as the wax is firmly set it is run through a shaving-machine, which reduces it to a uniform thickness, and leaves a smooth surface, into which graphite dust is thoroughly rubbed in order to prevent it from sticking to the type or engraving. The impression is made by forcing the latter (also covered with graphite) into the wax to the required depth—an operation which was long performed on a hand-press, but which may now be done with great speed and perfect accuracy by power. The mould is taken from the press, the surplus wax removed with a sharp knife, and then with a hot iron new wax is melted and dropped on the surface between the lines and where there are large blank spaces. This avoids the necessity of later deepening the corresponding places on the cast plates, so as to prevent all possibility of their soiling the paper in printing. A piece of sheet-copper or lead is imbedded in the edge of the sheet of wax to facilitate electrical connection. The mould then receives a coating of graphite, and it is of the utmost importance that it should be thoroughly covered, and that the graphite should have a very high polish. The best work is done by a machine, which also obviates the great inconvenience of scattering the dust. The machine is entirely automatic. After washing the mould iron filings are sifted on, and a quantity of a weak solution of sulphate of copper is stirred in by means of a brush, a thin coating of copper being deposited upon the surface of the mould, as explained above. This operation is repeated, to make sure that every point is covered. The mould is then for one or two hours suspended as a cathode in a bath of sulphate of copper solution, and the coating is increased by the action of the electric current until it is about $\frac{1}{16}$ of an inch thick. After being detached from the mould and washed in boiling water, it is brushed on the back with a solution of chloride of zinc, and sheets of tin-foil are laid over it and melted, the face of the cast resting on a perfectly smooth surface. Molten metal is then slowly poured on, enough to give the plate the required thickness (about $\frac{1}{16}$ inch). It is cooled by an air-blast so diffused as to cause the entire plate to solidify at once, and is then subjected to pressure until quite cool and firm; if this is not done the plate is apt to become distorted, and needs to be straightened by skilful hammering. The plate is then finished to the exact size and thickness desired. Any blank spaces which are so high as to soil the paper in press are deepened, as also in stereotype plates, by a routing-machine. Plates to be used on a Hoe perfecting-press are passed through a machine which gives them the proper cylindrical curvature at one revolution. A special routing-machine is provided for such plates.

Electrotypes are sometimes faced with nickel by first placing the mould in a nickel solution and plating on a coating of the metal, and then removing to the copper solution and finishing in the regular way. Although these plates are attractive in appearance, and will not tarnish, the nickel is so liable to strip and the coating is so very thin that it is of little practical value.

Iron can be deposited by the electric current in the same manner as copper; electrotypes of iron have been made by Klein, of St. Petersburg, and the highest success is attributed to him in their application to the printing of bank-notes. The deposit is hard as steel and exceedingly durable.

Glyphography, another useful application of the art of electrotyping, is the invention of Palmer. A piece of ordinary copper plate is stained black on one side, and very thinly covered by a substance resembling white wax. The artist makes his sketch or drawing through this thin film, which wherever scraped away by his pencil exposes the black surface of the plate. The sketch when completed shows exactly what the print from an electrotypes made from the plate will be. When the artist has finished his work the remaining wax is carefully built up in the regular way, and the plate is electrotyped in the same manner as a wax mould.

By what is known as *electro-etching* this process can also be reversed, and instead of making an electrotypes from the prepared plate (the plate can be immersed in the solution and connected with the positive pole of the dynamo,

and the plate dissolved away where the lines expose it to the action of the solution. As the wax withstands the solution, the plate where covered by it will remain unchanged. When the lines are deepened by the action of the electric current and solution to the required depth, the plate is taken from the solution, and after the wax is cleaned off is mounted for printing. The drawing or sketch will appear in white lines on a black ground.

O. B. BEACH.

Sterility [from Lat. *sterilitas*, deriv. of *sterilis*, barren, sterile]: an incapacity for procreation, whether in the male or female. A knowledge of the causes of sterility depends on an understanding of the laws of conception. (See EMBRYOLOGY, OVARIES, etc.) Sterility in the male is due either to impotency or to the absence of zoöspers (spermatozoa) in the semen, or to their lack of vitality when present. If by cause of old age, malformations of the genitals, or other influences, a man is incapable of performing the part allotted by the laws of nature, he is said to be impotent, and is therefore sterile. The male may be able, however, to perform the sexual act, and yet be incapable of procreation, because the semen may not possess zoöspers, without which fructification is impossible. This deficiency may be natural or acquired; it is normal only in extreme youth and in advanced old age. If a man is born with but one testis (monorchid), as a rule it does not secrete zoöspers; and if the testes are so imperfectly developed as to remain always in the cavity of the abdomen, as in the foetus, then also the seminal fluid is deficient in the all-important property necessary for fecundation. Whatever produces an inflammation of the testes (orchitis) may bring about such a change in the secretory apparatus of these organs as to destroy the vitalizing power of the semen. A fall or a blow on these glands may do this, but the most common cause is inflammation communicated to them by continuity of surface from the urethra, neck of the bladder, and vesiculæ seminales, sequels of urethritis (gonorrhoea). Not unfrequently this happens as a consequence of parotitis (mumps), where from cold or other cause the inflammation is suddenly transferred from the parotid (salivary) gland to the testes. The seminal fluid may be emitted in a normal manner and may contain zoöspers or spermatic particles, but these may be dead or very feeble and incapable of surviving long enough to meet the ovule deep within the genital canal. This condition may be the result of some constitutional vice, drunkenness, syphilis, or excessive venery. It is estimated that 20 per cent. of sterile marriages are due to faults in the male. A man may be sterile or incapable of procreation at one time, and by appropriate treatment under favorable circumstances he may possibly regain the lost power; but the removal of incapacity in the male is not generally so successful as the removal of the obstructive causes in the female.

In the female, if competent for the married relation, and if the ovaries are functionally active, the cause of sterility is generally some obstruction to the entrance of zoöspers into the cervical canal (neck of the uterus), or a diseased condition of the mucous secretion of that canal, or some obstruction either to the exit of ovules from the ovary (periovaritis), or to the passage of zoöspers or ovules along the Fallopian tube or oviduct. If menstruation is normal, it may be taken for granted that ovulation is normal—that the ovum is at the regular time discharged from the ovary and starts on its way to the cavity of the womb; but some previous pelvic inflammation may have obstructed the Fallopian tubes or bound down their fimbriated extremities, so as to prevent them from fulfilling their functions in conducting the ovum to the cavity of the uterus. This state of things can usually be diagnosed with accuracy, but can not usually be relieved as far as sterility is concerned. Any marked and permanent deviation of the uterus from its normal position, whether anteriorly, posteriorly, laterally, or by descent, may interfere with conception. When the body of the uterus falls far forward, on the bladder, toward the pubes, it may so displace the os tincæ (outer orifice of the cervical canal) or produce such a degree of congestion in the whole organ as to prevent the zoöperm from reaching the cavity of the uterus; and if the uterus is bent on itself in this form of displacement (anteflexion), the obstruction is practically insuperable. When the body of the uterus falls far back under the hollow of the sacrum, pressing upon and obstructing the rectum, it may easily be restored to its normal position and kept there in a great majority of cases. Lateral malpositions and descent may require the same attention. A more frequent cause of the sterile condition, however, is

found in the neck and cavity of the uterus. The cavity of the uterus may contain a tumor or polypus, which must be removed, or it may be in a state of inflammation (endometritis), which must be cured. Again, the mouth of the uterus (os tincæ) may be so small that the semen can not enter it: then it must be enlarged by forcible dilatation. Abnormal angulation of that portion of the womb just above the neck (lower uterine segment) is a frequent cause of sterility. It is often bent to an acute angle instead of being comparatively straight, but when this is not complicated with the presence of a fibroid tumor or other adventitious growth, it may be remedied, and is often easily and promptly cured, by surgical means. Another frequent cause of sterility is an abnormal condition of the secretions found in the utero-cervical canal. The mucus of the cervical canal from the third to the tenth day after the end of menstruation should be translucent, clear as the white of a new-laid egg, without any opaque or milky-looking spots. A drop of mucus taken from the cervical canal a few hours after sexual intercourse should be examined under the microscope. If living zoöspers are found in abundance twenty-four hours or more after coition conception is possible; but if the zoöspers are all dead or in a dying state, then there is some abnormal condition of the utero-cervical canal which gives rise to an abnormal secretion. The diseased condition of the utero-cervical canal (called endometritis) is often found in women whose general health is perfect, and is generally curable. See also the article HYBRIDISM.

Revised by B. C. HIRST.

Sterilization: See DISINFECTION.

Sterlet [= Fr. = Germ., from Russ. *sterlyadt*, sterlet]: the *Acipenser ruthenus*, a small species of sturgeon found in various Russian rivers and the Caspian and Black Seas, into which they empty, and esteemed for its flesh. It is characterized by a narrow, pointed snout, and the slightly fringed barbels; the dorsal shields, 11 to 17, are moderately developed, the lateral ones, 60 to 70, small, and the abdominal, 13 to 15, moderate; the skin is densely covered with minute denticulated ossifications of subequal size. It rarely or never attains a length of 3 feet, and a common size is 2 feet in length and 3 lb. in weight. It leaves the sea in May and June, and ascends the rivers, sometimes very high up, for the purpose of spawning. It has not only a superior reputation as a table-fish, but from its roes is made the best caviare, which constitutes a noteworthy article of trade in Russia. Its introduction into rivers of the U. S. has been strongly recommended, and it has been claimed that the Mississippi and Ohio rivers would be especially suitable for it. The Russian Government has introduced it into waters about St. Petersburg, and in 1870 a number of the fry were introduced into the waters of Sutherlandshire, Scotland, in apparently good condition. Their embryonic life is so short that it is difficult to transport the eggs with success.

Revised by F. A. LUCAS.

Sterling: city; Whiteside co., Ill.; on the Rock river, and the Burlington Route and the Chi. and N. W. railways; 52 miles E. N. E. of Rock Island, 110 miles W. of Chicago (for location, see map of Illinois, ref. 2-D). It has excellent water-power; manufactures agricultural machinery, common and barbed wire, hearses, coffins, school furniture, gas-engines, and paper; and is in an agricultural region. There are 14 churches, 3 public schools, hospital, 2 national banks with combined capital of \$175,000, a private bank, and a monthly, 2 daily, and 4 weekly periodicals. Pop. (1880) 5,087; (1890) 5,824; (1895) 6,724, estimated with suburbs, 7,800.

EDITOR OF "GAZETTE."

Sterling: city (founded in 1872); Rice co., Kan.; on the Atch., Top. and S. Fé and the Mo. Pac. railways; 252 miles W. of Kansas City, Mo. (for location, see map of Kansas, ref. 6-F). It is in an agricultural and stock-raising region; is principally engaged in farming, salt-mining, and milling; and contains 18 churches, 3 public-school buildings, Cooper Memorial College, a national bank (capital \$50,000), a State bank (capital \$50,000), a private bank, and 3 weekly papers. Pop. (1880) 1,014; (1890) 1,641; (1895) estimated, 2,000.

EDITOR OF "BULLETIN AND GAZETTE."

Sterling, JOHN: author; b. at Kames Castle, Isle of Bute, July 20, 1806, son of Edward Sterling, editor of the London Times; was educated at Glasgow and Cambridge; went to London in 1827; was a short time on the editorial staff of *The Athenæum*, and during a part of 1831-32 resided for his health in the West Indies. Returning to England, he took

Donner's orders in 1834; was for a short time a curate at Harrogate, then, under Julius C. Hare, but soon gave himself wholly to literary studies and pursuits. Among his works are *Arthur Cloughly*, a novel (1833); *The Days They* (originally in *Blackwood's Magazine*, republished 1830); *Myra Thorne* (1839); *The Eltonian*, a poem (1841); and *Mistford*, a drama (1845). Two volumes of his *Essays and Tales* were edited, with a *Memoir*, by Julius C. Hare (1849), and Thomas Carlyle has written *The Life of John Sterling* (1851). D. at Ventnor, Isle of Wight, Sept. 18, 1848. Revised by H. A. BRUCE.

STERN, DANIEL: See ADOLPH.

Sterne, LAURENCE: humorist; b. at Clonmel, Ireland, Nov. 24, 1713; son of a lieutenant in the British army; educated at Jesus College, Cambridge; graduated in 1740; entered into holy orders, and was presented by his uncle with the valuable benefice of Sutton, Yorkshire, to which that of Seillington, 1½ miles distant, was soon after added. Here he lived for nearly twenty years. In 1750 he published the first two volumes of *Tristram Shandy*, which became popular at once, and gained for him from Lord Esconbridge the additional curacy of Cotswold. He had been married nearly twenty years, and now, leaving his wife and daughter at York, he went to London, where, or upon the Continent most of the remainder of his life was spent. He published several occasional sermons, and at intervals seven volumes entitled *The Sermons of Mr. Yorick, or Sermons by Laurence Sterne, A. M., Prelate of York, etc.* (1760-69). His *Life and Opinions of Tristram Shandy, Gent.*, in all nine volumes, was published at intervals (1759-67). The *Sentimental Journey*, his best work, was written in France, and published in London, 1767. D. in London, Mar. 18, 1768. In 1775 appeared three volumes of his letters to his friends, edited by his daughter, and his *Letters to Eliza, Susan, Letters by Sterne and his Friends*, edited by W. Durrant Cooper, was privately printed in 1844. Sterne was a subtle delineator of character, and a delicate artist of the pathetic and comic. His chosen province was the whimsical, and his great model in this kind was Rabelais. He was the cleverest of English sentimentalists. He was a minute philosopher, his philosophy is kindly, and he had the art of making much out of little; but his writings are morally corrupt, and his sentiment has a taint of insincerity. He was the most unclerical of clergymen, though his sermons were both witty and affecting. In character he was selfish, worldly, and vain. See the *Life of Sterne*, by Percy Fitzgerald (1864), and Thackeray's *English Humors*.

Revised by H. A. BRUCE.

Sterne, SIMON: lawyer and economic writer; b. in Philadelphia, Pa., July 23, 1830; graduated at the law school, University of Pennsylvania, 1850; removed to New York 1850; appointed in 1875 member of the commission to devise a plan for the government of cities in the State of New York, a report of which was presented to the Legislature, Feb. 24, 1887. He is the author of *Representative Government and Personal Representation* (Philadelphia, 1871); *Constitutional History and Political Development of the United States* (New York, 2d ed. 1885); and contributions to *Lalor's Cyclopedia of Political Science*. C. H. T.

Sternhold, THOMAS: hymnologist; b. near Blakeney, Gloucestershire, England, about 1500; was educated at Oxford, but did not take a degree, and became groom of the robes to Henry VIII. and Edward VI.; with John Hopkins (d. 1579) he is certainly known of him) was joint author of the first version of the Psalms into English meter. D. Aug. 1546. His first edition appeared in London in 1548, and contained nineteen Psalms; the second, *All such Psalms of David as Thomas Sternhold, late groom of the King's Majesty's robes did in his life time draw into English meter* (1549), contained thirty-seven Psalms translated by Sternhold. A 3d ed., 1551, contains seven Psalms translated by John Hopkins. Other editions followed until 1602, when *The Whole Booke of Psalmes collected into English Metre by T. Sternhold, J. Hopkins, and others, conferred with the Rheims, with apt Notes to Sing them withal*, was annexed to the Book of Common Prayer. Of the entire number of Psalms, 40 were versified by Sternhold and 50 by Hopkins. Of the *Old Version*, Julian's *Dictionary of Hymnology*. Revised by S. M. JACKSON.

STERNUM, or Breast-bone [*sternum* is Lat. Lat., from Gr. *stēron*, breast, chest]: a bony or semi-cartilaginous plate which serves as the anterior (or inferior) point of

union of many of the ribs. It represents the blended humeral spines of the dorsal vertebrae. In fishes, batrachians, and serpents it is absent. In turtles it forms the lower shell or plastron, and is much widened. In most birds it is strongly keeled in front, the keel serving as a point of attachment for the strong wing-muscles. In man it consists of three pieces, of which the uppermost is the manubrium; the next, the gladiolus; and the lowest, the xiphoid or xiphoid cartilage. The sternum may be rendered very prominent in certain bone-diseases, as rickets, by the sinking in of the ribs, which thus push the sternum forward. The chicken-breast thorax results from such deformity. Contrariwise, the sternum is sometimes sunk below the rest of the front of the chest, especially in ill-formed phthisical persons.

Sterreutiation: See SERRATION.

Sterrett, Jous Rowzer Serrington, Ph. D.: professor of Greek; b. at Rockbridge Station, Va., Mar. 4, 1801; educated at University of Virginia, University of Leipzig, Polytechnic of Aix-la-Chapelle, and Universities of Berlin, Athens, and Munich (Ph. D.); secretary American School of Classical Studies at Athens; leader of various archaeological expeditions to Asia Minor; member of the Wolfe expedition in Assyria and Babylonia; Professor of Greek in Miami University, Oxford, O., 1850-58, in the University of Texas, Austin, Tex., 1858-62, and at Amherst College, Amherst, Mass., since 1862; author of *Quæ in re Hymni Homærici quinque majores inter se differunt* (Boston, 1861); *Inscriptions of Sebaste (Asia Minor, Philol., 1863); Inscriptions of Asia, Inscriptions of Tralles, Preliminary Report of a journey to Asia Minor* (all three Boston, 1865); *An Epigraphical journey in Asia Minor, The Wolfe Expedition to Asia Minor* (both Boston, 1868); and numerous articles in *The Nation*, *The Independent*, *Classical Review*, etc. C. H. TAYLOR.

Stesichorus [= Lat. = Gr. *Στεσιχόρος*; *stēsichōros* (ancient, *stēsichōros*, *stēsichōros*, establish + *choros*, chorus): Greek lyric poet of Himera, in Sicily; b. about 650; d. about 555 B. C.; of great reputation in antiquity, especially as an inventor of poetical forms. His true name was Telesias, but he was called Stesichorus, "arranger of choruses," from his choral odes, consisting of strophes, antistrophes, and epodes, though this triple form is doubtless older. His themes were epic, and the Fourth Pythian of Pindar is supposed to give some notion of the way in which, according to Quintilian, "he sustained the weight of the epic with the lyric." On account of the poem in which he charged Helen with the woes of Troy he was fabled to have been smitten with blindness, which was removed when he withdrew his slanders in a *prothodia* or recantation. Stesichorus was also a fabulist, and to him is attributed the famous fable of the horse, the stag, and the man (Arist., *Rhet.*, II, c. 20). Of this Homer of the lyric poets we have only scant fragments, to be found in Bergk's *Poeta Lyrici Græci* (vol. III, 4th ed., pp. 205-204). B. L. GILCHRIST.

Stethoscope (from Gr. *stēthos*, chest + *skopein*, view, examine): an instrument employed by physicians for the physical exploration of the chest. (See AUSCULTATION.) Laennec, the founder of methodical auscultation, introduced the solid stethoscope, a tube made from a single piece of wood (Fig. 1). It is from 10 to 12 inches long, has a flanging chest-piece to receive sound, an open canal to convey sound, the solid structure also serving to conduct it, and a broad flat ear-piece for apposition to the ear and the exclusion of extraneous sounds. The medical profession is indebted to Dr. Camman, of New York, for originating the "binaural" or "double stethoscope" (Fig. 2). For purposes of careful diagnosis, by concentrating local sound, conducting it to the exclusion of surrounding noise, and conveying a separate but similar and simultaneous impression to each ear, the stethoscope is invaluable. It is further valuable in hospital and other public service, preventing contact of the listener's head with unhealthy and uncleanly patients. It is particularly serviceable in



FIG. 1

FIG. 2

localizing the origin of sounds, as of small cavities in the lungs, valvular diseases of the heart, and in aneurism. The best auscultators prefer the unaided ear for habitual chest examination, reserving the stethoscope to aid in special and obscure cases. The habitual use of the stethoscope blunts the delicacy of the hearing. Revised by W. PEPPER.

Stettin, *stet-teen'*: town and railway center of Pomerania, Prussia; on the left bank of the Oder, at its entrance into the Stettiner-Haff, 83 miles N. E. of Berlin (see map of German Empire, ref. 2-G). Across the river, which is here from 12 to 16 feet deep, lies the suburb of Lastadie, connected with Stettin proper by three bridges. Outside and on the line of the old fortifications, removed in 1874, are the suburbs of Bredow, Grabow, and Zülchow. The site it occupies is hilly, and its streets are consequently uneven, but the houses are neat and substantial, and many buildings, such as the royal palace, the citadel and barracks, and the town-hall, are very handsome. Its sugar-refineries, oil-mills, glass-works, breweries, distilleries, and manufactures of anchors, sailcloth, rope, tobacco, soap, candles, hats, etc., are very important, and as a place of commerce Stettin is one of the leading ports of Germany. Only small vessels can reach it, however; its port on the Baltic is Swinemünde. It is the ancient *Sedinum*, afterward *Stettinum*, and is of Slavic origin. In the Middle Ages it was the residence of the Duke of Pomerania, and, having joined the Hansa, it soon became a flourishing commercial town. It forms the outlet for the rich products of Silesian industry. Pop. (1890) 116,228.

Revised by M. W. HARRINGTON.

Steuart, Sir JAMES DENHAM: political economist; b. in Edinburgh in 1712; was educated at the University of Edinburgh, and became an advocate. While traveling on the Continent he entered into relations with the Pretender, and when the rebellion of 1745 broke out he was forced to go into exile. He returned to Scotland in 1763, and was subsequently pardoned for any share he might have had in the rebellion. He published, among other works, *Apologetic du Sentiment de Monsieur le Chevalier Newton sur l'ancienne Chronologie des Grecs* (1757) and *An Inquiry into the Principles of Political Economy* (1770), which preceded by several years Adam Smith's *Inquiry into the Nature and Causes of the Wealth of Nations*. Smith's work completely superseded Steuart's *Inquiry*, but the latter contains many valuable suggestions, and in some respects anticipates the ideas of later economists. Though he must be classed with the mercantilists, Steuart was free from many of the errors of that school of economists. D. in 1780.

Steuben, *Germ. pron. stöi'ben*, FRIEDRICH WILHELM AUGUST HEINRICH FERDINAND, Baron von: soldier; b. Nov. 15, 1730, in the fortress of Magdeburg, Prussia, where his father was an officer; entered the Prussian army as a cadet 1747; distinguished himself at the battle of Rossbach 1757; became adjutant-general 1758; was aide to Gen. Knoblauch in his brilliant march into Poland 1761; was taken prisoner and carried to St. Petersburg; won the favor of the Grand Duke Peter; was soon exchanged; was made captain (1762), and placed on the staff of Frederick the Great, from whom he received, with a few other selected officers, special instruction in tactics; was appointed in 1764 grand marshal to the court of the Prince of Hohenzollern-Hechingen, but resigned that post about 1775. In 1777 he was induced by Saint-Germain to offer his services to the American insurgents through the agency of Silas Deane, and was appointed, inspector-general, with the rank of major-general, in the spring of 1778; took part as a volunteer in the battle of Monmouth in the following June; rendered memorable services in drilling the officers and men of the Continental army into efficiency; prepared a manual of instruction for the army, adopted by Congress and printed 1779; was a member of the court martial on Maj. André; took command of the forces in Virginia 1780, and rendered good services at the siege of Yorktown 1781. His greatest exploit, however, was his Virginian campaign. He had been left in Virginia by Gen. Greene to gather up and discipline the levies voted for the Southern army by that State when it was invaded by Arnold. On the appearance of this new danger the militia flocked to Steuben's standard. Arnold succeeded in burning Richmond, and then went down the James river on a marauding expedition; but when pursued and overtaken by Steuben with the militia, he fled up the Elizabeth river. Remaining as a citizen of the U. S. after the war, Steuben procured with difficulty an adjustment of his claims upon Congress. He was ultimately assigned a pension of \$2,500

and received grants of land from several States. On the tract given him by New York, in Oneida County (the township of Steuben), he settled, accompanied by North, Poplar, Walker, and others of his former aides, to whom he gave a large portion of his lands. D. at Steuben, Nov. 28, 1794. He was a man of great kindness and generosity, of ready wit and highly polished manners. A *Life* by Francis Bowen appeared in Sparks's series; another, containing much new material, was published by Friedrich Kapp (1860), and an epitome of the latter may be found in Greene's *German Element in the War of Independence* (1876).

Steubenville: city (site of a fort built in 1786, laid out as a town in 1798, incorporated as a city in 1851); capital of Jefferson co., O.; on the Ohio river, and the Cleveland and Pittsburgh Div. of the Penn., the Pitts., Cin., Chi. and St. L., and the Wheeling and Lake Erie railways; 22 miles N. of Wheeling, and 43 miles W. of Pittsburg (for location, see map of Ohio, ref. 4-J). It is in a rich agricultural and mining region; is laid out on the second terrace of the Ohio, above danger from the floods for which the river is noted, and is nearly surrounded by hills from 300 to 500 feet high, which protect it from destructive winds. The city has excellent surface drainage, good sewerage, and a water-supply obtained from the river 2 miles above the city, with a system of high-pressure mains for fire and manufacturing purposes and one of low-pressure for domestic uses. The principal streets are paved with vitrified brick.

Churches and Schools.—Steubenville has 5 Methodist Episcopal churches, 3 Presbyterian, 2 Roman Catholic, 2 Lutheran, and 1 each African Methodist Episcopal, Baptist, Congregational, Christian, Methodist Protestant, Protestant Episcopal, and United Presbyterian. The public-school system comprises 6 school buildings, 54 teachers, and over 2,200 pupils, and in 1893-94 cost for maintenance over \$37,000. There are 2 Roman Catholic parochial schools, with over 500 pupils. The Steubenville Female Seminary, founded in 1829, has been enlarged in scope by the addition of a college preparatory department for both sexes. There are several libraries and 3 daily and 8 weekly newspapers.

Finances and Banking.—In 1893 the receipts for municipal purposes were \$113,243; expenditures, \$87,479; net debt was \$24,655; assessed property valuation, \$5,624,100. In 1894 there were 2 national banks with combined capital of \$225,000, 3 private banks, and a building and loan association.

Business Interests.—In the surrounding hills and underlying the city are extensive supplies of excellent coal. The seam beneath the city limits is worked by means of several shafts. Natural gas is abundant at distances of from 5 to 50 miles, and is piped into the city; petroleum-wells have been opened within 5 miles; and economic clays are easily mined in the hills. The principal manufactures are 3 blast-furnaces, 2 rolling-mills and nail-factories, 2 foundries, 2 machine-shops, steel plant, boiler-works, 5 glass-factories, 2 flour-mills, glass-melting pot-works, paper-mill, white-ware pottery, and ice plant. Extensive fire-brick, paving-brick, and sewer-pipe works, N. of the city, form a part of the local industries, as do also numerous coal mines and quarries of building-stone in the vicinity, operated by local capital. The greater part of the coal product is shipped to the lakes. The city is the distributing point for a large area of country. Pop. (1880) 12,093; (1890) 13,394.

H. N. MERTZ, SUPERINTENDENT OF PUBLIC INSTRUCTIONS.

Stevens, ABEL, LL. D.: minister and author; b. in Philadelphia, Pa., Jan. 19, 1815; studied at the Wesleyan University, Middletown, Conn.; joined the New England Conference of the Methodist Episcopal Church in 1834, was agent for the Wesleyan University one year, and in 1835 was stationed at Boston; in 1837 made a European tour, and after his return was stationed at Providence, R. I.; in 1840 became editor of *Zion's Herald* at Boston, and in 1852 of *The National Magazine*, an illustrated monthly, at New York, which was discontinued after two or three years. In 1856 he was elected by the general conference as editor of the New York *Christian Advocate and Journal*. From 1860 to 1874 he was joint editor of *The Methodist*, an independent journal published in New York. He has published numerous books, including *Memorials of the Introduction of Methodism into New England* (1848); *Memorials of the Progress of Methodism in the Eastern States* (1852); *Church Polity*; *History of the Religious Movement called Methodism* (3 vols., 1858-61); *Life and Times of Nathan Bangs, D. D.* (1863); *History of the Methodist Episcopal Church*

in the *United States of America* (4 vols., 1864-67; vol. v. in press, 1895); *The Centenary of American Methodism* (1866); *The Women of Methodism* (1866); *Life and Times of Madame de Staël* (2 vols., 1882); *Character Sketches* (1882); and *Christian Work and Consolation* (1885).

Revised by A. OSBORN.

Stevens, ALFRED: genre-painter; b. in Brussels, May 11, 1828; studied at the École des Beaux-Arts and under Roqueplan, Paris; third-class medal, Salon, 1853; second-class, Paris Exposition, 1855; first-class, Paris Exposition, 1867 and 1878; medal of honor, Paris Exposition, 1889; commander Legion of Honor 1878; commander in the Orders of Leopold of Belgium, Francis Joseph of Austria, and St. Michael of Bavaria. He is one of the ablest and most charming painters of modern life in the French school, to which, by residence and affinities, he belongs, and his works are especially fine in color quality. An excellent example of his style is *Five o'clock Tea*, in the collection of Mrs. W. H. Vanderbilt, New York. Studio in Paris.—His brother JOSEPH, born in Brussels, 1822, is distinguished as a painter of dogs and other animals. Among his works are *Tauureau flamand poursuivi par un Chien* (1853) and *Chien regardant une Mouche* (1878).

WILLIAM A. COFFIN.

Stevens, ALFRED GEORGE: sculptor; b. at Blandford, Dorsetshire, England, in 1817. He was the son of a house-painter and decorator, and was sent to Italy at the expense of a wealthy gentleman to study painting. He returned to England about 1842, and was made a teacher in the Government School of Design, then established at Somerset House, London, in which he remained about four years. During this time he made many designs for ornamental work of various kinds, such as the doorway of the Jermyn Street School of Mines, the doors themselves having been designed also by him but never carried further than the fine drawing in South Kensington Museum. As designer for the Green Lane works at Sheffield he made, about 1851, some remarkable fire-places and stoves, anticipating by many years the work of 1885-95 in modern adaptation of classical ornament. Of the years from 1850 to 1860 are some remarkable designs for pottery, daggers, and other small objects, and then, or at a later time, he designed the decorations of many very costly houses. He made designs, in competition, for the painted decorations of some of the halls of the new Houses of Parliament, for the decorations of the new Foreign Office, and for a memorial of the Exhibition of 1851. In 1857 he competed for a monument to the Duke of Wellington, and, among eighty-two competitors, was so far successful as to receive one of the minor prizes, and at a later time to be employed as designer of the work. His design was partly carried out, and the monument in a small chapel of St. Paul's Cathedral is what exists of it. The architectural design of the monument is fine and worthy of the occasion, but not very original. The sculpture is of very great merit. This was to consist of the equestrian statue on the summit, which, however, was never finished, and the following, which is all in place: A recumbent figure on a sarcophagus, a group of *Valor and Cowardice*, and one of *Truth and Falsehood*, besides decorative panels. D. in London, Apr. 30, 1875.

RUSSELL STURGIS.

Stevens, CHARLES ELLIS, Ph. D., LL. D., D. C. L.: clergyman; b. in Boston, Mass., July 5, 1853; studied at Wooster University, Ohio, University of Pennsylvania, Yale College, Berkeley Divinity School, Middletown, Conn., Nashotah, Wis., and in Europe; ordained priest in the Protestant Episcopal Church 1875; assistant minister of Grace church, Brooklyn, N. Y., 1876; rector Church of the Ascension, Brooklyn, 1877; for many years from 1878 secretary of an auxiliary of the board of missions of the Protestant Episcopal Church and chairman of numerous committees of the diocese of Long Island; examining chaplain diocese of Long Island; archdeacon of Brooklyn 1888-91; president of League for Moral Instruction in Public Schools of New York 1890; rector Christ church, Philadelphia, 1891; lecturer on English and American constitutional law, Wooster University, 1888, at the University of the City of New York 1891, and at the University of Pennsylvania 1892; lecturer on constitutional law and English literature at St. Stephen's College, Annandale, N. Y., since 1890; received honorary degrees from Wooster University and King's College, Nova Scotia; fellow of Society of Antiquaries, Edinburgh, the Royal Geographical Society, and other learned societies; has in preparation a work entitled *Sources of the Constitution of the United States*.

Stevens, EBENEZER: soldier; b. in Boston, Mass., Aug. 22, 1751; was a member of Paddock's Company of Boston Artillery, and one of the famous "Boston tea-party" Dec., 1773; removed soon afterward to Rhode Island; raised two companies of artillery and one of artificers for the expedition against Quebec, in which he served as lieutenant, having been commissioned May 8, 1775; became captain of Knox's regiment Jan. 11, and brevet-major Nov. 9, 1776; commanded the artillery at Ticonderoga and at Stillwater; was appointed lieutenant-colonel Apr. 30, 1778; was assigned to Lamb's regiment; served under Lafayette in Virginia; was, alternately with Lamb and Carrington, in command of the artillery during the siege of Yorktown; was one of the founders of the Society of the Cincinnati, and became after the war a leading merchant of New York in the West India and Mediterranean trade; agent of the War Department, and a major-general of militia. D. at Rockaway, L. I., Sept. 2, 1823.

Stevens, EDWIN AUGUSTUS: inventor; b. at Hoboken, N. J., in 1795; son of John and brother of Robert L. Stevens; took part in their steamboat experiments and enterprises, and in conjunction with his brothers established passenger and tow boats on the Hudson and other rivers; also aided in the introduction of railways, and invented many appliances for use thereon. At the breaking out of the civil war he urged the Government to put in service the ironclad floating battery of which his brother had long before undertaken the construction, offering to complete it at his own risk, and to receive payment only in case it should prove successful; this offer being declined, he expended considerable sums on the vessel, and upon his death bequeathed it to the State of New Jersey, together with \$1,000,000 for its completion; this, however, proved insufficient, and the battery was never finished, and was finally sold to dealers in old iron. He inherited a large fortune from his father and brothers, endowed the Hoboken High School, and bequeathed nearly \$1,000,000 to establish at Hoboken the Stevens Institute of Technology. D. in Paris, Aug. 7, 1868.

Revised by R. H. THURSTON.

Stevens, GEORGE BARKER, D. D.: clergyman and educator; b. at Spencer, N. Y., July 13, 1854; graduated at the University of Rochester, New York, 1877, and at the Yale Divinity School 1880; pastor of the First Congregational church, Buffalo, N. Y., 1880-83, of the First Presbyterian church, Watertown, N. Y., from 1883 to 1886, when he was appointed Professor of Criticism and Interpretation in Yale Divinity School. Besides reviews, essays, etc., he has edited Chrysostom's *Homilies on the Acts and the Romans* (1889), and published a *Commentary on the Epistle to the Galatians* (1890), *The Pauline Theology* (1892), and *The Johannine Theology* (1894).

GEORGE P. FISHER.

Stevens, HENRY: bibliographer; son of Henry Stevens, antiquary; b. at Barnet, Vt., Aug. 24, 1819; studied at Middlebury College 1838-39; graduated at Yale College 1843, and at Cambridge Law School 1844; established himself in London 1845 (where he resided till his death) as agent for the British Museum in the purchase of North and South American books of all kinds, and was thus instrumental in placing in the British Museum a very complete collection of Americana. He also purchased for the Smithsonian Institution, the Library of Congress, and the chief libraries of the U. S., and for many private individuals. He published several valuable bibliographical treatises and catalogues, among which are *A Catalogue Raisonné of English Bibles* (1854); *A Catalogue of the American Books in the Library of the British Museum* (1856); *A Catalogue of the Crowninshield Library* (1860), and of the library of Baron Humboldt (1861), which latter collection he had purchased; *Bibliotheca Americana* (1861); *Historical Nuggets* (1862); *Bibliotheca geographica et historica* (1870), the latter book being the catalogue of the library of his father, of whom it contains a biographical sketch; *The Bibles in the Canton Exhibition* (1878); *Historical Collections* (2 vols., 1881-86); and *Recollections of James Lenox* (1886). He also prepared indexes to the State papers in London relating to New Jersey (1858), Maryland (10 vols.), Rhode Island (6 vols.), and Virginia (1858), the three latter being in MS.; published a work on *The Tehuantepec Railway* (1869), and two small volumes of *Historical and Geographical Notes* (1869), relating to early explorations in America. He frequently wrote after his name the initials G. M. B. (= Green Mountain Boy). D. in London, Feb. 28, 1886.

Revised by S. M. JACKSON.

Stevens, ISAAC INGALLS: soldier; b. at Andover, Mass., Mar. 28, 1818; graduated at the U. S. Military Academy July 1, 1839; promoted second lieutenant of engineers; was engaged upon construction and repairs of fortifications 1839-46; served in the war with Mexico as adjutant of engineers, participating in all the battles from Vera Cruz to the city of Mexico, and for gallantry at Contreras and Churubusco and at Chapultepec was breveted captain and major, and was severely wounded in the San Cosme suburb. From 1849 to 1853 he was principal assistant and in charge of the office of the U. S. Coast Survey at Washington; in Mar., 1853, resigned from the army to accept the governorship of Washington Territory; conducted the pioneer survey of the route for the Northern Pacific Railroad, an account of which he published; delegate to Congress from Washington Territory 1857-61; on the outbreak of the civil war was made colonel of the Seventy-ninth (Highlanders) New York Volunteers. Moving his command to Washington, he was made a brigadier-general of volunteers Sept. 28, and attached to the Port Royal expedition, which left Hampton roads a month later. He commanded the land forces in the actions at Port Royal Ferry, Coosaw river, and a division in the actions on Stono river and the assault on Secessionville. On July 4, 1862, he was made a major-general of volunteers, and a week later transferred to Newport News in command of a division; at the second battle of Bull Run his division (Ninth Corps) was hotly engaged. Near Chantilly, on the morning of Sept. 1, 1862, his division encountered the enemy, when Stevens, ordering a charge, placed himself at the head of his command, where he was shot through the head and instantly killed.

Revised by JAMES MERCUR.

Stevens, JOHN: inventor; b. in New York in 1749; graduated at King's (Columbia) College in 1768, and was admitted to the bar, but did not practice; became interested in the question of navigation by means of steam, and as early as 1789 presented a memorial to the New York Legislature stating that he had perfected his plans, and in 1804 launched a small vessel worked by steam with screws, and in 1807 built a steamboat which he called the *Phoenix*. Fulton had in the meantime built his steamboat, the *Clermont*, and obtained the exclusive right of navigating the Hudson by steam, and Stevens sent his vessel to the Delaware river. In 1812 he planned a revolving steam-battery, to be plated with iron, and involving essentially the principles afterward embodied in the monitors, and in the same year put forth an essay on railways, indicating the methods of operating them by steam, and suggested the construction of a railway from Albany to Lake Erie. The Camden and Amboy Railroad was planned by him. He once owned the entire site of Hoboken, N. J., and through profits in real estate and other enterprises amassed an immense fortune. D. at Hoboken, Mar. 8, 1838.

Revised by R. H. THURSTON.

Stevens, JOHN LEAVITT, LL. D.: writer and diplomat; b. at Mt. Vernon, Me., in 1820. He was educated in the schools and seminaries of his native State. In 1855 he became partner and coeditor with James G. Blaine of *The Kennebec Journal*, of which he subsequently was chief editor for many years; member of the Legislature 1865-70; U. S. minister to Uruguay and Paraguay 1870-73. In 1877 he was appointed minister to Sweden and Norway. During his official residence of six years in Stockholm he wrote the *History of Gustavus Adolphus*. In 1883 Tufts College conferred on him the degree of LL. D. In 1889 he was appointed minister resident to the Hawaiian islands, a title soon after changed, by act of Congress, to that of minister plenipotentiary and envoy extraordinary. He was recalled in 1893, his attitude during the revolution in the islands being condemned by President Cleveland as compromising the neutrality of the U. S. D. at Augusta, Me., Feb. 8, 1895.

Stevens, ROBERT LIVINGSTON: inventor; b. at Hoboken, N. J., Oct. 18, 1787; son of John Stevens, inventor; became early interested in the ideas of his father regarding steam navigation, and made many improvements in the construction of vessels, among which was that of giving concave water-lines to the hull. He subsequently engaged largely in the building of steamboats, improving the marine engine, and introducing the beam engine. In 1813 he invented and made for the Government elongated percussion shells for smooth-bore guns, and in 1822 used anthracite coal in a furnace, and soon after in his steamers; in 1836 introduced the T-rail on the Camden and Amboy Railroad, of which he was president, and in 1842 was commissioned to build for

the U. S. Government an iron-plated floating battery, which remained uncompleted at his death. D. at Hoboken, Apr. 20, 1856.

Revised by R. H. THURSTON.

Stevens, THADDEUS: statesman; b. at Peacham, Vt., Apr. 4, 1792; graduated at Dartmouth College in 1814; went to Gettysburg, Pa., where he taught in an academy, at the same time studying law; was admitted to the bar in 1816, and soon acquired an extensive practice. In the presidential canvass of 1828 he was a strong opponent of the election of Gen. Jackson; in 1833 and several times subsequently he was a member of the State Legislature, in 1836 a member of the convention to revise the State constitution, and in 1838 canal commissioner. He was active in introducing the public-school system in Pennsylvania. In 1843 he removed to Lancaster; in 1848 was elected Representative in Congress; was re-elected in 1850, 1858, 1862, and thereafter to each Congress until his death, serving at various times as chairman of important committees, being one of the acknowledged leaders of the Republican party, and distinguishing himself for his earnest advocacy of measures in opposition to slavery, for the emancipation and enfranchisement of the colored race, and after the war for stringent proceedings against the seceding States. He was one of the most active managers in the impeachment trial of President Johnson. The degree of LL. D. was conferred upon him by Middlebury College in 1867. D. at Washington, Aug. 11, 1868.

Stevens, WALTER LE CONTE, Ph. D.: physicist; b. in Gordon co., Ga., June 17, 1847; graduated at the University of South Carolina 1868; instructor in chemistry, Oglethorpe College, Atlanta, Ga., 1870-72; teacher of physical science, Chatham Academy, Savannah, Ga., 1873-76. After a year at the University of Virginia he taught in New York until 1882, at the same time writing on physiological optics and acoustics in *The American Journal of Science*, *London Philosophical Magazine*, and other journals. He was Professor of Mathematics and Physics in the Packer Collegiate Institute, Brooklyn, N. Y., 1882-90; studied physics at Strassburg, Berlin, and Zurich from 1890 to 1892, when he became Professor of Physics in the Rensselaer Polytechnic Institute, Troy, N. Y. Besides contributions to various periodicals he wrote a large part of *Appletons' Physical Geography* (New York, 1887) and revised *Steele's Physics* (1888).

Stevens Institute of Technology: a school of mechanical engineering at Hoboken, N. J., founded in 1870 by a bequest from Edwin A. Stevens, and further assisted by donations by its president, Henry Morton. It prepares young men for employment in manufacturing establishments, on railways, and the like, where machinery is designed, constructed, and operated. Its course of studies comprises departments of mathematics, mechanical drawing, physics, general chemistry, analytical chemistry, mechanical engineering, experimental mechanics and shop-work, applied electricity, languages, belles-lettres, and engineering practice. Its course has been especially characterized by its large admixture of practical work in the line of workshop practice, in the handling of machine tools, and particularly in dealing with experimental problems, such as the operation of steam, gas, and hot-air engines, pumps, injectors, etc., with accompanying measurements of their efficiency by the use of indicators, dynamometers, calorimeters, etc. A department of applied electricity was established in 1883 and a chair of engineering practice was founded in 1888. The buildings include, besides lecture-rooms and drafting-rooms, chemical and physical laboratories, machine-shops, foundries, and other provisions for practical mechanical and electrical work. The faculty numbers eighteen, many of whom are leaders in their departments as original investigators and authors. The students number upward of 250, and on graduation receive the degree of mechanical engineer.

HENRY MORTON.

Stevenson, ALAN: engineer; son of Robert Stevenson (1772-1850); b. in Edinburgh, Scotland, 1807; educated at the University of Edinburgh; subsequently studied natural philosophy under Sir John Leslie, and for the profession of a civil engineer in the office of his father, with whom he entered into partnership. In 1843 he succeeded his father as engineer to the commissioners of northern lighthouses, to which his subsequent practice was confined. Among many other important improvements in lighthouse apparatus, he introduced the dioptric system in 1836. Of the many lighthouses designed and constructed by him, the Skerryvore was his chief work, an *Account of which* he published; also a *Treatise on Lighthouse Illumination*; contributed

articles *Harbors, Lighthouses, etc.*, in the *Encyclopædia Britannica*, and various scientific articles in the *Edinburgh Philosophical Journal*, etc. The Emperor of Russia and the Kings of Prussia and Holland bestowed medals upon him in recognition of his services as a lighthouse engineer. He was a fellow of the Royal Society of Edinburgh, member of the British Institution of Civil Engineers, etc. D. at Portofino, near Edinburgh, Dec. 29, 1895.

Stevenson, Robert Louis BALFOUR; author; b. in Edinburgh, Scotland, Nov. 13, 1850. He was grandson of Robert Stevenson, a distinguished engineer, and son of Thomas Stevenson, author of *Lighthouse Optics*. (See *Thomas Stevenson in Memoirs and Portraits*.) His ancestors for three generations had been civil engineers in the service of the board of northern lighthouses, and Robert, who was educated at the University of Edinburgh, was at first intended for the same profession. He was also admitted to the Scottish bar, but did not engage in practice. He first attracted attention as an author by two charmingly sketchy and vagabondish little volumes, *An Inland Voyage* (1878) and *Travels with a Donkey* (1879). These were followed by a series of romances, *New Arabian Nights* (1882); *Treasure Island* (1883), a tale of buccannery and buried treasure and one of the best boy's books; *Prince Otto* (1885), a love story; *The Strange Case of Dr. Jekyll and Mr. Hyde* (1885), a psychological romance, and the most popular of Stevenson's fictions; *Kidnapped* (1886), a novel with historical elements and studies of Scottish character-types quite equal to Sir Walter Scott's; *The Merry Men and other Tales* (1887), a volume of short stories in a variety of keys; *The Master of Ballantrae* (1888); *The Wrecker* (1893, with Lloyd Osbourne); *David Balfour* (1893), a sequel to *Kidnapped*, etc. Stevenson's versatility is shown in his *A Child's Garden of Verses* (1895), a very imaginative, poetic representation of the world from the childish point of view, and in various volumes of travel, criticism, miscellaneous essays, and sketches, such as *Virginibus Puerisque* (1881); *Across the Plains* (1882); *The Silverado Squatters* (1883); and *Memoirs and Portraits*. He traveled much in search of health, and many of his books were written in a sick-bed, on railway journeys, or at sea. For a number of years he resided at Samoa and elsewhere in the South Sea Islands, reporting his observations in *A Footnote of History* (1892), *Island Nights Entertainments* (1900), and other volumes. In an age of realism Stevenson brilliantly advocated the claims of romance both by practice and by theory. D. at Vallima, Samoa Islands, Dec. 3, 1894. H. A. BEERS.

Stevens Point; city; capital of Portage co., Wis.; on the Wisconsin river, and the Gr. Bay, Winona and St. P. and the Wis. Cent. railways; 21 miles N. E. of Grand Rapids, 71 miles N. of Portage (for location, see map of Wisconsin, ref. 5-D). It is at the base of one of the most valuable pine districts of the West; has large lumbering interests and abundant water-power; and contains water, gas, and electric-light plants, numerous saw, shingle, and planing mills, foundries, railway machine and repair shops, flour-mills, 2 national banks with combined capital of \$150,000, a State bank with capital of \$50,000, and 4 weekly newspapers. Pop. (1880) 4,449; (1890) 7,895.

Stewardship of the Children Hundreds: See *CANTON LUDLOW*.

Stewart, Alexander TURNER; merchant; b. near Belfast, Ireland, Oct. 27, 1803; distinguished himself at school, and was entered at Trinity College, Dublin, where he did not graduate. He emigrated to New York in 1829, bringing with him a few hundred pounds, a part of a small estate which he inherited, and for a time taught mathematics and the classics in a private school. Having invested his ready money in a small mercantile venture, he found himself unexpectedly left alone in the business with the rest of the stock on his hands and was forced to become a trader. Returning to Ireland, he sold his other property, invested the proceeds in Irish lace and similar goods, and in 1835 opened a small store in Broadway, and began the business which afterward grew to be the most extensive dry-goods establishment in the world, with branches in England, Scotland, Ireland, France, and Germany, besides large manufactories of woollen, carpets, and hosiery in the U. S. and Great Britain, the whole employing about 8,000 persons. At the time of his death it was said that only two men in the U. S. were more wealthy than he. Among his enterprises was the establishment of a town called Garden City, on Long Island, a few miles from Brooklyn. During the civil war he was

an earnest upholder of the national Government, and in 1860 accepted from President Grant the nomination as Secretary of the Treasury. The nomination was withdrawn, it being found that he was rendered legally ineligible for that position on account of his being engaged in the importation of foreign merchandise. He was president of the honorary commission sent by the U. S. Government to the Paris Exposition of 1867. D. in New York Apr. 10, 1876, leaving no children. By his will his entire estate, with the exception of certain legacies, was devised to his wife, To Mr. Hilton, his legal adviser, was left a legacy of \$1,000,000.

Stewart, BALDWIN F. R. S.; physicist; b. in Edinburgh, Scotland, Nov. 1, 1828; educated at the Universities of St. Andrews and Edinburgh; settled in Australia, where he was engaged in business in Melbourne 1852-54; returned to Great Britain 1855; was for three years assistant to Prof. Forbes in Edinburgh in his lectures and experiments upon mechanics; was appointed director at Kew, July 1, 1859, and Professor of Natural Philosophy at Owens College, Manchester, 1870. He was the discoverer of the law of equality between the absorptive and radiative powers of bodies, for which he received the Rumford medal of the Royal Society, 1866; was author, jointly with Messrs. De la Rue and Loewy, of *Researches in Solar Physics*, and, with Prof. P. G. Tait, of papers giving the results of experiments on *Heat produced by Rotation in Vacuum*, and of a religious-scientific treatise, *The Unseen Universe* (1873); contributed numerous papers, chiefly on meteorology and terrestrial magnetism, in the *Transactions of the Royal Society*, and published *Elementary Lessons in Physics* (1870); *Elementary Treatise on Heat* (1871); the *Physics Primer* (1872); and the *Conservation of Energy* (1873) in the International Scientific Series, D. at Drogheda, Ireland, Dec. 10, 1897.

Stewart, CHARLES; rear-admiral U. S. navy; b. in Philadelphia, Pa., July 28, 1778; went to sea at the age of thirteen as cabin-boy in a merchant vessel, and before he was twenty had become captain of an Indianan. In 1798 he entered the U. S. navy as lieutenant, and in July, 1800, was appointed to the command of the *Experiment*, a schooner of 22 guns, with which, Sept. 1, he captured the French privateer *Deux Amis*, 8 guns, and soon after the *Diana*, 14 guns, also recapturing several U. S. vessels which had been taken by the French. In 1804, in command of the brig *Siren*, he took part in the naval operations against Tripoli, aiding Decatur in the destruction of the U. S. frigate *Philadelphia*, which had fallen into the hands of the Bey of Tripoli. He was made captain in 1806; in the summer of 1813 took command of the frigate *Constitution*, 32 guns, and in December sailed from Boston for the West Indies, making several captures of British vessels. In Dec. 1814, he sailed on a second cruise, and on Feb. 20, 1815, captured the British ship *Cyane*, 34 guns, and the *Levant*, 21 guns. The action was fought at night, and lasted forty minutes; the *Levant* was, however, recaptured by a British squadron. In 1816-20 Stewart commanded the Mediterranean squadron, in 1821-23 that of the Pacific, subsequently serving on the board of navy commissioners, as commander of the home squadron, and of the naval station at Philadelphia. He was placed on the retired list in 1837, but resumed service in 1859, and was placed in command of the *Philadelphia* navy-yard with the rank of senior flag officer, and in 1862 was made rear-admiral on the retired list. D. at Bordentown, N. J., Nov. 7, 1869. Revised by C. BELKNAP.

Stewart, DAVID, Duke of Rothesay and Earl of Carrick; son of Robert III., King of Scotland; b. about 1377; became lieutenant of Scotland, subject, however, to the advice of his council, of which his uncle, the Duke of Albany, was a member. He defended Edinburgh against Henry IV. of England 1400, but was soon after seized by the opposite party and imprisoned in Falkland Castle, where he died by starvation 1401.

Stewart, DUGALD; philosopher; b. in Edinburgh, Nov. 29, 1752; son of Matthew Stewart, Professor of Mathematics in the University of Edinburgh; studied there and at Glasgow; was in 1774 appointed assistant professor to his father, whom he succeeded in 1785. In the same year receiving the chair of Moral Philosophy. In 1810 he resigned his chair on account of failing health, and passed the remainder of his life in literary labor at his seat on the Firth of Forth, the sincere office of gazette-writer for Scotland having been created for him. The following are his principal works: *Elements of the Philosophy of the Human Mind* (1792); *Outlines of Moral Philosophy* (1793); *General View of the*

Progress of Metaphysical, Ethical, and Political Philosophy, prefixed to the supplement to the *Encyclopædia Britannica* (1816); *The Philosophy of the Active and Moral Powers of Man* (1828). He also wrote biographies of Adam Smith, Thomas Reid, and Dr. Robertson. The best edition of his collected works is that prepared by Sir William Hamilton (1856). D. in Edinburgh, June 11, 1828.

Revised by J. MARK BALDWIN.

Stewart, ESME: Lord of Aubigny, Earl and Duke of Lennox; b. in France about 1555; grandson of John, third Earl of Lennox; derived his French title from Sir John Stewart of Darnley, constable to the Scots army in France in the wars of Charles VII.; arrived in Scotland in Sept., 1579, and immediately became a favorite of his cousin, King James VI., who created him Earl of Lennox Mar. 5, 1580, Duke of Lennox and Earl of Darnley Aug. 5, 1581; took an active part in the political intrigues of the time, instituting legal proceedings against the ex-regent Morton, and secured his condemnation and execution for the murder of Darnley; quarreled with the Church, and was accused of treason, and expelled from Scotland Dec., 1582. D. in Paris, May 28, 1583.

Stewart, MATTHEW: Earl of Lennox, regent of Scotland; b. in Scotland about 1510; married Lady Margaret Douglas, and had by this marriage two sons, of whom the elder, Earl Darnley, married Mary Queen of Scots. He was prominent in the movement which resulted in the seizure and imprisonment of the queen at Lochleven Castle, June 15, 1570; was the next day declared lieutenant-governor of Scotland in behalf of his grandson, the infant Prince James VI.; was elected regent July 12; conducted the war against the partisans of Mary; took Dumbarton Castle Apr., 1571, but was unable to secure that of Edinburgh; held a Parliament at Leith May 9, 1571, and when on his way to hold a Parliament at Stirling was attacked and mortally wounded by a party of the queen's friends. D. at Stirling, Sept. 4, 1571.

Stewart, ROBERT: See CASTLEREAGH, VISCOUNT.

Stewart, WILLIAM, D. D.: minister and professor; b. at Annan, Dumfriesshire, Scotland, Aug. 15, 1835; educated at the University of Glasgow; minister in the parish of St. George's-in-the-Fields, Glasgow, 1868-75; in the University of Glasgow examiner in mental philosophy for degrees 1867-70, and since 1873 Professor of Divinity and Biblical Criticism. Dr. Stewart has published *The Divinely Established Connection between the Old Testament and the New* (1873); *The Plan of St. Luke's Gospel* (1873); a revised and edited translation of vols. xi. and xiv. of Meyer's *Commentary on the New Testament* (1879-80); *The Church of the Fourth Century* (1883); and *The University of Glasgow, Old and New, Illustrated* (1891). C. K. HORT.

Stewart Island, also called **New Leinster:** the southernmost and smallest of the three chief islands of New Zealand. It is of triangular form, about 100 miles in circumference, with an area of 665 sq. miles; consists largely of hills, of which there are three ranges; the highest summit is Mt. Anglem in the northern part, 3,200 feet; is separated from New Zealand by Foveaux Strait, 20 miles wide, and forms a part of the province of Southland. It is well wooded and watered, has much mineral wealth, and some fertile valleys, and the waters surrounding it abound in fish and oysters. The population is sparse, mostly Maoris or half-castes.

Revised by M. W. HARRINGTON.

Stewartry: the name which was given in Scotland to a district governed by a steward, which officer was appointed by the king with jurisdiction over crown lands and powers similar to those of a lord of regality. While the civil jurisdiction of a steward was equivalent to that of a sheriff, his criminal jurisdiction was much more extensive. The only remaining trace of that jurisdiction exists in the term stewartry, which, in place of county, is applied to the district of Kirkcudbright. The reorganization of the office took place in 1747, but the name was continued until 1 Vict., c. 39, substituted the name sheriff for it.

Stib'ium: the Latin name of ANTIMONY (*q. v.*).

Sticking-plaster, or Adhesive Plaster: an article for surgeons' use, made of resin, lead plaster, and soap, melted together and spread by machinery upon stout muslin. It is of great value in practical surgery, but requires rather frequent renewal, as it loses its adhesive qualities. It has to be warmed before application, but is not loosened by wetting. Light adhesive plasters, court-plasters, and the like, are made of silk or goldbeater's skin, covered on the adhesive side

with a solution containing isinglass and gum-benzoin, while the back of the plaster receives a varnish of Chian turpentine and benzoin. These plasters are wetted before application.

Revised by H. A. HARE.

Stickleback [*M. Eng. stickle, prickle, spine + back*]: a hemibranchiate fish of the family *Gasterosteidae*, having the back armed with stout spines, whence the popular name. (See HEMIBRANCHII.) The form is more or less elongated; the body naked or covered with lateral plates; head compressed, more or less pointed; dorsal fin represented by a variable number of free stout spines (2-15) and an oblong fin with articulated rays; ventral fins represented by enlarged spines with an axillar ray each, and inserted more or



The stickleback (*Gasterosteus aculeatus*).

less behind the basis of the pectorals. The species with two or three free dorsal spines belong to the genus *Gasterosteus*, those with four to *Eucalia*, those with from seven to nine to *Pygosteus*, those without a bony cuirass between the ventrals to *Apeltes*, and the elongated salt-water species with fifteen spines to *Spinachia*. The species rarely exceed 6 inches, and are generally very much less. Although so small, they are nevertheless extremely pugnacious and voracious, and attack without hesitation animals many times larger than themselves. In the breeding season the males assume resplendent hues, which are very changeable. The males construct nests of particles of grass, roots, sticks, or leaves, which are united together by a viscid mucus or silk-like thread exuded from the body and wound round the material collected. The male seeks out a gravid female, conducts her to the nest, and she deposits a few eggs, and then escapes by an aperture already made or which she herself makes opposite to the one she entered by. This is repeated day after day until a considerable number of eggs is accumulated. Each time the male rubs himself against the female and passes over the eggs. For a month, while the eggs are maturing, the male watches over them with jealous care, and only leaves when the young are hatched and ready to care for themselves. The eggs are large in proportion to the size of the fish, and few in number, not much, if at all, exceeding 100 in the common two-spined sticklebacks.

Stigma: See PISTIL.

Stigmatiza'tion [from Lat. *stigmatiza'tio*, deriv. of *stigmatiza're*, from Gr. *στυγμᾶν*, to mark, brand, deriv. of *στυγμᾶ*, *στυγμᾶτος*, puncture, brand, mark, deriv. of *στυγμᾶ*, to prick, brand, mark]: a term employed in the literature of the Roman Catholic Church to denote the miraculous impression upon certain saints of marks similar to the five wounds of Christ (*stigmata*) or of the crown of thorns. Remarkable instances are those of St. Francis of Assisi (Sept. 15, 1224) and Veronica Giuliani (1694). Many persons, among whom was St. Catharine of Siena, are said to have felt at regular intervals the pain of such wounds, but without any external mark. See Görres, *Die Christliche Mystik* (1854), and Imbert-Gourbeyre, *Les Stigmatisées* (Paris, 1873).

Revised by J. J. KEANE.

Stiles, EZRA, D. D., LL. D.: clergyman and author; b. at North Haven, Conn., Dec. 15, 1727; son of Rev. Isaac Stiles, minister at North Haven; graduated at Yale College 1746; studied theology; was ordained a Congregational minister June, 1749; was tutor at Yale College 1749-55; engaged in a series of researches with an electrical apparatus sent to the college by Dr. Franklin, and made the first electrical experiments in New England; preached for a short time to the Stockbridge Indians 1750; studied law; was admitted to the bar 1753, and practiced two years in New Haven; pronounced a Latin oration in honor of Franklin on the occasion of his visit to New Haven, Feb., 1755; was pastor of a church at Newport, R. I., 1755-77; was inaugurated president of Yale College June 23, 1778; acted also as Professor of Ecclesiastical History after 1780; delivered lectures on scientific subjects; was author of a *History of Three of the Judges of King Charles I.* (Hartford, 1794) and *An Account of the Settlement of Bristol, R. I.* (Provi-

ance, 1750), and an unfinished ecclesiastical *History of New England*. D. at New Haven, May 12, 1795. His daughter married Dr. Abel Holmes, who published his *Life* (1798) and edited *The Family Tablet* (1798), containing poems by members of the Stillicho family. Revised by H. P. Fournier.

Stilicho, *stil'ikō*; general; son of a Vandal in the Roman service. He was born about 359; grew up in the camp, and developed such eminent talents that the Emperor Theodosius gave him his niece Serena in marriage; made him commander-in-chief of the whole military force of the Western empire, and appointed him guardian to the young Honorius. After the death of Theodosius in 395 A. D., Stilicho was the actual ruler of the Western Roman empire; he married his son to Placidia, the daughter of Theodosius, and his daughter, Maria, to the Emperor Honorius. The earlier part of his career was mostly occupied by rivalries with Rufinus, guardian of Arcadius, who had received the Eastern Roman empire, and the feud ended with the assassination of Rufinus. In 400, when Alaric invaded Northern Italy, Stilicho brought together in haste the legions which were stationed in Britain, Gaul, and all along the northern frontier of the empire; defeated Alaric first at Pollentia, then at Verona, and drove him out of Italy. But on the withdrawal of the legions from the frontiers immense swarms of barbarians gathered under Radagaisus, invaded Italy in 406, and besieged Florence. Stilicho attacked them and routed them completely; Radagaisus was put to death and his troops were sold as slaves. At the court, Olympius, a eunuch, succeeded in turning the mind of the young emperor from his gratification. While Stilicho was encamped at Bologna, a number of his friends were put to death at Pavia. In the camp Stilicho's friends demanded that he should march immediately against Pavia and punish Olympius; and when he hesitated they rebelled against him. He fled from the camp and took refuge at Ravenna, where he was murdered Aug. 23, 408. The principal events of his life have been celebrated in verse by the poet Claudian.

Still, JOHN, D. D.; bishop; b. at Grantham, Lincolnshire, England, about 1543; educated at Christ's College, Cambridge; took orders in the Church of England; became faculty Margaret Professor of Divinity at Cambridge 1579; held livings in Suffolk and Yorkshire; became prebendary of Westminster 1573, master of St. John's College, Cambridge, 1574 and of Trinity College 1577; archdeacon of Sudbury 1577, prolocutor of the convocation 1589, and Bishop of Bath and Wells 1592. D. at Wells, Feb. 26, 1607. He was the author of *A Ryght Pythie, Pleasant, and Moeve Comedie, intituled Hammer Gurton's Needle, played on the Stage not longe ago in Christes Colledge in Cambridge. Made by Mr. S. Noaster of Arts*, etc. (London, 1575). This piece, abounding in low humor, supposed to have been written as early as 1565, was long considered the first extant English comedy, but that rank is now assigned to Udall's *Ralph Royster Doyster*.

Stillingfleet, EDWARD, D. D.; bishop and controversial writer; b. at Cranbourne, Dorsetshire, England, Apr. 17, 1635; educated at Cambridge; took a fellowship 1653; entered holy orders; became rector of Sutton in 1657; preacher at the Rolls, London, 1654; rector of St. Andrew's, Holborn, London, and lecturer at the Temple 1665; prebendary of St. Paul's 1667 and of Canterbury 1669; chaplain to Charles II. 1670; dean of St. Paul's 1677, and Bishop of Worcester 1680, holding also several other ecclesiastical preferments. His ranks among the foremost of English polemics, his life having been an almost uninterrupted controversy with Roman Catholics, Nonconformists, and Socinians. He was characterized by unrivaled learning and a sincere love of truth. Many of his works have been frequently republished in different forms. The most important are *Irenicum, a Weapon-salve for the Churches Wounds, or the Divine Right of Particular Forms of Church Government, Dissolved and Examined* (1661); *Origines Sacre, or a Rational Account of the Christian Faith as to the Truth and Divine Authority of the Scriptures and the Matters therein contained* (1663); 9th ed. 1707; *A Rational Account of the Grounds of the Protestant Religion* (1665); *Discourse Concerning the True Reason of the Sufferings of Christ* (1669); *Discourse Concerning the Idolatry Practised in the Church of Rome* (1671); *Unconformity of Separation from the Church of England* (1681); *Origines Britannice, or Antiquities of the British Church* (1685); *The Doctrine and Practice of the Church of Rome Truly Represented* (1686); now ed. by W. Cunningham, Edinburgh, 1837; 3d ed. 1831—

a standard work; and *Discourse in Vindication of the Doctrine of the Trinity* (1697). He was so benignant that he was widely called the "beauty of holiness." D. at Westminster, Mar. 27, 1699. See memoir in his *Collected Works* (6 vols. fol., 1719). Revised by S. M. JACKSON.

Stillingia [Mod. Lat., named in honor of the English botanist Dr. Benjamin Stillingfleet (1702-71)]; a genus of euphorbiaceae from shrubs and herbs. The U. S. has several species. *Stillingia sylvatica*, queen's-delight or queen's-root, is an herb of the Southern states whose root has a good reputation as an antisyphilitic remedy. The tallow-tree of China (*S. sebifera*) is naturalized in the southern parts of the U. S. It is a beautiful tree, and from its seeds the Chinese extract large amounts of a white tallow-like fat, very useful for candles. The wood is hard and is a good substitute for box. The leaves give a black dye.

Revised by L. H. BAILEY.

Stillman, WILLIAM JAMES; painter, journalist, and critic; b. at Schenectady, N. Y., June 1, 1809; graduated at Union College, New York, 1848. He studied landscape-painting under Frederick E. Church and in France, exhibiting at the National Academy of Design in New York 1851-59. His most noted picture is the *Promission of the Peace*, painted in 1858. (See Emerson's *The Adirondacks*.) He was art editor of the *New York Evening Post* in 1853-54, and again thirty years later. In 1855 he founded, in connection with John Dupard, *The Oregon*, a monthly art journal in sympathy with the views of Ruskin and the Pre-Raphaelite brotherhood. In 1852 he visited Austria on a secret political mission for Kosuth. He was U. S. consul at Rome 1861-65, and in Crete 1865-69. Since then he has lived mainly abroad as correspondent of *The Times* in Greece and in Italy. He has given much attention to and has written controversially about Greek art and archaeology, particularly the cyclopean (Pelagic) constructions, which he has extensively explored. His principal works are *The Crete Insurrection of 1866* (New York, 1874); *The Hecatomnia and the Late Uprising* (London, 1877); *On the Track of Olympus*, embodying also an essay on the so-called Venus of Melos (Boston, 1889); also *The Acropolis of Athens*, a valuable collection of photographs (London, 1870).

Stills: See DISTILLATION.

Stillwater: city (settled in 1845); capital of Washington co., Minn.; on the St. Croix river, at the head of Lake St. Croix, and on the Chi. and N. W., the Chi., Mil. and St. P., the Chi., St. P., Minn. and Om., the St. P. and Duluth, and the Wis. Cent. railways; 16 miles N. E. of St. Paul, 25 miles E. N. E. of Minneapolis (for location, see map of Minnesota, ref. 9-P). Originally the settlement was on a small plain, slightly above the level of the lake, and surrounded by graceful bluffs; but with the growth of the city the plain has been surrendered to business houses and manufactories, and the bluffs are adorned with handsome residences. The city is 30 miles above the junction of the St. Croix and the Mississippi rivers, and, with regular lines of steamers communicating with Dubuque and St. Louis, claims to be at the head of Mississippi river navigation. Stillwater is the business center of the great St. Croix lumber region, which extends north over large portions of Minnesota and Wisconsin. It contains many large sawmills, with an aggregate daily capacity of over 500,000 feet, and a capital of \$3,000,000. During the summer several hundred million feet of logs are here formed into rafts to be towed by steamers to sawmills on the Mississippi. Although lumbering has always been the principal business, other industries have sprung up, and there are several flour-mills and feed-mills, grain elevators, foundries and machine-shops, carriage and wagon factories, and agricultural-implement works. There are 16 churches, 14 public schools, public library, 2 Roman Catholic convents, a hospital, 2 national banks with combined capital of \$500,000, 2 savings-banks, 1 daily, 6 weekly, and 3 monthly periodicals, and the State penitentiary. Pop. (1880) 9,055; (1890) 11,200; (1894) including suburbs, 18,960.

HARRY R. DANIEL.

Stilt: See ALTRA STILIA.

Stilt: any bird of the genus *Himantopus* (family Recurvirostridae). They are related to the avocets, and are distinguished by the excessively long legs, the straight, slender bill, which is slightly compressed, the feet with the middle and outer toes connected by a small web and destitute of a hind toe, and projection of the tail beyond the wings. There are some half dozen species, inhabitants of various

parts of the world. One is found in America, and ranges from the northern parts of the U. S. to Paraguay. Its total length is about 14 inches, of which the bill forms 3 inches, and the tail also 3 inches; the tarsi are about 4 inches in length, and rather longer than the tibiae; the color is a glossy black on the head above, the neck behind, the back, and the wings; white on the head in front of and behind the eyes, and beneath; the bill is black, and the legs red. It not only dwells by the seacoast, but is found far inland, at least on the lakes and rivers of the western parts of the U. S. The stilts generally associate together in flocks of twenty or thirty. They prefer muddy flats with reedy margins. They breed in the U. S., and make nests of grasses, etc. They lay generally four eggs; these are relatively large and of a yellowish or ochraceous color, with dark-brownish blotches and lines. According to Coues, on the ground, whether walking or wading, they move gracefully and with measured steps; the long legs are much bent at each step (but only at the joint), and planted firmly and perfectly straight. When feeding, the legs are bent backward at an acute angle at the heel-joint, to bring the body lower. They feed mostly on aquatic insects, as well as the eggs and young of fishes, and small fishes. Revised by F. A. LUCAS.

Stilton Cheese: See CHEESE.

Stimpson, WILLIAM, M. D.: naturalist; b. at Cambridge, Mass., Feb. 14, 1830. He devoted himself principally to the description of invertebrates. He was naturalist of the Ringold and Rodgers expedition to the North Pacific Ocean, later was curator of the Chicago Academy of Science, and lost all his collections, MSS., etc., in the great fire of 1871. Later he superintended the dredgings of the U. S. Coast Survey in the Strait of Florida. Among his works are *Testaceous Molluscs of New England* (1851); *Marine Invertebrates of Grand Manan* (1854); *Prodromus Descriptionis Animalium Evertibratorum* (1857-61, containing a part of the invertebrates collected on the Ringold and Rodgers expedition); *Notes on North American Crustacea* (1859-71); *Crustacea and Echinodermata of the Pacific Shore* (1857); and *Crustacea Dredged in the Gulf Stream* (1871). D. at Ithaca Mills, Md., May 26, 1872. J. S. K.

Stimson, FREDERIC JESUP: novelist; b. at Dedham, Mass., July 20, 1855; graduated at Harvard in 1876; was admitted to the bar, and in 1882, under the pseudonym *J. S. of Dale*, published *Guerndale*, a novel of college life. In 1884-85 he was assistant attorney-general of Massachusetts. Other novels are *The Crime of Henry Vane* (1884) and *The Residuary Legatee* (1888). He has also published a number of law-books, the most important of which is perhaps *American Statute Law* (1886). H. A. B.

Stimulants [from Lat. *stimulans*, *stimulantis*, pres. partic. of *stimulare*, urge, goad on, deriv. of *stimulus*, a goad]: those agents which increase functional activity of the various organs of the body, more particularly in connection with the respiration, circulation, and nervous system. Such are, pre-eminently, strongly nourishing hot food if it can be digested; if it can not, then alcoholic or etheral potions, ammoniacal solutions, heat, strychnine, etc.

Stimulus: that which excites or stimulates; used in physiology and psychology for any influence from outside which causes a reaction of the muscles in movement or of the attention.

Sting-fish: the greater weever (*Trachinus draco*). See TRACHINIDÆ.

Sting-ray: any ray of the genus *Trygon* (family *Trygonidae*), a group of elasmobranchs belonging to the order *Raiiæ*. These fish have the body rhombic and moderately broad, the skin smooth and without tubercles, the nasal valves coalescent into quadrangular flaps, the teeth flattened, and the tail long, tapering, destitute of a true fin, and armed with an elongated spine (sometimes with two) compressed from before backward, and with teeth or serratures at each side directed downward. These spines are the "stings" which have insured the popular name to the forms in question. There are about thirty species found in almost all tropical and temperate seas, and much dreaded on account of the wounds which they inflict with their spine-bearing tail. They can whip the tail around with great ease and transfix the incautious intruder with the spines. Tetanus is sometimes the result, but the wound is a physical injury solely and not the result of poison. One species (*Trygon centrura*) is quite common along the eastern coast of the U. S. See also TRYGONIDÆ. Revised by F. A. LUCAS.

Stinkhorn Fungi: the *Phallaceæ*, a family of fetid gastromycetous fungi numbering ninety-two species, most of which are tropical. The plants are filamentous saprophytes, growing in soil which is rich in decaying organic matter. The spore-fruits are roundish or egg-shaped bodies resembling PUFF-BALLS (q. v.), which develop at or beneath the surface of the ground and whose spore-bearing tissue (*gleba*) emerges from the peridium by the elongation of the sterile base (see figure). The fetid odor attracts flies and other insects, to which the spores adhere, thus securing their distribution. Several species occur in the U. S., one of the most common being the *Ithyphallus impudicus* (see figure), which is from 5 to 10 inches high, with a white or pinkish base (*volva*), a white, hollow, loosely cellular stalk, and a conical, reticulated pileus bearing black spores. Species of *Dictyophora*, *Mutinus*, and *Simblum* are common in the U. S. CHARLES E. BESSEY.



Stinkhorn (*Ithyphallus impudicus*) reduced one-half, with a young spore-fruit at the side.

Stinkstone: any one of certain marbles or limestones which on being struck emit the smell of sulphuretted hydrogen. The British islands abound in stones of this character and of various geological ages, some of them useful building-stones.

Stinkwood: the hard, durable wood of the *Ocotea bulbata* (family *Lauraceæ*) and related plants, found in South Africa. The wood is handsome and valuable, but has a disagreeable smell even when seasoned. *O. foetens*, a tree of the Canaries, has wood of a vile odor, but other members of this widespread genus are of pleasing fragrance. The name is also applied to a species of *Cassia*.

Revised by L. H. BAILEY.

Stipple-engraving: See ENGRAVING.

Stirling: town of Scotland; capital of Stirlingshire: on the Forth; 35 miles N. W. of Edinburgh (see map of Scotland, ref. 11-G). It contains a fine old castle, situated on a basaltic hill, with steep precipitous sides toward the W. and rising to a height of 340 feet above the plain. The town and its vicinity are rich in historic associations, and contain many objects of interest. Tartans, shawls, rope, soap, leather, and malt are extensively manufactured, and an important trade both on the river and by rail is carried on. Stirling unites with Dunfermline, Culross, Inverkeithing, and Queensferry in sending one member to Parliament. Pop. (1891) 16,974.

Stirling, JAMES HUTCHISON, M. D., LL. D.: philosopher; b. in Glasgow, Scotland, June 22, 1820; took the course in arts and medicine at Glasgow University; for a short time practiced as a surgeon in New South Wales; abandoned practice in 1851 and went to Germany to continue philosophical studies; is the author of *The Secret of Hegel, being the Hegelian System in Origin, Principle, Form, and Matter* (2 vols., 1865); *Sir William Hamilton, being the Philosophy of Perception* (1865); *Jerrold, Tennyson, Macaulay, and other Essays* (1868); *As Regards Protoplasm* (1869); *Philosophy and Theology*, Gifford lectures (1890); *Darwinianism: Workmen and Work* (1894); and the translator of Dr. Albert Schweigler's *Handbook of the History of Philosophy* (1867). Dr. Stirling is an opponent of Haeckel and Huxley on biological theories.

Stirling, Sir THOMAS, of Ardoch: soldier; b. in Scotland about 1735; became a captain in the Royal Highlander July, 1757; served under Abercrombie at Lake George 1758, and Amherst at Lake Champlain 1759, at the siege of Niagara, and the invasion of Lower Canada 1760; was stationed in 1765 at Fort Chartres, Ill., whence he marched to Philadelphia 1766; became lieutenant-colonel 1771, colonel 1779, and major-general Nov., 1782; served throughout the war of the Revolution; took part in the battles of Long Island, Fort Washington, Red Bank, Brandywine, and Springfield; was made a baronet and lieutenant-general 1796, and full general Jan. 1, 1801. D. May 9, 1808.

Stirling, Sir WILLIAM: See MAXWELL.

Stirlingshire: a county of Scotland, bounded by the counties of Perth, Clackmannan, Linlithgow, Lanark, and Dumbarton, and forming the border land between the Highlands and the Lowlands. Area, 447 sq. miles, of which about two-fifths is under cultivation. The western part of the county is mountainous, and rich in iron, coal, and freestone. The highest peak is Ben Lomond, 3,192 feet above the level of the sea, near the foot of which lies the beautiful Loch Lomond. Agriculture, cattle-breeding, mining, and the manufacture of cotton and woollen goods, chemicals, etc., are pursued with success. The iron-works at Carron in this county are among the largest in the country. There are also extensive iron-works at Falkirk, where also three annual fairs, called *trysts*, the largest in Scotland, are held for the sale of horses, cattle, sheep, and wool. Stirlingshire is rich in historic associations, and boasts of many battle-fields, the chief of which are Stirling Bridge, Falkirk, Rannochburn, and Kilcree. Pop. (1891) 118,021. The county sends one member to Parliament. County-town, STIRLING (q. v.).

Stille, William: clergyman, educator, and author; b. in Virginia in 1680; educated in England, where he studied theology and took orders in the Church of England 1731; became in that year master of the grammar school of Williams and Mary College; chaplain of the Virginia House of Burgesses 1735, and president of Williams and Mary College and rector of Henric parish from 1752 to his death at Williamsburg, Sept. 27, 1755. He was a brother-in-law of Peyton Randolph, and author of a *History of the First Decades and Settlement of Virginia* (Williamsburg, 1747; 2d ed. 1753; new ed. New York, 1866). It traces the history only to 1624, has been by some critics censured as inelegant in style, but is admitted to be accurate and faithful, and the work is of the greater value since the materials on which it was based were destroyed by fire.

Stjernehjelm, styern'yel'm, Geroik: statesman, scholar, and poet; b. in Dalarna, Sweden, in 1598. He was the son of a poor miner named Margareta, but on entering school assumed the name of Göran Lölje. His early education was obtained at Vesterås. After filling various Government positions he was appointed by Gustavus Adolphus lecturer in the school at Vesterås. Afterward he was ennobled by the king, and assumed the name by which he is known in literature. He was court poet to Queen Christina and high in favor, but afterward fell under suspicion and was disgraced. D. in poverty 1672. His principal works are the didactic poem *Hercules*, written in hexameters; *Bröllops besvär* (*Wedding Vexations*) (Remembrances of Wedding Vexations), a humorous lyric poem, also in hexameters; and three so-called ballets—*Parnassus triumphans*, *Den fängne Cupido* (The Captive Cupid), and *Freda Af*—the first of which is like a modern opera, the others like the contemporary English masques. He is called the father of Swedish poetry. Before him there is a condition of absolute confusion in form. By his use of new meters, and particularly of the alexandrine, which he introduced into Swedish literature, he established a standard for his successors, who regarded him in form and language a model of artistic perfection. His poetical works were published at Upsala, 1850. See SWEDISH LITERATURE.

WILLIAM H. CARPENTER.

Stout: See EMMET.

Stobæus, Joannes [so called from his birthplace, Stobi, in Macedonia]: an author assigned to the end of the fifth century of our era. For the instruction of his son, Septimius, he made a collection of sayings on various subjects from about 300 Greek authors, and these quotations have become of great interest, as in most cases the works from which they were taken have perished. They are arranged in two separate works—*Anthologion* and *Eclogæ*—both edited by Meineke, the former in 4 vols. (1855-57), the latter in 2 vols. (1869-72). There is a new critical edition of both, under the common title *Anthologia*, by Wachsmuth and Henze (Berlin, 1894), of which the third volume appeared in 1894.

Revised by R. L. GILBERTSON.

Stockbridge: town: Berkshire co., Mass.: on the Housatonic river, and the N. Y., N. H. and Hars. Railroad; 5 miles N. of Great Barrington, 17 miles S. by W. of Pittsfield (for location, see map of Massachusetts, ref. 2-C). It is noted for picturesque mountain scenery, includes the beautiful Lake Mahomet, and has numerous villas, chiefly occupied during the summer by citizens of New York. Originally called Housatonic, the place was the chief residence of the wife of Indians of the same name, also called

Stockbridge Indians, who were Christianized in the eighteenth century by the labors of John Sargent, Timothy Woodbridge, and the celebrated Jonathan Edwards, to whose memory a monument has been erected here. The village, numbering 460, removed after the Revolution to Madison co., N. Y., afterward in the vicinity of Green Bay, Wis., and subsequently resided near Port Lawrenceville, Kan. Stockbridge was the native place of several eminent persons, including Catherine M. Sedgwick, Mark Hopkins, Cyrus W. Field, Henry M. Field, D. D., and Judge Henry B. Brown, of the U. S. Supreme Court. It contains the villages of Stockbridge, West Stockbridge Center, Curtsville, and Glendale, eight public schools, a public library (founded in 1822), an academy, woollen-mills, paper-mills, saw-mills, grist-mills, and sawmills, and a national bank with capital of \$200,000 and surplus of \$150,000. It was incorporated in 1789, and in 1894 had an assessed valuation of \$2,940,497. Pop. (1880) 2,377; (1890) 3,132.

HENRY M. FIELD, mayor of the "Village."

Stockbridge, Henry: lawyer; b. at North Hadley, Mass., Aug. 11, 1822; graduated at Amherst College in 1845; studied law in Baltimore, and was admitted to the Maryland bar in 1848. During the civil war he took an active part in favor of the Union; in 1864 was a member of the Legislature, and drafted the act by which a constitutional convention was convened for the abolition of slavery in Maryland; was a member of that convention, took an active part in its proceedings, exerted himself to secure the adoption of the constitution framed by it, and defended it before the court of last resort. He instituted and conducted a successful issue in the Federal courts proceedings by which were annulled the indentures of apprenticeship by means of which the effect of the emancipation clause was sought to be evaded, and thus secured the unfetterment of more than 10,000 colored children in the State. He edited for years the Fund publications of the Maryland Historical Society, of which he was vice-president. D. May 11, 1903.

Stock-dove: a European wild pigeon, *Columba oenas*, named from its habit of nesting in hollow stocks or tree-stumps, although it often builds in rabbit-burrows, etc. It is gray, with a purplish breast, scarlet eyes, orange bill, and red toes and legs. It is some 14 inches long. The young birds are prized as food.

Stock Exchange: an association of brokers in shares, bonds, or other securities of corporations, nations, states, counties, or municipalities, and in negotiable certificates representing commodities of trade. Until the decade 1880-90 the last-mentioned instruments were not regularly dealt in by stock exchanges. The Petroleum and Mining Exchange of New York city was, however, in 1885, expanded into an exchange for stocks, oil, and mining shares, and the older New York Stock Exchange shortly afterward admitted to regular trading on its board the so-called "pipe-line certificates" of the petroleum market, and later certificates of deposited silver bullion, through which the price of silver might be made a convenient speculation. Grain contracts for future delivery have also been dealt in regularly in the Consolidated Stock and Petroleum Exchange, but neither these nor the pipe-line certificates on the New York Stock Exchange became in any degree important features of the institutions.

Membership Regulations.—Membership in a stock exchange is usually limited, and as, in a number of exchanges, a "seat" is the property, not only of an active broker, but also of his heirs or assigns, the privilege represented by it possesses a marketable value. Memberships in the New York Stock Exchange have sold as high as \$34,000 (price reached in 1885), and as low as \$15,250, the record of 1896. Sales were made in the first quarter of 1895 at \$15,000. The purchase of a seat from a previous incumbent does not of itself entitle the buyer to the privilege of trading on the floor. He becomes a member only after formal application, and by the approval of the committee on admissions. On the London Stock Exchange the applicant for membership must be recommended by three members of at least four years' standing, who severally bind themselves to pay \$300 to the applicant's creditors, in case he be declared a defaulter within four years after his admission. No foreigner is eligible unless he shall have been naturalized for two years. In the Paris Stock Exchange the *agent de change* (see below) is ineligible unless a Frenchman. He must be proposed by his predecessor in membership (or that predecessor's heirs or proxies), and must be formally approved by the governing body of the exchange and the Minister of Finance.

Most stock exchanges place a limit on the number of members. On the New York Stock Exchange the limit is 1,100, a number reached after a considerable increase in 1869, when a successful rival, the Open Board of Brokers, was absorbed by consolidation of membership. In New York the Stock Exchange member frequently acts as solicitor of investment business—advertising extensively—as general banker and promoter, and as executor of orders on the floor. These functions are separated in London, where a customer usually gives his order to a broker in the exchange membership, through whom the “jobber,” also a member of the exchange, is employed; the Stock Exchange forbids all its members to advertise. By the constitution of the Paris Bourse, its members, the *agents de change*, number only sixty; but stock-exchange business in Paris fell largely from the first into the hands of *coulissiers* or outside brokers, who frequented the outer corridors of the Bourse and traded as though members of a regular exchange. The strife between the *coulissiers* and the *agents de change* is bitter and historic. The *coulisse* was repeatedly suppressed by the courts and the police, and was driven at times to other quarters of the city. In 1859 individual *coulissiers* were heavily fined, but their business, under the generic name of the Petite Bourse, flourishes to this day. Trading on the larger Bourse in recent years has been also carried on by the head clerks of the *agents de change*, each agent being allowed two such clerks with privileges of the exchange.

Discipline and Rules.—Stock exchanges are invariably governed by strictly enforced by-laws, covering rules for general management, mutual arrangement and enforcement of contracts, and requirement of personal business honesty and good behavior. On the New York Stock Exchange an insolvent member is suspended until he has settled with his creditors, and may be readmitted only on proof of such settlement and on the formal vote of the committee on admissions or, if rejected by them, on appeal to the general governing committee. Suspension or expulsion is also fixed as penalty for (1) the making of fictitious sales; (2) the making of fictitious or trifling bids or offers; (3) the buying or selling of securities for a less commission than that fixed in the by-laws; (4) “obvious fraud”; (5) refusal to comply with any other regular provision of the by-laws. The London Stock Exchange’s by-laws impose suspension or expulsion as penalty for violation of any Stock Exchange rules or regulations; for failure to comply with the committee’s decisions; and for “dishonorable or disgraceful conduct.” A declared insolvent also ceases to be a member. The *agent de change* in Paris is subject to discipline, under the institution’s by-laws, whenever he “does not confine himself strictly to his duties,” or if he “introduces into his operations or into the collection of his dues any innovations that may be injurious to the public weal or to the interests of the company.” The penalty is left wholly discretionary with the governing board or “syndical chamber.” It may fine, censure, or suspend a member, but for expulsion may only submit its recommendation to the Minister of Finance. This recommendation is, however, usually final.

“Listing” of Securities.—In nearly all stock exchanges no security can be dealt in on the floor unless it has been officially admitted by the committee appointed for the purpose. Securities may also be expressly excluded from trading by vote of this committee. The only exception to this privilege of exclusion, in European stock exchanges, is the public stock of the nation to which the exchange belongs. In London an explicit Stock Exchange rule forbids trading in public loans raised by nations at war with Great Britain. For the “listing” of new securities on the New York Stock Exchange certain formalities are prescribed. The applicant company must show to the committee on stock list that the shares or bonds in question were regularly issued, and that they have been actually marketed. A general financial statement at a date not too far distant must accompany the application. In the case of shares, the securities must be registered with a trust company satisfactory to the stock exchange. In the case of bonds, evidence must be submitted that the mortgage was properly drawn and properly recorded in every county touched by the enterprise. These stringent provisions were the result of numerous frauds and “over-issues” of securities in the earlier history of American stock speculation.

The competition of the Consolidated Exchange after 1885 led to some change in sentiment among the New York Stock Exchange authorities. A few years after that date the New York Exchange governors established a so-called “un-

listed department,” in which securities were admitted without the stringent provisions as to financial statement, registry of shares, etc. As a result, securities to an enormous aggregate value were admitted to official trading, when the investing public was left in total ignorance of the financial status of the enterprises. These securities soon became the chief center of active and reckless speculation. Although the Stock Exchange generally repudiates responsibility for the character and good faith of securities dealt in upon its floor, it has lately been generally admitted that the influence of these “unlisted securities” was demoralizing and harmful. Retroactive legislation against such securities was impracticable, but in Feb., 1895, the governing committee of the exchange adopted a resolution which marked an important change of policy. A very great amount of securities of insolvent companies were certain, later on, to be subject to reorganization. In such cases the new securities issued in the adjustment of the corporation’s debt must apply for admission to the Stock Exchange. The governing committee’s resolution stipulated that all such applications must be accompanied by a full and complete income report for the year preceding, by a detailed balance sheet, and by a civil engineer’s report on the physical condition of the property. The resolution also went much further, and officially “recommended” to all corporations, whose securities were already admitted to trading, the publication, at least fifteen days prior to an annual meeting, of a faithful and detailed income account and balance sheet for the year. Although not mandatory, this declaration of general policy was regarded as highly important in the struggle of investors to obtain complete and frequent financial statements from corporation directors.

Method of Business.—All stock exchanges provide an open hall where brokers may personally buy from or sell to one another, for their own account or that of customers, such securities as are admitted to trading. A regular commission, which is a fixed percentage usually on the par value of securities bought or sold, is established for all such trading. Members are forbidden under penalty to accept a less commission. On the New York Stock Exchange the regular minimum commission is one-eighth of 1 per cent. on outside orders, one thirty-second of 1 per cent. on orders given by fellow members, and one-fiftieth of 1 per cent. where a member has merely employed a fellow member to make the bargain, delivery being made to or by the real purchaser or seller. All commissions are reckoned on a security’s par value. In London the official Stock Exchange commissions vary according to the nature and face value of the security dealt in. On the stock of British and colonial corporations they range from 1s. to 5s. per cent.; on shares and bonds issued in the U. S. the commission is 1s. per \$100; on British and foreign government funds it is 2s. 6d. per cent. In Paris the official commission of an *agent de change* is one-quarter of 1 per cent.

The bids and offers made on the floor of the exchange, though made only personally, become official. A broker is forbidden under penalty to sell stock at a price lower than the best bid made in his hearing for the amount in question, or to buy at a price higher than the lowest offer. This is to prevent unfair “manipulation.” On the New York Stock Exchange the broker must deliver stock sold, and must pay for stock bought, by 2.15 p. m. on the day following the transaction. Since 1892 most of these transactions are settled through the Stock Exchange Clearing-house. (See below.) On the London Stock Exchange, and in the majority of exchanges in Europe, as well as some in the U. S., “settlements” between buyers or sellers are made at longer intervals. In London a contract made for purchase or sale of securities is settled by delivery of the securities and payment of the price at the next official settling day. These days occur at fortnightly intervals, or nominally twice a month, for general securities, and once a month for Government stocks. By mutual agreement, commonly on payment of a fixed percentage charge, the contract may be deferred or “carried over” to the next settlement. The Paris Stock Exchange and most other stock exchanges on the Continent deal “for the account” similarly to London. In all these exchanges cash transactions, closed on the spot, are admissible, though rare outside of British consols. In such cases, as may be seen by the daily quotations of British consols, the price for the “account” is usually higher than the price for “money” by a margin sufficient to cover the interest charge between the date of cash sale and the date of the next fortnightly or monthly settlement.

In all stock exchanges actual delivery of securities sold is required, the one apparent exception being in cases where mutually balanced contracts are entered through the stock exchange clearing-house. The courts have in this case, however, decided that the cancellation in no respect affected the intent to deliver, the enforceability of delivery, and the actual delivery of stocks as far as customers are concerned. The common assumption that trading in stock exchanges involves no real sale, purchase, or transfer, but is merely a species of gambling on differences, is wholly erroneous. This species of gambling is confined to the so-called "bucketshops," private concerns with no stock exchange membership, and which neither receive nor deliver actual securities, merely paying to customers or receiving from them the money balance due between the stock exchange price at the time of the fictitious sale or purchase and at the time the contract is closed. In the U. S. these institutions are illegal by the statute of most States, and are at intervals raided by the police as common gambling-houses.

Stock-exchange Clearing-house.—The clearing-house for stocks is the most recent development in the machinery of stock exchanges. It is a natural outgrowth of the bank clearing-house (*q. v.*), and serves a similar purpose. Its fundamental principle is to offset contracts by one broker, to deliver securities, with contracts entered upon by the same broker to receive the same securities. If A has purchased 1,000 shares of stock from B, and has sold 1,000 shares of the same stock to C, the stock exchange clearing-house returns a balanced sheet to A, who thereupon neither receives nor delivers any of the stock, the double transaction being settled by the delivery of the 1,000 shares by B to C. Or if A has bought 1,000 shares from B and sold 600 to C, the clearing-house so arranges that B shall deliver 400 shares to A and 600 to C, no deliveries being made by A. By an ingenious book-keeping system, this principle is extended to the entire membership of the exchange, and as such, active broker is apt to trade daily on both sides of the account in many securities, the economy in expense and labor is enormous. This system was first introduced in the Handelskammer at Frankfurt in 1867. It was found that through its employment the necessary transfers of securities were reduced more than 90 per cent. The Berlin Exchange adopted the system in 1869, Hamburg in 1870, Vienna in 1879, London in 1876, some of the U. S. exchanges between 1880 and 1887, and the New York Stock Exchange in 1892. The last-named institution, following and perfecting the plan of the Consolidated Stock Exchange of New York, added a system of money clearings, through which the checks due by brokers in settlement were mutually offset, so far as the two sides of any broker's account balanced, at the clearing-house. It is estimated by officers of this clearing-house that the saving in checks drawn for brokers' settlements, under this system, has in the New York Stock Exchange alone averaged \$400,000,000 per month. The system of money clearings has not been adopted in Europe, except, in a modified form, by the London Stock Exchange. The stock exchange clearing-house has received more full and complete discussion in *The Political Science Quarterly* for June, 1903.

History.—The trade of brokers, in the sense of professional buyers, sellers, and lenders on security, using for the purpose their own money or that of customers, is very ancient. Such trade was carried on in the Roman Forum during the days of the republic. The use for this purpose of the porticoes of the adjacent temples of Minerva and Mars Ultor is mentioned frequently by Martial, Juvenal, and other Latin writers, and their references assume a long-established institution. The brokers of that period, however, were hardly distinguishable from the bankers and money-lenders of the Middle Ages. The money-broker or money-changer, transacting much the same business as the money-broker do to-day, was older as representative of a distinct profession, and indeed followed early international commerce as a necessary accompaniment. In the later Middle Ages exchanges for the transaction of general business were established, usually by national or municipal governments, and took the place of the temple porticoes and public markets commonly used at the beginning of the Christian era. The Royal Exchange in London, founded under Elizabeth by Sir Thomas Gresham, was of this character, and was suggested by similar institutions already established in some of the German commercial cities. But these were not stock exchanges, and were never used as such except when,

in the infancy of stock-trading, a part of the general market space was used by brokers in securities.

The term broker is used in English statutory law as early as 1285, but apparently refers there to a species of pawn-broking business only. In 1694 an act of Parliament defines brokers only as dealers in "merchandise and wares." There is no evidence that the stock-broker in the modern sense became a factor in trade until the great movement for the creation of limited government debts at the close of the seventeenth century, followed a few decades later by the incorporation of the East India Company and the South Sea Company in London, and of the Mississippi Company in Paris. The shares of these corporations were offered for public purchase, and advanced enormously in value. Here the South Sea Bubble burst in 1720 the stock-poly had become a feature in English society, and both he and his peculiar professional slang were frequently in the literature of the period.

The stock-broker's business was long confined either to the Royal Exchange in London or, later, in the coffee-houses of the adjacent Change Alley. In 1691 the London Stock Exchange was founded in Chapel Court, where it has continued ever since. A public exchange for brokers was established in Paris as early as 1694, but stock-jobbing began only with John Law's Mississippi Bubble of 1720. It was suppressed by governmental edict in 1726 and in 1764, both actions being provoked by the great demoralization in values caused by currency inflation. The present Bourse was founded early in the nineteenth century, and was first occupied in 1806. Contrary to usage elsewhere, the expense of its construction was paid by the city. As an organized body of brokers, the New York Stock Exchange seems to have originated so early as 1792, solely "for the purchase and sale of public stock." Its meetings, however, were held only in coffee-houses, or in rooms of private buildings; first in an office at No. 47 Wall Street, and later in the old *Courier* and *Enquirer* buildings. In 1827 an upper room was chartered in the Merchants' Exchange, Wall and William Streets; from 1854 to 1857 a room over the Corn Exchange Bank was used, then a hall in a building on Beaver Street, the present exchange being completed and first occupied in Dec., 1863. The list of celebrated names among the speculators in the membership of the New York Stock Exchange includes Jacob Little, Samuel Ward, Cornelius Vanderbilt, William H. Travis, Charles Woerckoff, Daniel Drew, James Fisk, Jr., William H. Vanderbilt, and Jay Gould. Of these only the first mentioned, who flourished in the decade 1825-35, antedated the days of railway-share speculation. The Philadelphia Stock Exchange was founded at the opening of the century, and was for some time a more important institution than its New York rival. It has not kept pace with the New York Exchange, however, and, though trading actively in many of the securities dealt in at New York, devotes itself largely to specialties, notably, since 1890, to stocks and bonds of street-railways in various quarters of the Union. Philadelphia is the headquarters for the so-called traction stocks of New York, Baltimore, Philadelphia, and other cities. The Boston Stock Exchange—a much more recently founded institution—deals especially in securities of railways in New England. The Chicago Stock Exchange is dwarfed by the much larger concentration of grain-dealing in that city. Its dealings are chiefly restricted to shares and bonds of the elevated and surface railways of Chicago, Baltimore, New Orleans, and other cities possess also stock exchanges doing a still more limited business in securities of local enterprises. There are stock exchanges in all the principal commercial cities of Europe, and in many of the smaller municipalities. The most important institutions, outside of those already mentioned, are the stock exchanges of Berlin, Hamburg, Frankfurt, and Vienna.

Stock-exchange Phraseology.—Trading in stocks has for nearly two centuries been characterized by a set of terms and phraseology peculiar to itself. Of these the most familiar are the following: A "bear" is a market operator working to cause lower prices. A "bull," conversely, is working for higher prices. Both of these terms come in colloquial literature at least as old as England's South Sea speculation of 1720. The bear is usually said to be "short" of stocks. The origin of this more modern term is plain, and signifies that the operator has sold stocks which he does not yet own, for delivery at a fixed future date. The price may or may not be lower than previous recorded quotations. Usually he resolves his payment, at current prices, on the spot, and

in modern stock exchanges he also makes his delivery of stocks on the spot. But the stock thus delivered is borrowed from real holders, to be repaid when the "short" seller "covers"—that is to say, when he buys outright in the market to close his contracts. The bull is commonly "long" of stocks in a speculative way. This term signifies that he buys the stock and pays for it in money on the spot, but borrows the money for payment. When he sells his stock, at a profit or otherwise, he repays the loan. It often happens, therefore, that when the bear is borrowing stocks and the bull borrowing money, the one is simply lending to the other. Sales by the bulls are currently called liquidation. Stocks are said to be "carried" when a banker advances money to the bull speculator, retaining the stocks as security for the loan. The "carrying rate" naturally varies, therefore, with the rate of money and the demand for stocks. "Pools" are combinations of operators devoting their joint resources to the manipulation of a single security or group of securities. The manipulation is usually directed by one member of the pool. Contracts for such purpose have in some cases been recognized as legal by the courts, but appeal to law is rarely made, and bad faith, such as the "selling out on his associates" by one member of a "bull pool," is not easily proved against the offender. A "put" is a contract drawn by a capitalist or broker and sold at a specified sum to a speculator, in virtue of which the speculator may, within a fixed period, deliver the stock to the issuer of the put and be paid for it at a stipulated price. The buyer of a put is of course usually a bull, and buys the put to guard himself against losses on a possible decline. A "call" is the converse of a put. Its issuer contracts to sell to the buyer of the call, at or before a stipulated date, a certain amount of a certain stock at a fixed price. The bear buys this to guard against unexpected advances. A "spread" or "straddle" combines the features of both put and call, contracting at the option of its buyer to deliver to him or receive from him a fixed amount of securities named, the limits of price being set as many points apart as the situation, in the view of the issuer, will justify. All of the contracts described are generally classed as "options" or "privileges." A "wash sale" is a transaction in stocks wherein buyer and seller do not permanently transfer the securities at all, but work in a common interest to create semblance of activity and affect prices. In most stock exchanges "wash sales" are forbidden under heavy penalty, but they are difficult of detection and undoubtedly play a large part in current stock transactions. Two expressions in stock-exchange dialect, frequently used in cable dispatches, are peculiar to London. "Contango," a word probably derived from the continental expression for "contingent," refers to the rate or percentage charged an operator long of stocks for carrying over his account to the next fortnightly settling-day. (See above, under *Methods of Business*.) "Backwardation" is an etymological barbarism describing the premium, if any, charged to a short operator for permitting him to defer delivery from one settling day to the next. Its equivalent on the New York Stock Exchange is the premium charged in the "loan crowd," where actual owners of stocks are lending the shares to bear operators desirous of making present deliveries.

Statistics.—Transactions on the New York Stock Exchange are more carefully recorded and tabulated than in any other similar institution. The statistics of its business will therefore give a fair idea of the trading which passes annually on a great stock exchange. For the calendar year 1894 the following figures of actual sales have been compiled:

STOCKS AND SHARES.	Par value.	Market value.
Shares *.....	\$4,821,876,020	\$3,094,942,769
Railway bonds.....	339,950,250	248,987,506
U. S. Government bonds.....	4,345,400	5,220,460
State bonds.....	10,929,900	4,441,015
Bank stocks.....	527,985	924,507

* Total number of shares sold, 49,075,032.

The year 1894, however, being a period of great financial depression, is not a fair year to select as representative of investment and speculation. Even in 1893 the shares sold on the New York Exchange aggregated 80,977,839, of a par value of \$7,550,440,205, and a market value of \$4,550,260,916. The maximum year's record of the Stock Exchange in the several kinds of securities is as follows: Shares (number), 116,307,271 in 1883; railway bonds, \$660,659,400 in 1885; Government bonds, \$112,571,850 in 1879; State bonds, \$26,-

571,260 in 1882. It is generally estimated by brokers that sales of 200,000 to 300,000 shares a day are a fair average in active times. In a period of market excitement trading runs far beyond this average. The extreme high point was touched in the summer of 1887, when one day's total ran above 1,000,000 shares, the volume of business being so great that the Stock Exchange authorities were never able to compile its figures, even approximately.

LITERATURE.—The literature of this subject is not rich. The most complete legal and historical discussion will be found in J. R. Dos Passos's *Treatise on the Law of Stock-brokers and Stock Exchanges* (New York, 1882). The *Report of the British Royal Commission on the origin and methods of the Stock Exchange* (London, 1878) is full of valuable data. G. R. Gibson, of New York, has written several light but readable monographs on the various European exchanges. Various memoirs, chiefly of little value, have been published to narrate episodes of stock-exchange adventure. The most thorough and philosophical discussion of the financial questions involved in the subject is that of Robert Giffen, statistician of the British Board of Trade, in his *Stock Exchange Securities* (London, 1877). The numerous books and pamphlets on *How to Avoid Losses in Wall Street*, etc., are worthless and mischievous. Annual reports of the exchanges are usually limited to lists of officers, committees, and members. Valuable information as to the functions of stock exchange trading at earlier periods may be obtained from Walter Bagehot's *Lombard Street* (London and New York) and Clement Juglar's *Crises commerciales* (Paris).

ALEXANDER D. NOYES.

Stockfish (from the German *stockfisch*): a name for cod-fish and related species salted and dried. The fishes are split from head to tail, and the vertebral column in part taken out; they are then thoroughly washed and rid of the blood; after the water has been drained off, they are put in large vats, salted, and heavy weights are imposed; they are next washed and brushed, and laid out on the sandy shore and rocks. Finally, they are combined in small heaps, and become ready for the market, this stage being indicated by the assumption of a floury whitish appearance, technically designated as the "bloom." Revised by F. A. LUCAS.

Stockholm: the capital of the kingdom of Sweden; beautifully situated at the outlet of Lake Mälär in the Baltic (see map of Norway and Sweden, ref. 11-G). It is divided into (1) Staden, the inner city, consisting of the islands of Stadsholmen, Riddarholmen, and Helgeandsholmen; (2) Norrmalm, the northern part, connected with the inner city by a magnificent bridge of granite; (3) Ladugårdslandet, now Östermalm, communicating W. with Norrmalm; (4) Kungsholmen, communicating E. with Norrmalm; (5) Södermalm, the southern suburb, connected with the inner city by two drawbridges; and (6) Saltsjö-bårne, comprising the islands of Skeppsholmen, Djurgården, Kastellholmen, and Beckholmen, which complete the picture of an island city cut up and traversed in all directions by water. In Staden, the most prominent building is the royal palace, one of the most beautiful in Europe (built 1697-1754), containing a rich library, the palace of the stadholder, the mint, the town-house, the church of St. Gertrude, Storkyrkan, the Finnish church. In the island of Riddarholmen stand the Riddarholm church, containing the royal tombs, among which are those of Gustavus Adolphus and Charles XII.; the new house of deputies, and the statue of Birger Jarl. The bridge which leads from the inner city across the Helgeandsholmen to Norrmalm is 380 feet long and 64 feet broad; on its eastern side extend the most beautiful promenades of the city, Strömparterren. This part of the city contains the Brunkberg Place, the Hay Market, and the Place of Charles XIII., surrounded on three sides by rows of linden-trees, on the fourth by the sea, and ornamented by the statue of Charles XIII.; the palace of the princes, the royal theater, the Hammer museum, the academy of fine arts, the academy of science with rich collections, the observatory, the national museum, and the Fersen Terrace, which offers a magnificent prospect. Ladugårdslandet contains the arsenal, the barracks, the veterinary school, the academy of arboriculture, and the Hedwig Eleonora church; the Kungsholmen, the Seraphim hospital the Carolinian institute, the garrison hospital; and close by are Mariaberg, the military high school, and Carlberg, the cadet school. In Södermalm are Mosebacken, which presents the finest view of the city, and the Catharine and Maria Magdalene churches. Södermalm and Norrmalm are connected by a railway which for bold-

ness in construction hardly has any equal in the world. The central depot in Norrmalm is a fine building, and next to the royal palace, the largest in the city. Burgundien is a stone line park of considerable size, the general resort for amusement and recreation of the city, occupying a peninsula—2 miles long and 1 mile broad—whose western boundary has been much improved by art. Communication between the various parts of the city is generally covered on by small steamboats which traverse the waters in all directions, with fixed routes and a cheap fare. The surroundings are rich in beautiful parks, palaces, and villas, of which the royal summer palace, Drottningholm, is the most noticeable. The city possesses excellent water-works. The industry is considerable, especially in manufactures of tobacco, leather, linen, and cotton fabrics, iron, sugar-refining, etc. Commerce is also considerable, though navigation is closed each year for about five months, during which the harbor is covered with ice.

The town was founded toward the end of the twelfth century by King Knut Eriksson, and given the rank of city in 1286 by Birger Jarl. In 1289 it was taken by Margarethe, Queen of Denmark. On Oct. 14, 1471, the Swedes under Sten Sture defeated the Danes at Brånksborg, close by Stockholm, and drove them out of the country; but in 1520 they again took the city under Christian II, and the Stockholm massacre took place; by the general rising which the massacre caused throughout the kingdom Gustavus Vasa succeeded in establishing himself on the throne. During the peaceful times of the nineteenth century the prosperity of the city, like that of all Sweden, has much increased. Pop. (1890) 557,997. Revised by M. W. HARRINGTON.

Stock'mar, CHRISTIAN FRIDRICH; diplomatist; b. at Cölnberg, Aug. 22, 1787; studied medicine, and became physician and confidential adviser to Prince Leopold of Coburg, and was very active in various diplomatic negotiations. He was the intimate friend of Prince Albert and Queen Victoria; received the title of baron. D. at Cölnberg, July 9, 1865. *The Denkwürdigkeiten aus den Papiere des Freiherrn Christian Friedrich von Stockmar*, edited by his son (Darmstadt, 1872), was translated into English, with the title *Selections from the Papers of Stockmar*, and contains many interesting illustrations of the interior working of English politics in its relations with the court. See Jastot, *Le Baron Stockmar* (Brussels, 1873), and Catherine von Bauer's *Memories* (Kug. teins, 1864).

Stockport, town; in Cheshire, England; at the confluence of the Mersey and the Tame; 6 miles S. E. of Manchester (see map of England, ref. 7-G). It is irregularly built on rugged and uneven ground across a gorge spanned by a viaduct of the London and Northwestern Railway; has a number of fine modern buildings, including a market-hall and a technical school, etc. It is an important seat of the cotton industry, and has also breweries, brass-foundries, iron-foundries, machine-shops, etc. Stockport was the site of a Roman station, and afterward of a Norman castle which was destroyed during the parliamentary war. It returns two members to Parliament. Pop. (1891) 70,231.

Stocks, a wooden apparatus formerly much used in different parts of continental Europe and Great Britain for punishing petty offenders and vagrants. It consisted of two heavy timbers placed one above the other, with corresponding notches made in each, and so arranged that when the upper timber, which was movable, was shut down in place and fastened, holes were formed in which the wrists of the offender were secured. There were sometimes other holes for the hands, and in some cases a hole for the head. Stocks were first introduced into England probably about the time of the Statute of Laborers, 33 Edw. III. (1359), which provided that they be erected in every town; and by subsequent statutes this punishment was inflicted for minor offenses of various kinds down to very recent times. In the U. S. they were used to punish slaves. Stocks may still be seen in some villages in England.

F. STURGEON ALLEN.

Stocks and Stock Certificates; in the U. S., the collective name for the shares or a number of shares of a concern (usually a corporation, or the fund employed in the carrying on of its business or enterprise. In Great Britain the aggregate amount of the capital invested in a concern is called stock when it is not divided into shares, but, with certain limitations, into any such amount as a purchaser desires. In Great Britain the term stock is also applied to money lent to a government, or the fund or obligation consisting of a capital

debt by the Government to individual holders who receive interest at a fixed rate. This latter kind of stock, however, is a variety of public bonds.

Method of issuing stock.—A concern, in issue stock, need not necessarily be a corporation, but most of the stock in existence is issued by corporations. The capital stock of business corporations is usually divided into equal parts, called shares, the ownership of which confers a proportional right in the management of the company and to its profits, and in its assets upon dissolution. The amount of the capital itself, the number of its shares, and the par value of each are entirely arbitrary, and are fixed by the charter. The par value of shares is usually fixed at \$100, and otherwise, with very few exceptions, either at \$25, \$50, \$1000, or \$1500. This matter is often regulated by statute. The ownership of shares is usually evidenced by a stock certificate issued to each stockholder, certifying in substance that he is the holder of a designated number of shares. These stock certificates are not essential to the ownership of the shares or to their transfer, but they are merely the tangible evidences of the ownership of the shares and of the rights and duties attending to the ownership. They are negotiable, as are other physical chattels.

Kinds of Stock or Shares.—The stock of a corporation is frequently divided into two or more classes, with different rights and liabilities. The most common kinds are *common stock*, which is stock which entitles the owners to an equal proportionate dividend of the corporate profits and assets, with one shareholder or class of shareholders having no advantage, priority, or preference over another; and *preferred stock*, which is stock which entitles the owners to dividends out of the net profits before, or in preference to, the holders of common stock.

Other less common forms of stock are *deferred stock*, the payment of interest upon which is expressly postponed until some other class of shareholders are paid a dividend; and (under Massachusetts law) *special stock*, which is a legal statutory kind limited to two-fifths of the actual capital of the corporation, subject to redemption at par after a fixed time, and upon which the corporation is bound to pay a fixed half-yearly sum or dividend as a debt. The holders of this stock are in no event liable for debts beyond the amount of their stock.

The term *watered stock* does not designate any special class of stock issued, but is used to designate any stock issued as fully paid up when any amount less than the whole amount has been paid; that is, it is stock which purports to represent, but does not represent in good faith, money paid into the treasury of the corporation or money's worth actually contributed.

In Great Britain and France there is frequently issued a class of stock called *founders' shares*, the ownership of which entitles the holders to take the profits after certain other dividends are paid. They are a sort of deferred stock, and sometimes acquire great value. The term *scrip* is there in common use to designate a written acknowledgment by a corporation that the holder will be entitled to certain shares of stock and a certificate thereof when unpaid installments are paid. Another kind of stock issued in Great Britain and unknown in the U. S. is *debenture stock*, the issue of which is provided in the Companies Act, and which is a charge on the net earnings and profits of the corporation.

Issue of Stock.—It is not essential to the existence and continuance of a stock corporation that any stock certificates should be issued, but when the right is exercised it must generally be exercised for the benefit of all. The two general methods of issuing stock are (a) in pursuance to an agreement of subscription, and (b) by way of disposing of a surplus, or, as it is commonly called, by way of a stock dividend. A subscriber need not necessarily pay his subscription before he becomes entitled to his stock certificates. The issue of stock, the amount of the shares, the terms upon which it may be issued, the capitalization of the corporation, etc., are generally regulated by statute. Stock must be issued in strict conformity to the provisions of the corporation charter, and the unanimous consent of the stockholders will not validate either an over-issue of stock or reduction of the capital stock, except in strict compliance with the provisions of statutes.

The Legal Nature of Stock as Property.—With few exceptions, the English courts and the courts of the U. S. have held shares of stock to be personally, and in the nature of a chose in action. Shares of stock at the common law are therefore not subject to attachment or execution; and

under the English doctrine they are held not to be goods, wares, and merchandise, within the meaning of the clause of the Statute of Frauds, which requires delivery, payment, or a memorandum in writing to make valid a contract for the sale thereof. The contrary doctrine is held in the U. S.

Transfer of Stock.—The right of transferring stock is incidental to its ownership; and, although the officers of a corporation can not take away the right of reasonable transfer, they may make reasonable regulations governing it. The mode in general use, and often prescribed by statute, is as follows: A book is kept by some designated officer, in which is registered each certificate of shares, and the name of the person to whom it is issued. In order to complete a legal transfer, the holder of the certificate must surrender it up to this officer, who thereupon issues a new one for a like amount to the assignee, and registers it in the transfer-book, and cancels the old record. To obviate the necessity of the personal appearance of the assignor to surrender his certificate, it is the universal practice to print upon the back of the certificate a power of attorney to be signed by the assignor, constituting the assignee an agent to make the surrender, and perform such other acts as may be necessary to procure the cancellation and receive a new certificate. This power of attorney is often made out with a blank left for the name of the agent, and the instrument signed or indorsed in this form is passed from hand to hand through many successive owners, until some one inserts his own name, surrenders the certificate, and takes a new one.

Most corporations require, either in their charters or by-laws, that stock shall be transferable only on the books of the company. It is generally settled that a transfer otherwise regular but not registered as required is valid, and passes the interest of the transferor as between the parties. Where the rights of third parties are involved, the decisions vary as to the effect of the transfer. Except in a few cases, as where the transferor is indebted to the corporation and holds stock which is subject to a lien, or where no surrender has been made of the certificate, a corporation can not refuse to register a transfer of the stock upon the demand of the proper party; and in case of refusal, the registration of transfer may be enforced by either of several remedies—an action in equity; according to the same authorities, mandamus to compel registration; and an action at law for damages.

In the case of forged transfers, a corporation is liable to the real owner, and must make good any loss which he has suffered, and the same is true in various other cases, where the facts of the case are such as to charge the corporation with notice of the equity of the real owner.

Negotiability of Stock Certificates.—Stock certificates are not, strictly speaking, negotiable instruments; but they are practically treated in great financial centers as though they possessed the quality of negotiability. They are pledged as well as sold, and are thus used to a very great extent as collateral security for loans. Although the by-laws of a corporation may require a surrender, cancellation, and re-issue to complete a transfer and to create a perfect legal title, in the U. S. the doctrine of estoppel is applied to such an extent as to protect a *bona-fide* purchaser of stock, in almost every instance, where he would be protected if he were purchasing a promissory note or other negotiable instrument; and the courts are constantly extending this application of the law of estoppel.

In Great Britain an entirely different rule prevails, and certificates of stock there are mere evidences of ownership of stock, and are not negotiable or quasi-negotiable. The purchaser is not protected against equities involved in the title of prior owners of the certificate, and can shut them off only by a transfer on the books of the company; and this rule is applied to certificates of stock issued by U. S. corporations and held by British subjects.

In the U. S., if the holder of a certificate signs a power of attorney in blank, then delivers the certificate into the possession of some person for a specific purpose, as for safe-keeping, and this person in violation of his duties fills up the blank and fraudulently surrenders the certificate, and procures another one to be issued to a *bona-fide* purchaser, it is very generally held that the real owner would be estopped by his act of indorsing in blank from setting up a claim against a *bona-fide* purchaser. In this way the substantial benefits of negotiability are secured.

For further information, see Cook on *Stocks and Stockholders*.
F. STURGES ALLEN.

Stockton: city; capital of San Joaquin co., Cal.; at the head of Stockton channel, which connects it with the San Joaquin river, and on the Southern Pac. Railroad; 50 miles S. by E. of Sacramento, the State capital, and 100 E. by N. of San Francisco (for location, see map of California, ref. 7-1b). The entire San Joaquin valley, the richest and most prolific section of country in the world, 300 miles long and 100 miles wide, with its numerous cities and towns, is tributary to the city as a commercial and shipping point. Stockton is well laid out; has paved streets, four public squares, embellished with semi-tropical plants and flowers, excellent transportation facilities by rail and water, electric street-railway, gas and electric lights, thorough sewerage, and a water-supply from artesian wells; and contains 20 natural gas-wells, with a daily flow of over 500,000 cubic feet. The average temperature is 40° in winter and 75° in summer, and the death-rate is the lowest in the State. The public buildings include a granite court-house, which cost \$300,000; the Hazleton Public Library, of marble, cost \$85,000; the State Insane Asylum, which cost \$600,000; and the county jail.

Churches and Schools.—The principal religious denominations are represented by substantial church edifices. The public-school system has a high school and 12 grammar-school buildings, property valued at about \$270,000, enrollment (1894) 2,788, and annual expenses over \$67,000. St. Agnes's convent and St. Joseph's Primary School, under the Sisters of St. Dominic, are model institutions, with buildings and grounds covering an area of three blocks. There are also a business college and normal institute and several private schools of high grade.

Finances and Banking.—The annual revenue is about \$245,000; tax-rate, \$1.75 per 100; bonded indebtedness, \$370,000. There are 5 banks: the First National, with capital and surplus of \$436,000; Farmers' and Merchants', \$400,000; Stockton Savings, capital and reserve \$475,000; Stockton Savings and Loan Society, capital \$500,000, deposits \$1,600,000; and San Joaquin Valley, capital and surplus \$250,000.

Business Interests.—Stockton is an important manufacturing city, containing extensive flour, woolen, lumber, and paper mills, agricultural-implement works, foundries, ship-yards, machine-shops, and terra-cotta works. It is the wheat center of the State and one of the principal wheat-markets on the Pacific coast.

History.—The city was laid out in 1849 by Charles M. Weber, who owned a large tract of land under a Mexican grant; first became important as a point of departure for gold-mining parties, and has since prospered as a commercial and wheat-distributing center. Pop. (1880) 10,282; (1890) 14,424; (1895) estimated, 18,000. J. M. REUCK.

Stockton, ALFRED AUGUSTUS, Q. C., LL. D.: Canadian publicist; b. at Stockholm, King's County, New Brunswick, Nov. 2, 1842; graduated at Mt. Allison College in 1864; admitted to the bar in 1868. He is an examiner in arts in Mt. Allison College, an examiner in law at Victoria University, president of the New Brunswick Historical Society, and registrar of the court of vice-admiralty of New Brunswick. He has been a member of the New Brunswick House of Assembly since Aug. 23, 1883. He has edited, with copious notes, Berton's *Reports of the Supreme Court of New Brunswick*.
NEIL MACDONALD.

Stockton, FRANCIS RICHARD: humorist; b. in Philadelphia, Apr. 5, 1834. After graduating from the Philadelphia high school, he applied himself to wood-engraving and to literature, contributing illustrations to *Vanity Fair* and other periodicals, and issuing a number of stories for children, such as *The Ting-a-Ling Stories* (1869); *Tales Out of School* (1875), etc. He was employed successively upon the *Philadelphia Post*, the *New York Hearth and Home* (1872), *Scribner's Monthly* (afterward *The Century Magazine*), and *St. Nicholas* (1873). The first of his books to attract general notice to him, as a humorist of a new and original vein, was *Rudder Grange* (1879). This was followed by *The Lady or the Tiger?* (1884); *The Late Mrs. Null* (1886); *The Casting Away of Mrs. Lecks and Mrs. Aleshine* (1886); *The Dusanles* (1888); *The Merry Chanter* (1890); and many others.
H. A. BEERS.

Stockton, RICHARD: jurist; b. near Princeton, N. J., Oct. 1, 1730; graduated at the College of New Jersey in 1748; admitted to the bar in 1754; became member of the executive council in 1768, and judge of the Supreme Court of the province of New Jersey in 1774. He attempted to effect a reconciliation between the colonies and Great Britain, and

to this and submitted to Lord Dartmouth in 1771 "an expedition for the settlement of the American Dispute," in which he proposed a plan of self-government for the colonies; but in 1776 he was chosen a delegate to the Continental Congress, and was one of the signers of the Declaration of Independence. In Nov., 1776, he was captured by a party of royalists, who threw him into prison in New York, where he was treated with great severity; his library was destroyed, and his lands laid waste; he was finally exchanged, but never fully recovered from the effects of the ill usage which he had received. D. at his home near Princeton, Feb. 28, 1781. In 1809 his statue was placed by the State of New Jersey in the Capitol at Washington.

Stockton, Richard Field: naval officer; son of Richard (1764-1829), jurist and U. S. senator; b. at Princeton, N. J., Aug. 20, 1795; studied at the College of New Jersey, but left to enter the navy as a midshipman Sept. 1, 1811; became a lieutenant 1814; negotiated in 1821 the purchase from African native chiefs of the territory constituting the republic of Liberia; took part in the extermination of piracy in the West Indies; surveyed the Atlantic coast of the Southern States 1822-24; became commander 1830 and post-captain Dec. 8, 1838; was flag-officer of the Ohio in the Mediterranean 1838-39; declined the secretaryship of the navy 1841; was an early advocate of a steam navy; superintended the construction of the ship Princeton, the first successful war-steamship, 1842; was chosen to carry to Texas the resolution of annexation 1845; proceeded to the Pacific as commander of the U. S. squadron on the coast of California Oct. 1845; took possession of California for the U. S. Government, and formed a provisional government 1846; resigned from the navy May 28, 1850; was U. S. Senator 1851-53; was nominated in 1856 for the presidency by the newly formed "American party," but the ticket was withdrawn before the day of election. D. at Princeton, Oct. 7, 1866. See his *Life, Speeches, and Letters* (1866).

Stockton-on-Tees: town; in the county of Durham, England; on the left bank of the Tees, 4 miles from its mouth, 11 miles E. N. E. of Darlington (see map of England, ref. B-H). A new town which has sprung up on the right bank of the river is known as South Stockton, the two being connected by an iron bridge of three arches built in 1787. The Tees is navigable for vessels of large tonnage up to the town, and the navigation of the river has been much improved. The town is well built, and has flour-mills and spinning-mills, breweries, blast furnaces, foundries, engine-works, and building-yards for iron ships, and carries on a considerable trade in wheat, coal, iron, and timber. The Stockton and Darlington Railway, opened Sept. 27, 1825, was the first railway to begin passenger traffic. Pop. of the parliamentary borough, returning one member, (1901) 68,803.

Stoddard, Charles Andrews, D. D.: editor; b. in Boston, Mass., May 28, 1833; educated at Williams College, New Church College, Edinburgh, Scotland, and Union Theological Seminary; pastor of Washington Heights church, New York, 1858-63; and since 1863 editor of *The New York Observer*. Dr. Stoddard has published *America Russia* (New York, 1861); *Spanish Cities* (1862); *Beyond the Rockies* (1864); and many sermons and pamphlets. C. K. R.

Stoddard, Charles Warren: poet and traveler; b. at Rochester, N. Y., Aug. 7, 1843; educated at New York and California. In 1864 he visited the Hawaiian archipelago, where he has since resided at various times, and to which his writings largely relate. These include *Poems* (1867); *South Sea Idylls* (1876); *Makahala: a Flight into Egypt* (1881); and *The Legends of Molokai* (1885). In 1872-78 he traveled extensively as foreign correspondent of *The San Francisco Chronicle*. In 1885-89 he was Professor of English Literature at the University of Notre Dame, Indiana, and subsequently lecturer on English literature at the Catholic University of Washington, D. C. H. A. REXES.

Stoddard, Richard Henry: journalist and poet; b. at Hingham, Mass., July 2, 1825; was taken to New York when a child; attended the public schools of that city; became a bookbinder in an iron-foundry; contributed poems to various periodicals and in 1849 privately printed *Printed Poems*, a small volume of poems, followed in 1852 by a larger volume. From 1853 to 1873 he held appointments in the New York custom-house and bank department; was literary editor of *The New York World* in 1860-70, and in 1880 became literary editor of the *New York Mail and Express*. Besides numerous contributions in prose and verse to periodicals, he

has published *Adventures in Fairy Land* (1853); *Songs of Nature* (1855); *Down and Country* (1857); *Life, Travels, and Books of Alexander von Humboldt* (1860); *The King's Roll* (1862); the story of *Little Red Riding Hood* in verse (1865); *The Children in the Wood*, in verse (1865); *Alexander Lincoln, a Harbinger Tale* (1867); *Palmers the Brave* (1869); *The Book of the East*, a collection of his later poems (1871); a collection of his *Poems* (1880); and *The Lion's Cub*, poems (1889). He has also edited many volumes. See *Stoddard's Poets of America*, pp. 57-59.

Revised by H. A. REXES.

Stoever, Martin Luther, Ph. D., LL. D.: scholar and editor; b. at Germantown, Pa., Feb. 17, 1820; graduated at Pennsylvania College, Gettysburg, 1838; was tutor in Pennsylvania College, 1839-40, afterward principal of its preparatory department, and Professor of Latin, History, and Political Economy until his death July 22, 1870. He was for many years secretary of the General Synod of the Lutheran Church and editor of *The Evangelical Quarterly Review*, in which he published an interesting series of *Reminiscences of Lutheran Ministers*; edited *The Literary Record* (1847-48); wrote biographies of Dr. Henry M. Muhlenberg (1856) and of Dr. Philip F. Mayer (1859), and a *Brief Sketch of the Lutheran Church in the United States* (1860), and had made extensive preparations for a fuller history of the same subject. Revised by H. K. JACOB.

Stoics [from Lat. *Stoici* = Gr. *Stoikoi*, liter., belonging to the Porch, deriv. of *Stoa Basileia*, the Painted Porch at Athens in which the Stoics were wont to gather]; an ancient philosophic school founded about 310 B. C. by Zeno of Citium in Cyprus (flourished about 290-260). He numbered among his immediate disciples Pericles of Citium, Aristo of Chios, Herillus of Carthage, and Cleanthes of Assos, who succeeded his master. Cleanthes was succeeded by Chrysippus of Soli, who refused the Stoic doctrines to something like a system, and he by Zeno of Tarsus. Other celebrated Greek Stoics were Diogenes of Babylon, Antipatros of Tarsus, Panaetius of Rhodes, and Posidonius of Apamea. Owing mainly to Panaetius, Stoicism found numerous disciples among the Roman nobility, and for centuries exercised a great and good influence upon the stronger minds of the empire. Among the Roman Stoics may be mentioned Q. Muscius Scaevola, L. Annæus Cornutus, A. Persius Flaccus, L. Annæus Seneca, C. Muscius Rufus, Epictetus, and the Emperor Marcus Aurelius.

Stoicism was an offshoot from Cynicism, Zeno having been at first a disciple of Crates the Cynic; but it dropped some of the most objectionable elements of Cynicism, and became a civilized philosophy. It was divided by its adherents into three parts—logic, ethics, physics—of which the last was held to be most important, although the second received by far the most attention. Indeed Stoicism, like all the post-Aristotelian philosophies of antiquity, was essentially ethical.

(A) Under logic the Stoics included dialectic and rhetoric, the former of which was in reality a theory of cognition. They attached great importance to what they called a criterion of truth, although they were never able to fix upon any that would satisfy them as absolute. Their theory of sense-perception was essentially the same as that of Locke, the sentient soul being considered as a *tabula rasa*, impressed or otherwise affected by external objects. Perception was followed by memory and conception. Their highest concepts (*τὰ γενικώτατα*), by which they replaced Aristotle's ten categories, were (Trendelenburg, *Kategorienlehre*, p. 220, seq.)—

1. *Υποκειμενα* substrata.
2. " *κατα* qualified (essentially).
3. " *κατα* *συμπερα* accidentally.
4. " " *απλα* *κατα* their relation.

The Stoics, in the matter of general terms, were nominalists, or, more strictly, conceptualists. Under dialectic they included grammar, in the development of which they did some very good work. See Lasebi, *Die Sprachphilosophie der Alten*, pt. II, pp. 25, seq.; Steinthal, *Gesch. der Sprache bei den Griechen u. Römern*, pp. 777-789.

(B) Under physics the Stoics included theology. They repudiated Aristotle's plurality of causes by a duality, viz., force and matter, inseparable, and conceived very much as they are by modern physicists. Everything, even God, contains both. Their physical theory was in the main that of Hæcætus (p. 8), even down to the notion of a peribolical *κόσμος* or return of the universe to primeval fire. At the base of all lies necessity or providence—a tenet perhaps borrowed

from Empedocles (*περί φύσεως*, line 1). With periodical conflagration, individual immortality (resurrection of the body) was of course incompatible. The individual, a mere temporary emanation, returns at last to his source.

(C) In their *ethics* the Stoics, if not what is now called altruistic, were essentially unselfish—that is, they rigidly maintained that the end of life was virtue for virtue's sake. What virtue was they found it difficult to define, their "living agreeably to nature" being very vague, not to say that they sometimes made nature mean human nature, sometimes universal nature. Man exists for society, for only in that is virtue possible. Virtue is sufficient for happiness; and pleasure, which naturally accompanies activity, is not to be sought for its own sake. The cardinal virtues are practical wisdom, courage, self-restraint, and justice (*φρόνησις, ἀνδρεία, σωφροσύνη, δικαιοσύνη*), and it requires the possession of them all to constitute the truly wise man, who is free and the equal of Jupiter himself. The Stoics drew a broad distinction between acts and motives, and made the moral quality of acts depend entirely upon motives. Man shall do that which is good independently of surrounding influences and circumstances, and, having done that which is good, he shall feel happy independently of the sufferings and misery which may result from his acts. Of the works of the Stoics only fragments remain, the most important of which is Cleanthes's splendid *Hymn to Zeus*, of which there is an English rendering in Francis Newman's *The Soul, its Sorrows and Aspirations*, and another in *The Radical* (Boston, 1867). The best and most complete presentation of the Stoic philosophy is in Zeller's *Philosophie der Griechen* (vol. iv., pp. 26–340). English translation, *The Stoics, Epicureans, and Skeptics* (London, 1869). See also Ravaisson, *Essai sur le Stoicisme* (Paris, 1856); W. W. Capes, *Stoicism* (London, 1880); H. W. Bann, *The Great Philosophers* (2 vols., London, 1882).

THOMAS DAVIDSON.

Stokes, Sir GEORGE GABRIEL, F. R. S.: mathematician and physicist; b. at Skreen, Sligo, Ireland, Aug. 13, 1819; educated at Bristol College; graduated 1841 as senior wrangler at Cambridge, and was elected to a fellowship in Pembroke College; and in 1849 was elected Lucasian Professor of Mathematics in that university; was elected to the Royal Society in 1851, and was awarded the Rumford medal of that society 1852; was secretary 1854–85, and was president 1885–90. From 1886 to 1893 he was member of Parliament for Cambridge, and in 1889 he was made a baronet. He contributed a report on hydrodynamics to the British Association in 1846, which contains many valuable investigations of his own, and several memoirs to the *Philosophical Transactions* on the dynamical theory of diffraction and the theory of fluorescence and phosphorescence, and has written papers in several scientific journals. In 1884–86 he delivered popular lectures on light at Aberdeen, which were published in 3 vols. (1887). His mathematical and physical papers have been reprinted (2 vols., 1880–83).

Stokes, WHITLEY: Celtic scholar; b. in Dublin, Ireland, Feb. 28, 1830; educated at Trinity College, Dublin; barrister in London; barrister in Madras 1862; connected with the law department of the Government of India 1864–82, rendering important service in the codification of the Anglo-Indian laws. His chief activity has been in the field of Celtic philology, where he is a scholar of great accuracy and wide acquaintance with the materials involved. He is the author of *Irish Glosses* (1860); *The Play of the Sacrament, a Middle English Drama* (1862); *Three Irish Glossaries* (1862); *Gwreans an Bys, the Creation of the World, a Cornish Mystery, with a Translation and Notes* (1864); *The Indian Succession Act* (1865); *Hindu Law-books, edited with Notes and an Index* (Madras, 1865); *A Cornish Glossary* (1870); *Goidelica* (2d ed. 1872); *The Old Welsh Glosses on Martianus Capella* (1872); *Life of St. Meriasek, a Cornish Drama* (1873); *Three Middle Irish Homilies* (1877); *On the Calendar of Oengus* (1880); *Togail Troy* (1881); *The Anglo-Indian Codes*, editor (2 vols., 1887–88); *Urkeitscher Sprachschatz*, in vol. ii. of Fick's *Vergl. Wörterb.* (1894).

Revised by BENJ. IDE WHEELER.

Stokes' Law: See FLUORESCENCE.

Stoke-upon-Trent: town; in Staffordshire, England; on the Trent; 16 miles N. of Stafford (see map of England, ref. 8–G). It is the capital of the Potteries district, producing earthenware, porcelain, encaustic tiles and pavements. Coal-mining and brick-making are also carried on, and engines, machinery, etc., are manufactured. Pop. of the parliamentary borough, returning one member, (1891) 75,352.

Stolz, stölts, FRIEDRICH: philologist; b. at Hall, in the Austrian Tyrol, July 29, 1850; studied at the gymnasiums of Hall and Innsbruck, and at the Universities of Innsbruck and Leipzig; teacher successively in the gymnasiums of Görz, Klagenfurt, and Innsbruck; since 1887 professor in the University of Innsbruck. He is the author of *Die zusammengestellten Nomina in den homerischen und hesiodischen Gedichten* (1874); *Die lateinische Nominalcomposition in formaler Hinsicht* (1877); *Beiträge zur Declination der griech. Nomina* (1880); *Studien zur lateinischen Verbalflexion* (1882); *Lateinische Laut- und Formenlehre* in Müller's *Handbuch der Alterthumswissenschaft* (1885; 2d ed. 1889); *Die Urbewölkerung von Tirol* (1886; 2d ed. 1892); *Historische Grammatik der lateinischen Sprache*, vol. i., *Einführung, Lautlehre, und Stammbildungslehre* (1894).

BENJ. IDE WHEELER.

Stomach [from Lat. *stomachus* = Gr. *στόμαχος*, throat, gullet, stomach, deriv. of *στόμα*, mouth]: the chief organ of digestion; the expansion of the anterior portion of the alimentary canal for the reception of food, its disintegration and solution, and the digestion of albuminoid matter. The stomach is situated on the left side of the body, below the diaphragm, behind and beneath the free ribs. Its lower extremity extends across the median line. It is a membranous bag or sac, capable of great distension by food and gas, but often flaccid and collapsed when empty. When full it is 12 inches long and 4 high. The oesophagus through its heart orifice, so termed because adjacent to the heart. The body of the stomach is beneath the ribs on the left side, and is termed the *fundus, cul de sac*, or *great pouch*. The *greater curvature* of the stomach is the lower, convex surface; the *lesser curvature* is concave and above. Food leaves the stomach through its lower orifice, the *pylorus* (Gr. *πυλωρός*, from *πύλη*, a gate), and enters the duodenum, the first section of the small intestine. The stomach has four coats: (1) The external serous layer, a reflection of the peritoneum, covering it at all points except the entrance of the nutrient vessels and nerves in the great and small curves. (2) The muscular layer, which has three separate sets of fibers—the longitudinal, the circular, and the oblique. These muscular bands, acting in different directions, propel the contained food from side to side of the cavity, aiding in its chemical disintegration by thorough admixture with gastric juice. This spiral movement is termed *vermicular* (worm-like), and also *peristaltic* (Gr. *περιστέλλω*, to surround or wrap up). (3) The cellular coat, consisting of loose areolar tissue, connects the muscular to the internal mucous layer. It is called also the sub-mucous coat and the vascular coat, as it contains the blood-vessels which supply the elaborate capillaries beneath the secreting glands of the mucous membrane. (4) The mucous coat is thick, especially at the lower or pyloric end, presents large longitudinal folds when the stomach is but partially filled or empty, which disappear when it is distended. Closely inspected, the mucous surface is found to



FIG. 1.—Section of oesophagus, stomach, and duodenum.



FIG. 2.—The muscular coat of the stomach.

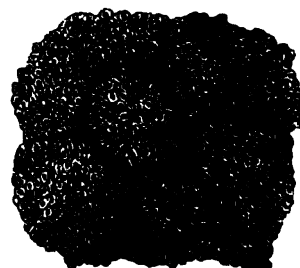


FIG. 3.—The mucous membrane of the stomach, orifices of the glands; magnified 20 diameters (Sappey).

the blood-vessels which supply the elaborate capillaries beneath the secreting glands of the mucous membrane. (4) The mucous coat is thick, especially at the lower or pyloric end, presents large longitudinal folds when the stomach is but partially filled or empty, which disappear when it is distended. Closely inspected, the mucous surface is found to

be perforated by innumerable closely aggregated orifices of the gastric tubules. These are of two kinds: (1) the peptic glands situated in the cardiac and central parts of the organ, and (2) the pyloric situated at the pyloric end. The stomach is constantly lubricated by secreted mucus, which may become excessive in digestive disorders. Gastric juice is chiefly secreted after the ingestion of food. (See DIGESTION.) The stomach is intimately related to important adjacent viscera by both vascular and nerve connections. Its main artery, the gastric, springs from a common root with the hepatic and splenic arteries, and it also receives two branches of each of them. By branches of the sympathetic nervous system its functional activity is influenced by the health of each organ and part of the body; it receives the terminal branches of the pneumogastric nerve, which gives off branches controlling the action of the heart, lungs, and in



FIG. 4.—A peptic gland, magnified 100 diameters (Sappey).

a measure the larynx and pharynx. It is by these connections that gastric indigestion may cause palpitation of the heart, difficult and sighing breathing, irritability of the larynx, and hoarseness, and by reflex influence many morbid sensations in various parts of the body.

The most frequent diseases of the stomach are its functional disorders. (See DYSPEPSIA.) In addition to these milder and chronic conditions, the stomach is liable to acute and organic disease. Acute inflammation or gastritis is of rare occurrence, the result of violent mechanical or chemical irritation, swallowing corrosive poisons or putrid and acrid food. It is characterized by violent ejection of all food, gastric mucus, traces of blood and bile, by sense of local burning pain, feeble pulse, cold extremities, and collapse. Perforating ulcer of the stomach is a not infrequent disease in young women of anæmic character. The symptoms are pain in the stomach upon reception of food, its rejection, and occasional hæmorrhage when the ulcerative process has eroded a blood-vessel. Hæmorrhage from the stomach is termed *hæmatemesis*, and must be carefully discriminated from *hæmoptysis*, the spitting of blood from the lungs. Cancer of the stomach is a relatively common affection of old persons, particularly of the male sex. It often occurs in persons of cancerous family history, in others with no hereditary taint. When at the pylorus, food is detained in the stomach, and after a time is ejected in great quantity, mixed with mucus, blood, and many fungous products of fermentation. There is a local darting pain, and often a local indurated tumor felt at the epigastrium through the emaciated abdominal wall; the face is cachectic, the body wasted, strength fails, death comes by exhaustion. Extreme neuralgia of the stomach—gastralgia or gastro-dynia—may occur, dependent on deranged nerve-centers or rheumatic or gouty vice of the blood.

Revised by W. PEPPER.

Stomach-pump: a form of syringe which has a flexible tube, designed to be passed down the œsophagus into the stomach, after which water is injected through it into the stomach and then withdrawn by reversing the action of the syringe. The operation may be repeated until the stomach is thoroughly washed clear of its contents. The instrument is especially useful in removing poisons from the stomach. In case of insane persons, or where some disease of the mouth or œsophagus exists, artificial feeding is required, and is usually accomplished with a simple rubber tube. The same is used in the treatment of diseases of the stomach for the purpose of washing out that organ.

Revised by W. PEPPER.

Stomap'oda, Stom'apod, or Stomatop'oda [Mod. Lat.; Gr. *στόμα*, *στόματος*, mouth + *πόδος*, *ποδός*, foot]: a group of malacostracous crustaceans, embracing about sixty species of marine forms with elongate loose-jointed bodies. The carapax is small, having the last three thoracic rings free; the stalked eyes have a distinct ring; five pairs of feet are modified for maxillipeds, the second of these forming a strong pincer; and three pairs of thoracic feet, each of which is two-branched. The gills are borne on the abdominal feet. These characters mark the group off strongly from all other forms. They further differ from most crustaceans in that

they deposit the eggs in their burrows. The young, though large, are thin and transparent, and were long regarded as

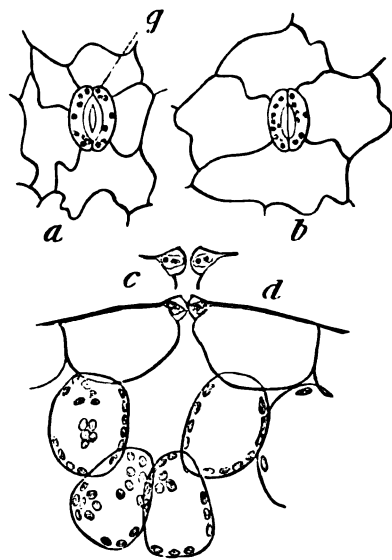


Mantis shrimp.

belonging to different forms. The species, which are known as Mantis shrimps, and which belong to the single family *Squilla*, are all inhabitants of the warmer seas, a single species occurring as far north as Massachusetts. See Miers, *Ann. and Mag. Nat. Hist.* (1880); Brooks, *Challenger Expedition*. J. S. KINGSLEY.

Sto'mate [from Gr. *στόμα*, mouth]: a breathing-pore in the epidermis of plants, consisting of two elongated, somewhat curved cells, the guard-cells (*g* in figure), between which is a definite opening. When the guard-cells curve away from one another, as they do when the atmosphere is moist, the slit between them is opened, permitting the free ingress and egress of gases. The stomates are always placed over intercellular spaces of the underlying tissues, an arrangement which permits an interchange of gases throughout the plant.

Stomates are found in some liverworts, where they are curious chimney-like structures, but in the nearly related mosses (where they are confined



Stomates of beet: a, top view, open; g, guard-cell; b, same closed; c, vertical transverse section, open; d, same closed, highly magnified.

to the capsules) they have essentially the same structure as in the flowering plants. In the fernworts they occur on the leaves and stems, and do not differ in any essential respect from those in the flowering plants. They rarely occur on submerged parts of plants, and in leaves which lie upon the surface of the water they are confined to the upper side. In ordinary leaves they are usually more abundant upon the lower side. In some, as in the compass-plants, they are about equally abundant upon both sides. The number of stomates on leaves varies very greatly. Weiss determined the number per square millimeter for the leaves of many species, and published the results in Pringsheim's *Jahrbücher für wissenschaftliche Botanik* (1865). A few of these are given below:

Olive (*Olea europea*), 625; hackberry (*Celtis occidentalis*), 616; black walnut (*Juglans nigra*), 461; lilac (*Syringa vulgaris*), 330; barberry (*Berberis vulgaris*), 229; golden currant (*Ribes aureum*), 145. In the foregoing, stomates occur on the upper side only; in the following they occur on both sides: sunflower (*Helianthus annuus*), upper, 175, lower, 325; cabbage (*Brassica oleracea*), u. 219, l. 301; pea (*Pisum sativum*), u. 101, l. 216; Indian corn (*Zea mays*), u. 94, l. 158; cottonwood (*Populus monilifera*), u. 89, l. 131; oats (*Avena sativa*), u. 48, l. 27.

In the development of stomates an epidermal cell undergoes division, usually into two unequal portions, and the smaller part is again divided in like manner. This may occur a third or even fourth time, when a last division into two equal parts (the guard-cells) takes place. These soon

become somewhat rounded and separate at the center by the splitting of the partition between them.

CHARLES E. BESSEY.

Stomatit'is: See MOUTH, DISEASES OF THE.

Stomatopoda: See STOMAPODA.

Stomat'idæ [Mod. Lat., named from *Sto'mias*, the typical genus, from Gr. *στόμα*, having a large mouth, deriv. of *σῶμα*, mouth]: a family of isospondylous fishes. The species are elongated and of a club-shaped form, tapering from before backward; the skin is naked, or covered with very thin and readily deciduous scales; opercular apparatus imperfectly developed and very oblique; mouth with a very deep lateral cleft; upper jaw with its margin formed by the supramaxillary as well as intermaxillary bones; teeth on the jaws acute, and often barbed; gill openings very deep and continuous below; branchiostegal rays numerous (twelve to seventeen); anal fin very far behind and small; caudal distinct; pectoral fins low down on the scapular arch, and narrow; ventral fins inserted far backward. The ovaries have oviducts, and consequently the eggs are discharged directly through them into the water. The family is composed of a few species, which are rather small (all being considerably less than a foot in length), and inhabitants of the open sea and deep water.

Stone [O. Eng. *stān* : O. H. Germ. *stein* (> Mod. Germ. *stein*): Goth. *stains*; cf. O. Bulg. *stēna*, wall, and Gr. *στῆν*, pebble]: in engineering, either natural or artificial rock suitable for use in foundations, walls, and piers. The natural sandstones, limestones, and granites furnish the greater part of all stone used in architecture and engineering. The essential qualities of a rock which renders it a good building-stone are strength and durability, while beauty and cheapness are desirable. The Egyptians quarried many very large stones for obelisks and for use in their temples, while from the earliest times stone-cutting has been a well-understood art. The cutting of dimension stones in the quarry by means of channeling-machines, introduced about 1870, has materially lowered the cost of many varieties of natural stone. See BUILDING-STONE for an account of the properties and methods of testing natural stone, and MASONRY for a description of the manner in which stones are laid together in buildings and engineering constructions.

Artificial stone consists of blocks or monolithic masses formed of materials which cement together. It is a combination of hydraulic cement, sand, crushed stone, pebbles, etc. Some varieties are of great value in districts where durable and cheap building-stone is not supplied by nature. The strength and durability of all varieties of artificial stone vary directly with the ultimate strength and hardness attainable by the hydraulic ingredients employed. An obvious means of improving their quality, therefore, is the employment of the highest grades of cement. Artificial stone may be made into blocks to be used as cut stone, or it may be built up into immense masses of any desired shape by moulding the different parts in place. The more important artificial stones are briefly described below. Most of these bear the names of their inventors.

CONCRETE (*q. v.*) is composed of hydraulic cement, sand, and broken stone or pebbles, and is much used in engineering construction. **Granolithic** is a trade-name for a combination of hydraulic cement and crushed granite (a granitic concrete), frequently employed for sidewalks and curbs, and for floors in stables, cellars, breweries, etc. **Béton-Coignet** is a combination of hydraulic cement, hydraulic lime, and sand, much used in France. The peculiarities are the substitution of hydraulic lime instead of part of the more expensive and stronger cement, and the small quantity of water used, and the thoroughness of the mixing. **Portland stone** is a name frequently given to a mixture of Portland cement and sand. The term Portland as applied to the stone, and also as applied to the cement of which it is made, was derived from the similarity of the artificial stone to the natural stone derived from the island of Portland, off the south coast of England. **McMurtrie stone** consists essentially of the Portland stone described above, in the pores of which are formed compounds of alumina with the fatty acids by the double decomposition of alum and a potash soap. The peculiar merit of this stone is that its power of absorbing water is decreased by the use of the alum and the soap. Absorbed water dissolves the salts of magnesia, lime, soda, and potash (of all of which there is always more or less in cement), and on evaporating leaves a white efflorescence on the surface which injures the appearance of the wall.

For this reason the ordinary artificial stones are in disfavor for architectural purposes. The **McMurtrie stone** has been used in Washington, D. C., to a limited extent, the window-trimmings of the National Museum and also the fronts of a few stores and dwellings being of this stone. **Frear stone** is composed of sand and Portland cement, to which gum shell-lac is added. The shell-lac adds to the early strength of the stone, but it is not certain that it adds to the ultimate strength. It was for a time much used in architectural work in the western parts of the U. S., but did not give satisfaction. **Ransome stone** is made by forming in the interstices of sand, gravel, or any pulverized stone a hard and insoluble cementing substance, by the natural decomposition of two compounds in solution. Sand and the silicate of soda are mixed in the proportion of a gallon of the latter to a bushel of the former and rammed into moulds. At this stage of the process the blocks or slabs may be easily cut into any desired form. They are then immersed, under pressure, in a hot solution of chloride of calcium, after which they are thoroughly drenched with cold water to wash out the chloride of sodium formed during the operation. In Great Britain grind-stones are frequently made by this process. **Sorel stone** has as its basis a cement formed by adding a solution of chloride of magnesium to the oxide of magnesium. The strength of this stone as well as its hardness exceeds that of any other artificial stone yet produced. This process was formerly used in making emery-wheels. Owing to the great strength of the cement only a comparatively small proportion is required. **Medusaline** is an artificial stone combining the peculiarities of the McMurtrie and Sorel processes. In one variety the inert material is sawdust and the product is used as fire-proofing.

IRA O. BAKER.

Stone: in Great Britain, legally a weight of 14 lb. avoirdupois; but other stones are in use, such as 24 lb. of wool and 8 of butcher's meat. In other European countries there are weights called stone differing in pounds avoirdupois, and chiefly employed for weighing wool, hemp, flax, and feathers, the stone for flax containing twice as many pounds as the one used for wool or feathers. In all the principal commercial states of Germany the stone (of flax) is the fifth of a hundredweight (centner = 100 or 112 lb.)—i. e. 20 lb. in Prussia and the Zollverein, Hamburg, Lübeck, and Bremen, 22 lb. in Austria, while in Sweden it is equivalent to 32 lb. The origin of this peculiar method of weight-measuring is rather obscure, and still more so is that of the different forms into which it has branched.

Stone (in pathology): See CALCULUS.

Stone, CHARLES POMEROY: soldier; b. at Greenfield, Mass., Sept. 30, 1824; graduated at the U. S. Military Academy in 1845; appointed a brevet second lieutenant of ordnance; served in the war with Mexico, and was breveted captain; constructed the arsenal at Benicia, Cal., and performed the duties of chief of ordnance of the division of the Pacific 1851-56; engaged in the banking business for a year in San Francisco; in 1857 was appointed by the Mexican Government chief of a commission to survey and explore its lands in Sonora and Lower California; was appointed Jan. 1, 1861, to organize and drill the District of Columbia militia for defense of the capital. Appointed colonel of the Fourteenth U. S. Infantry May 14, and a brigadier-general of volunteers May 17, he served under Gen. Patterson during the latter's operations in the Shenandoah in July. In Feb., 1863, he was placed in confinement in Fort Lafayette, New York harbor, and held until Aug. 9, when released, not only without charges being preferred against him, but without explanation of the cause of his arrest. In 1863 he served in the department of the Gulf; in 1863-64 was chief of staff to Gen. Banks; mustered out of volunteer service Apr. 4, 1864. He commanded a brigade of the Fifth Corps before Petersburg from Aug. 21 to Sept. 13, 1864, when he resigned from the army. He was in the military service of the Khedive of Egypt 1870-82; brigadier-general and chief of staff 1870; Ferik-Pasha 1873-83, a grade next below field-marshal; received numerous decorations and orders, and filled various confidential positions under the khedive. He was chief engineer for the erection of the Bartholdi statue of Liberty, New York. D. in New York, Jan. 24, 1887.

Stone, DAVID MARVIN: journalist and author; b. at Oxford, Conn., Dec. 23, 1817; was a merchant in Philadelphia 1842-49; obtained his earliest reputation as an author of poetry and light literature contributed to newspapers and magazines; became commercial editor of *The Journal of*

Commerce, New York, 1846; with William C. Prime purchased the paper in 1861, and a few years later became its editor-in-chief, which position he resigned in 1899, and of *Frank Forester*, which passed through more than thirty editions. D. in Brooklyn, N. Y., Apr. 2, 1899.

Stone, John S. 1823, D. D., clergyman, b. at West Stockbridge, Mass., in 1823; graduated at Union College in 1851; studied at the General Theological Seminary, New York, and took orders in the Episcopal Church 1856; was rector of churches at Edinfield, Conn., Frederick, Md., New Haven, Conn., Brooklyn, N. Y., Brookline, Mass., and of St. Paul's, Boston; lecturer in the Philadelphia Divinity School 1862-67; dean of the faculty of the Massachusetts Theological Seminary 1867-76. Besides several sermons and articles in periodicals, he published *Life of Bishop Griswold* (Philadelphia, 1841); *The Mysteries Unveiled* (New York, 1844; republished with title *The Christian Sacraments*, 1866); *The Church Universal* (1846), revised and enlarged as the *Living Temple*, 1899; *Life of Jesus Milner* (1848); *The Contrast, or the Evangelical and Trinitarian Systems Compared* (1853); *Lectures on the Christian Sabbath* (1867). D. at Cambridge, Jan. 15, 1892.—His son, JAMES KESE STONE, b. in Boston in 1840; graduated at Harvard in 1861; was ordained deacon and priest in the American Episcopal Church; professor (1863-67) and president (1867) of Kenyon College, Gambier, O., from which he received the degree of D. D. He was president of Hobart College, Geneva, 1868-69, but in 1870 entered the Church of Rome, becoming a Priest of the Order.

Revised by W. S. PERRY.

Stone, Lucy, reformer; b. at West Brookfield, Mass., Aug. 12, 1818; graduated at Oberlin College 1847; began to speak on woman's rights and anti-slavery in the same year; lectured through the U. S. and Canada to large audiences; helped organize the first national woman's rights convention at Worcester, Mass., in 1840; married Henry D. Blackwell in 1865; helped organize the New England Woman Suffrage Association in 1868 and the American Woman Suffrage Association in 1869, and was chairman of the executive committee of the latter for twenty years; established *The Woman's Journal* in Boston in 1870, and was its editor till her death, which occurred at Dorchester, Mass., Oct. 18, 1893.

Stone, THOMAS: a signer of the Declaration of Independence; b. at Pointon Manor, Charles co., Md., in 1743; was educated by a private tutor; studied law at Annapolis, and in 1764 began practice at Fredericktown. He was a member of the Continental Congress 1775-79, and advocated the establishment of an independent government, although at first instructed by the Legislature of Maryland to oppose it; the State receding from its opposition, he was one of the signers of the Declaration of Independence; was again elected to Congress in 1783, and was a member of the committee to draft a plan of confederation, and was appointed a delegate to the convention of 1787, but was unable to attend. D. at Fort Tabasco, Md., Oct. 5, 1787.

Stone, Age of: an archaeological term denoting the stage of development in which people used tools and weapons made of stone. It does not refer to general chronology, but to a period in the development of each race. Thus certain races of the South Sea Islands and extreme north have belonged to the stone age in the nineteenth century. It seems probable that in all parts of the world men have passed through this stage before making use of metals. (See BARREN, AGE OF.) In Europe the Stone Age is divided into two periods: the Palæolithic and the Neolithic. The remains of the former consist exclusively of flint, and roughly shaped by chipping into rude forms. The Neolithic implements include axes, batons, knives, etc. These are made of various stones, some finer specimens being of jade, and are often highly polished. See CHERT and LAKE-DWELLINGS. R. A. R.

Stone, Artificial: See STONE.

Stone-borer: any one of several bivalve molluscs belonging to several distinct families (*Pholidae*, *Gastropoda*, *Unionidae*, *Veneridae*, *Petriculidae*, and *Mytilidae*) which have the faculty of perforating stone. The boring is accomplished by the shell and by the rubbing of the foot sloughed with sand. Besides these molluscs, species of worms and earthworms also excavate stone, and to that extent may be called stone-borers. R. A. R.

Stone-chat: a bird, the *Protonotaria rubicola*. The male, in the breeding season, has the head, neck above, and back nearly black; the chin and throat black, and the neck on the

sides white; breast chestnut in front and lighter backward; the wing-coverts of the tertials white, but partly lost by the other coverts, which are blackish brown, edged with lighter brown; upper tail-coverts white, and tail-feathers blackish; tail and legs black. (Jewell.) The female is duller. The species is common in most parts of Middle Europe and Northern Africa. It is resident throughout the year in Great Britain, though mostly migratory in corresponding latitudes on the Continent. Its food is insects.

Stonecrop: the wall-pepper (*Sedum acre*). See WALL-PEPPER.

Stone-fly: any plecopteron insect of the family *Plecoptera*. See ECRONATOLOGY (*Plecoptera*).

Stone-fruits: a popular name for those fruits which are known in botany as drupes. Most of them belong to the genus *Prunus*, which includes plums, apricots, peaches, nectarines, and cherries. See DRUPE.

Stoneham: town (incorporated in 1725), Middlesex co., Mass.; on the Boston and Maine Railroad; 12 miles S. by W. of Boston (for location, see map of Massachusetts vol. 2-B). It is noted for its manufacture of shoes and leather, and contains a national bank with capital of \$50,000, a savings-bank, 6 churches, high school, 28 district schools, a public library, box-factory, machine-shops, and 2 weekly papers. In 1894 it had an assessed valuation of \$4,004,167. Pop. (1880) 4,580; (1900) 5,155. EIGHTH OF "INDEPENDENT."

Stonehenge [from Saxon *Stonhengest*, hanging stones]: a group of remains of rude-stone structures, standing on Salisbury Plain, 2 miles from Amesbury, Wiltshire, England. It is at present much defaced, but was composed somewhat as follows: At the center was a large slab of blue limestone, 16 feet in length, supposed to be an altar. Around this were nineteen granite posts, over 20 feet in average height, set in an ellipse. Around this was another ellipse of sandstone posts, bearing a transom or lintel of sandstone across the top. There seem to have been six of these triliths. Outside this ellipse was a circle of thirty rough pillars of granite, some 6 feet high. Outside of this there was a circle, about 100 feet in diameter, of thirty sandstone posts, 4 feet apart and 13 feet high. A horizontal course of stone, dovetailed and mortised to the top of the uprights and to each other, ran around this circle. Seventeen pillar-stones and six impacts retain their original positions. Without this circle there were a ditch and double mound of earth including an area of about 120 yards in diameter. Many sepulchral barrows are found in the vicinity. It was first mentioned in the twelfth century by Henry of Huntingdon and Geoffrey of Monmouth, whose account may be considered as giving the earliest beliefs with regard to the origin of Stonehenge. Numerous theories have been propounded, and Stonehenge has been attributed to the Phœnicians, Druids, Saxons, and Danes; but it is mostly regarded by later archaeologists as a burial-place of the people of the Bronze Age.

Stone Implements: See STONE, AGE OF; and INDUSTRY OF NORTH AMERICA.

Stone-lily: a crinoid having the form of a lily. See ECRINITE.

Stoneman, GEORGE, soldier; b. at Busti, N. Y., Aug. 8, 1822; graduated at the U. S. Military Academy in 1846, and entered the First Dragoons, which he joined at Fort Leavenworth, whence he conducted a supply-train to Santa Fé, N. M., where he became acting quartermaster of the Mormon battalion, which he accompanied to California in 1847. In Mar., 1855, he became a captain in the Second Cavalry, and served until 1861 mainly in Texas; was in command at Fort Brown in February, when he was ordered by Gen. Twiggs to surrender to the State forces, but refused to do so, and evacuated the fort. He was promoted to be major First Cavalry, May, 1861; served on the staff of Gen. McClellan in West Virginia; Aug. 19 was appointed brigadier-general of volunteers and chief of cavalry of the Army of the Potomac, which he organized and commanded during the Virginia Peninsular campaign of 1862; succeeded to command of Kearny's (first) division, Third Corps, on the death of the latter, and of the Third Corps Nov. 15, 1862; was promoted major-general of volunteers Nov. 29, 1862, and led his corps at the battle of Fredericksburg; commanded cavalry raid to Richmond Apr.-May, 1863; was chief of cavalry bureau July, 1863-Jan., 1864; in command of Twenty-third Corps Jan.-Apr., 1864; of cavalry corps department of Ohio Apr.-July, 1864, participating in the Atlanta campaign May-July, 1864; conducted a raid for the

capture of Macon and Andersonville and liberation of prisoners, but was compelled to surrender July 31, and held prisoner until Oct. 27; in temporary command of the department of Ohio Nov., 1864; in command of various districts and departments until mustered out of volunteer service Sept. 1, 1866; became colonel Twenty-first Infantry July 28, 1866; breveted colonel, brigadier, and major-general for gallant conduct; retired from active service Aug. 16, 1871. Resigned Sept. 15, 1882; Governor of California 1883-87. D. in Buffalo, N. Y., Sept. 5, 1894.

Stone-pine, Swiss: See CEMBRA PINE.

Stone River, Battle of: See MURFREESBORO.

Stoneware: See POTTERY AND PORCELAIN.

Stoneworts: the *Characeæ*, an order of lower plants, allied to the RED SEAWEEDS (*g. v.*) on the one hand and the

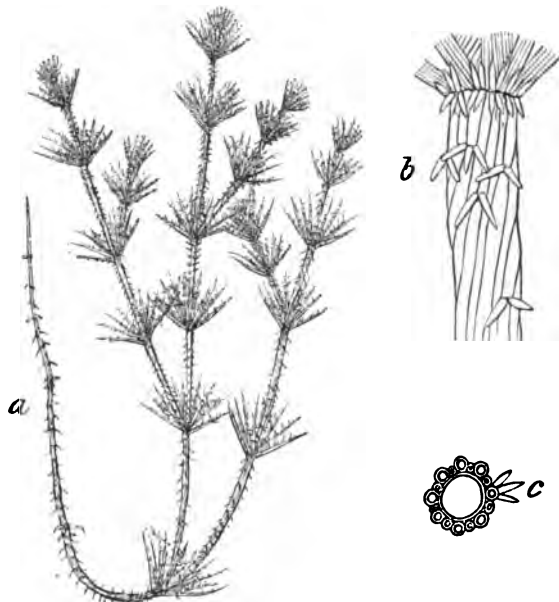


FIG. 1.—a, a stonewort (*Chara intermedia*), half the natural size; b, portion of stem, $\times 15$; c, cross-section of stem, $\times 15$.

Mossworks (*g. v.*) on the other. They are small, green aquatic plants with jointed stems, bearing whorls of leaves

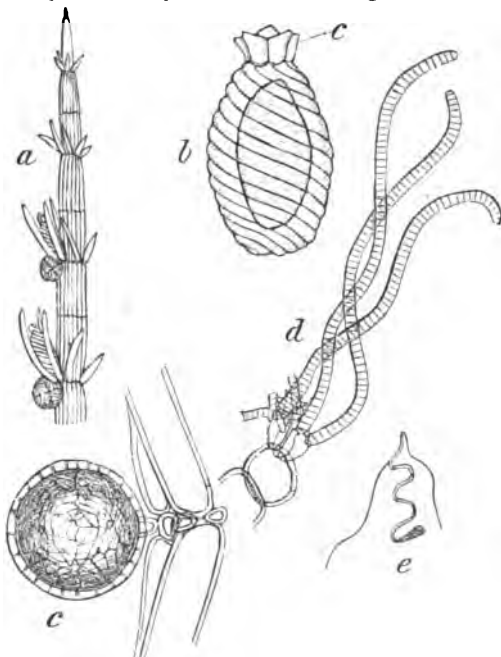


FIG. 2.—a, leaf, bearing young sexual organs, $\times 15$; b, carpogone; c, coronula, $\times 80$; c, antherid; d, threads from interior of antherid, $\times 200$; e, antherozoid, $\times 600$.

(Fig. 1). Both stems and leaves are very simple, being often no more than a row of cells, but sometimes a cylindrical mass of cells. The sexual organs, which occur upon the leaves, consist of antherids and carpogones. The former are globular bodies (Fig. 2), which at maturity are hollow and contain a number of short-celled threads. Each cell contains a spiral antherozoid, which, escaping into the water, swims actively with a rotating motion. The carpogone consists of a central cell, the oöspere, which soon becomes covered by a layer of spirally twisted cells, the pericarp, surmounted by one or two rows of short cells, the coronula (Fig. 2, b, c). Fertilization takes place by the entrance of the antherozoid through the opening in the coronula, and its fusion with the oöspere, which then acquires a thicker wall. This ripened spore-fruit soon falls to the bottom of the pond, and after a period of rest germinates by sending out a jointed filament, which eventually gives rise to a branching plant again.

The stoneworts number about 150 species, which are distributed among five genera and two families, viz., *Nitella* and *Tolypella*, constituting the family *Nitelleæ*, and *Lamprothamnus*, *Lychnothamnus* and *Chara*, constituting the family *Characeæ*. In North America there are about sixty-two species, widely distributed in ponds and slow streams.

The best works on the *Characeæ* are T. F. Allen's *Characeæ of America* (New York, 1888); W. Migula's *Die Characeen in Rabenhorst's Kryptogamen Flora von Deutschland, Oesterreich und der Schweiz* (Leipzig, 1890); and A. Brann's *Fragmenta einer Monographie der Characeen*, edited by O. Nordstedt (Berlin, 1882).

CHARLES E. BESSEY.

Stonington: town (incorporated in 1658); port of entry; New London co., Conn.; on Long Island Sound, and the N. Y., N. H. and Hart. Railroad; 12 miles E. of New London, one of the county-seats (for location, see map of Connecticut, ref. 11-L). It includes the borough of Stonington, the villages of Old Mystic, Mystic, and Pawcatuck, and the farming region known as the Road district. The town has an excellent harbor, protected by a breakwater, and is in daily steamboat communication with New York. The principal industries are the manufacture of silk and cotton machinery, cotton and woolen goods, printing-presses, paper-cutters, spools for silk and thread, velvet and thread, boilers, and iron and brass goods. Stonington has a national bank with capital of \$200,000, a savings-bank, and a weekly newspaper. In Aug., 1814, the town was bombarded by a British fleet, but the people successfully resisted occupation. Pop. (1880) 7,355; (1890) 7,184.

EDITOR OF "MIRROR."

Stony Point: town; Rockland co., N. Y.; at the head of Haverstraw Bay; on the west side of the Hudson river, and on the N. J. and N. Y., the N. Y., Ont. and W., and the W. Shore railways; 42 miles N. of New York (for location, see map of New York, ref. 8-J). It is on a rocky promontory, which was fortified early in the Revolutionary war, was captured, strengthened, and garrisoned by the British, was retaken by the U. S. forces under Gen. Wayne in a night attack July 16, 1779, and soon afterward the fortifications were destroyed and the place abandoned. The summit contains a lighthouse and fog-bell tower. The house in which Benedict Arnold held his treasonable interviews was destroyed by fire in 1892. Remains of the fortifications are still preserved. Pop. (1880) 3,308; (1890) town 4,614, village 514.

Stop: in the organ, a series or set of pipes of similar tone and quality, tuned in regular gradation according to the order of the scale, and corresponding with the key-board either in the whole or a part only of its range. These stops are either simple or compound. A simple stop (as a diapason, flute, or trumpet) has only one pipe allotted to each key on the keyboard, but in a compound stop (as the sesquialtera or mixture) there are from two to five pipes for each key. The stops in a large organ are not only of various qualities of tone—soft, loud, delicate, bold, shrill, and the like—or imitations of the trumpet, violin, flute, etc., but are also distinguished by peculiarities of pitch, some stops giving the sound represented by the finger-keys to which they belong, others the octave or double octave below or above, while others are tuned in triple octaves above, and even in double and triple thirds and fifths, the whole combining and blending together with united effect, as if each key sounded only one richly toned pipe. The theoretical basis of this latter class of stops is explained in the article HARMONIC STOPS (*g. v.*). Organ-pipes are of two classes—flue-pipes and reed-pipes. The former are either metallic cylinders of

various forms and proportions, with a mouth and lip resembling those of the ordinary pitch-pipe, or are square wooden tubes projecting round on the same principle. The latter are chiefly metallo tubes of tapering form, provided with flexible reeds of brass or other metal, the vibrations of which produce a sound softer and more penetrating than that of the diaphragm. Among the flutes are the diapasons, principal, twelfth, fifteenth, second, and the compound stops; also the gamba, krumpholzer, and the various flute-stops. In the class of reed-stops the most prominent are the trumpet, trombone, horn, bassoon, clarinet, oboe, hautboy, and cor anglais. See *Organ and Pipe in music*.

Revised by DONALD ROCK.

Stoppage in Transit [*in transitu* = Lat., in passage]: in law, stopping goods while they are in transit, and resuming possession of them by an unpaid seller, who has parted with their possession. The seller is allowed to exercise this right upon discovering the insolvency of the buyer, on the ground "that the goods of one man should not be applied in payment of another man's debts." The rule originated in obscure cases decided during the latter part of the seventeenth century, and was adopted by the common-law courts "for the benefit of trade." *Balliford v. Jones*, 3 East 181.

By whom exercised.—This right has been regarded with much favor by the courts that they have permitted not only sellers, but persons in the position of sellers to exercise it; for example, an agent of the seller to whom the bill of lading has been issued, or a consignee, or an agent of the buyer who has himself paid, or is directly responsible for, the price. (British Sale of Goods Act, 1893, § 49.) A seller is deemed unpaid when he has not been paid in full, or when he has received a negotiable instrument as conditional payment, which has been dishonored or has been discredited by the insolvency of the parties liable thereon to the seller. Nor does it matter that the buyer has negotiated such paper. A buyer upon credit is bound to keep his credit good, if he would prevent the unpaid seller from exercising his right of lien or of stoppage in transit.

Buyer's Insolvency.—This is the basis of the right in question. If the seller knew of the buyer's insolvency when the sale was made on credit, there would be no equity in permitting him to stop the goods after deliberately parting with their possession in favor of the insolvent (*Pentecost v. Williams*, 20 Nev. 313); but the fact that the buyer was insolvent when the sale was made, if unknown to the seller, does not affect the latter's right. (*Benedict v. Schuette*, 12 Ohio St. 515.) A buyer who disputes the rightfulness of a particular stoppage of goods, by an unpaid seller, must prove that he was not insolvent when the goods reached their destination, and that he had not "afforded the ordinary apparent evidences of insolvency." A person is insolvent, within the meaning of the word in this connection, who has ceased to pay his debts in the ordinary course of business, or who is unable to pay his debts as they fall due, whether he has committed an act of bankruptcy, or become subject to insolvency proceedings or not.

Transit.—The rule upon this head was stated by Lord Esher, as follows: "When the goods have not been delivered to the purchaser or to any agent of his to hold for him otherwise than as a carrier, but are still in the hands of the carrier as such and for the purposes of the transit, then, although such carrier was the purchaser's agent to accept delivery as to pass the property, nevertheless the goods are *in transitu* and may be stopped. There has been a difficulty in some cases where the question was whether the original transit was at an end, and a fresh transit had begun. The way in which that question has been dealt with is this: Where the transit is a transit which has been caused either by the terms of the contract or by the directions of the purchaser to the vendor, the right of stoppage in transit exists; but if the goods are not in the hands of the carrier, by reason either of the terms of the contract or of the directions of the purchaser to the vendor, but are *in transitu* afterward in consequence of fresh directions given by the purchaser for a new transit, then such transit is no part of the original transit, and the right to stop is gone. So, also, if the purchaser gives orders that the goods shall be sent to a particular place, there to be kept till he gives fresh orders as to their destination in a new carrier, the original transit is at an end when they have reached that place, and any further transit is a fresh and independent transit." (*Bethell v. Clark*, 20 Queen's Bench Division 615.) Whether the delivery of goods on board a ship, chartered by the buyer, puts them into the

buyer's possession or not, or amounts to a final delivery at their place of destination, depends upon the intention of the parties, as disclosed by all the circumstances of the case. Goods are still subject to the right in question while in the carrier's or other custodian's possession, although they have reached the end of their transit, provided the buyer has not taken actual or constructive possession of them. For example, where the carrier retains or warehouses those subject to his lien for freight and charges, or where the buyer has rejected them; or where he has obtained delivery of a part only. If the delivery of part is made under such circumstances as to show an agreement to give up possession of the whole, or if the carrier wrongfully refuses to deliver the goods to the buyer, or if the carrier attorns to the buyer, that is, acknowledges that he holds the goods for the buyer, the transit is at an end.

Defeating the Right during Transit.—The buyer may defeat it by obtaining delivery of the goods before their arrival at the appointed destination. In Great Britain it seems to be immaterial whether delivery is obtained rightfully or wrongfully (*Whitehead v. Anderson*, 9 M. & W. 519; Sale of Goods Act, § 46 (2)); but there is authority in the U. S. for the view that this premature delivery must be obtained in good faith. (*Debs v. Ry.*, 58 Tex. 194.) He may also defeat it by a sale of the goods accompanied by the delivery of actual or constructive possession, but a sale without delivery will not affect it. A creditor of the buyer can not defeat the right by levying an attachment or execution upon the goods while in transit. Such a levy gives him no greater claim to the property than the debtor had; and, besides, the object of the right—to prevent the application of one man's goods to the payment of another's debts—is defeated against such a creditor. Constructive possession of the goods may be given by the transfer of the bill of lading. It follows that a transfer of the bill of lading to a bona-fide purchaser of the goods for a valuable consideration will defeat the right of stoppage in transit. It has even been held that such a transferee will get a clear title to the goods, although the right of stoppage had been exercised before the transfer, the goods being in transit still. (*Newhall v. Ry.*, 51 Cal. 344.) If the bill of lading is transferred by way of pledge, instead of by way of sale, the right of stoppage is subject to the rights of the pledgee.

How Exercised.—Either by taking actual possession of the goods or by giving notice of his claim to the carrier or other bailee in possession of the goods. When it is given not to the person in actual possession, but to his principal, as a ship-owner or a transportation company, it must be given at such a time and under such circumstances that, by the exercise of reasonable diligence, it may be communicated to the one in actual possession in time to prevent delivery to the buyer.

Consequences.—The seller does not rescind the sale by stopping the goods *in transitu*, but restores his vendor's lien. Upon his giving due notice to the carrier or other person in possession, it becomes the duty of the latter to redeliver the goods in accordance with the seller's directions, but at the seller's expense. After the goods are stopped, the purchaser or his assignee may regain them by paying or tendering the price. Under the British statute (§ 48), if the goods are perishable, or if the seller notifies the purchaser of his intention to resell, and the latter does not within a reasonable time pay or tender the price, the goods may be resold, and the original seller may recover from the original buyer any loss thereby occasioned. This seems to be the common-law rule. (*Tutill v. Skidmore*, 124 N. Y. 149.) The right of the seller who has stopped goods *in transitu* is similar to that of a pledgee, with power to sell at private sale in case of default.

FRANCIS M. BRIDGES.

Storage Batteries: See ACCUMULATORS.

Storer, DAVID HUMPHREYS, M. D.; naturalist; b. at Portland, Me., Mar. 26, 1804; graduated at Bowdoin College in 1825; devoted himself especially to natural history, and, besides contributions to scientific periodicals, published a translation from the French of Krieger's *Monera, Spores, etc., of Recent Shells* (Boston, 1837); *Ichthyology, etc., of Massachusetts* (1839); *Fishes of North America* (Cambridge, 1845); and *History of the Fishes of Massachusetts* (Boston, 1853, and, with plates, 1866). D. in Boston, Sept. 10, 1891.

Storer, FRANCIS HUMPHREYS, B. S.; in Boston, Mass., in 1832; graduated at the Lawrence Scientific School in 1835; was Professor in the Massachusetts Institute of Technology 1865-70; since 1870 Professor of Agricultural Chemistry in

Harvard University, and dean of the Bussey Institution; has contributed to scientific periodicals; was the American editor of Barreswill's *Répertoire de Chimie appliquée*, and has published *Alloys of Copper and Zinc* (1859); *Manufacture of Paraffin Oils* (1860); *First Outlines of a Dictionary of the Solubilities of Chemical Substances* (1863-64), and with Charles W. Eliot, *Manual of Inorganic Chemistry* (1869); *Manual of Qualitative Chemical Analysis* (1870); and *Agriculture in some of its Relations with Chemistry* (2 vols., New York, 1887).

Storer, HORATIO ROBINSON, M. D.: surgeon; b. in Boston, Mass., Feb. 27, 1830; educated at Harvard, where he received A. B. 1850, and M. D. and A. M. in 1853; was Professor of Obstetrics and Medical Jurisprudence in the Berkshire Medical College; has contributed largely to medical literature, and has published *Why not? A Book for every Woman*, which received the gold medal of the American Medical Association (1866); *Is it I? A Book for every Man* (1867); *Decrease of the Rate of Increase of the Population in Europe and America* (1867); *Nurses and Nursing* (1868); with F. F. Heard, *Criminal Abortion, its Nature, its Evidence, and its Law* (1868) and *Volunteer Sanitary Organizations as an Aid to Official Boards of Health* (1890). He was coeditor of *The Journal of the Gynecological Society of Boston* from 1869 to 1872. He is a high authority on medals, jetons, and tokens illustrative of the science of medicine. S. T. A.

Stork [O. Eng. *stork*: O. H. Germ. *storch* (> Mod. Germ. *storch*): Icel. *storker*. Cf. Gr. *τόρπος*, vulture]: any bird of the genus *Ciconia* and of the family *Ciconiidae*, which contains half a dozen species, all—save *Ciconia magnani*—inhabitants of the Old World. In general appearance they resemble the European stork (*Ciconia alba*). This is a large bird, about 3½ feet long; the head, neck, and body above, as well as below, are white, the wings partly black, and the bill and legs red. It is a migratory species, which in the warm season extends into Northern Europe, and in winter (as well as other seasons) is found in Northern Africa and Asia. It has no cry, but claps its bill together with a loud noise.

Storks are great favorites with the people, who conceive that their presence brings good luck. They often build upon the roofs of houses. They devour offal, reptiles, and other vermin. The stork displays remarkable affection for its young, and is of old a popular emblem of filial piety and conjugal faithfulness. See also *SHOEBILL* and *SHADOW-BIRD*.

Revised by F. A. LUCAS.

Stork, CHARLES AUGUSTUS, D. D.: clergyman; b. at Jefferson, Md., Sept. 4, 1838; graduated at Williams College, Massachusetts, 1857; Professor of Greek Language and Literature, Newberry College, South Carolina, 1859-60; pastor Philadelphia, 1861-62, Baltimore, Md., 1862-81; Professor of Didactic Theology, Gettysburg, Pa., 1881-83. D. in Philadelphia, Dec. 17, 1883. After his death a selection from his writings was published, with the title *Light on the Pilgrim's Way* (Philadelphia, 1885), with a biographical sketch by his brother, T. B. Stork. See also *The Stork Family in the Lutheran Church* (Philadelphia, 1886).

H. E. JACOBS.

Storm: an intense atmospheric disturbance, which may be general or local, and may be characterized by high winds, when it is of especial importance to navigators, or by heavy precipitation of rain or snow, when it is most important inland, or by both wind and precipitation. General storms are areas of low pressure ("lows," or cyclones) of intense action, which travel eastward in temperate latitudes, but westward in the tropics. In summer very few of the "lows" are sufficiently intense to deserve the name of storm; in winter, perhaps, half of them are stormy, and in spring and autumn the ratio is still larger.

Stormy weather increases in frequency from the tropics toward the poles. The ocean in the vicinity of Cape Horn has the reputation of being the stormiest sea in the world, but the North Atlantic is the stormiest frequented ocean. The Pacific Ocean deserves its name only in lower latitudes. About the Aleutian islands and S. of Australasia it is very stormy. In the U. S. the storm frequency is greatest in New England and the region of the Great Lakes. Next come

the extreme northwest, and the Atlantic coast. The most destructive general storms in the U. S. are of tropical origin (see HURRICANES), but they affect only the eastern part of the country, and occur only in late summer and autumn. The general storms which enter the U. S. from the western Gulf coast or Mexico in the colder seasons bring warmer weather with abundant precipitation, sometimes torrential rains. Most of the general storms which affect the eastern part of the U. S. appear first in sight on the plains E. of the Rocky Mountains, in Alberta or Assiniboia. The general storms from the Pacific come from the N. W., and enter on the coast of British Columbia, Washington, and Oregon. General storms are unknown on the Pacific coast from Lower California to Panama, but are more common over the West Indies, and occasionally pass far enough westward to affect Spanish Honduras, Yucatan, and, to a less degree, British Honduras. The western portion of the Gulf of Mexico is subject to severe winter gales from the N. The American storms which last long enough to cross the Atlantic usually pass northward of the British islands. A few pass over Great Britain, or sometimes pass farther S., over France, or even Spain. The most of the European storms, however, do not previously appear on the American weather-map. Manchuria and Central and Northern Japan are crossed by many storms, and the Sea of Japan, on which Russia has established her Pacific ports, is very stormy. The typhoons of the China Sea bring stormy weather to the Chinese coast S. of Shanghai, to the Philippine islands, Formosa, and Southern Japan. Similar typhoons occur about the Samoan and Fiji islands and about the Mascarenes, and Southern New Zealand and Tasmania have stormy coasts. The general storms of South America enter from the Pacific on the coasts about Chiloe, then pass northeastward, affecting Patagonia, Southern Argentina, Uruguay, and the coasts of Southern Brazil.

The approach of a general storm is heralded by a falling barometer, a rising thermometer (generally), and a sheet of clouds ascending from the W. and preceded by long filmy streaks of cirrus. These signs usually give a day's notice, and the weather-map a notice of two or three days. The storm lasts from one to three days; the maximum of rainfall and wind usually precede by a few hours the minimum of air-pressure; and the retreat of the signs of the storm is more rapid than their advance with the approaching storm. The official forecasts of general storms can be made with more accuracy than those of moderate changes of weather, and their approach is heralded by storm-signals and warnings at the ports likely to be affected. (See WEATHER SIGNALS.) A general storm occupies an area of about 500 miles in diameter on the average, and may live from three days to a fortnight.

While the advance of the general storm can be forecasted with fair accuracy a day or two beforehand, the same is unfortunately not true of local storms. They are small, are not of long duration, travel but short distances, occur usually in warm weather, and only in the hottest part of the day. The individual storms give but brief warning of their approach, and though the conditions under which they develop are known and can be predicted, yet the individual storms will be only sparsely scattered over the area in which these conditions exist. Tornadoes and squalls are forms of local storms especially characterized by high winds, and thunder-storms and cloudbursts those characterized by heavy precipitation. In the U. S. local storms usually occur in the warm season a few hundred miles to the southward of a large, moist, and warm "low," especially when this is closely followed by a sharp fall of temperature. In the tropics they have no association with general areas of low pressure, but have a marked diurnal periodicity. For instance, at San José, Costa Rica, in the rainy season there is rain two days in three, and the rain is always after noon. Nine-tenths of the rain there falls between 2 P. M. and 7 P. M. See also SQUALLS, CLOUDBURST, METEOROLOGY, and OCEAN.

MARK W. HARRINGTON.

Storm, JOHAN FREDERIK: philologist; b. at Lom, Norway, Nov. 24, 1836; educated at the University of Christiania; Professor of Romanic and English Philology in the University of Christiania since 1873; author, among other works, of *Practical Course in English* (1862, in Norwegian); *The Romance Nations and Languages* (1871, in Norwegian); *Selections of Phrases for Tourists Traveling in Norway* (4th ed. 1881); *English Philology* (1879, in Norwegian); *Englische Philologie, die lebende Sprache* (revised translation

of preaching, 1881; 2d ed. 1902): *Det nyvordte Landmaal* (1888, concerning the attempt to create a new standard Norse on the basis of the Old Norse and the Norwegian dialects); *Romance Languages* (article in *Encycl. Britannica*, vol. xxi.); *French Dialogues, a Systematic Introduction to the Grammar and Idiom of Spoken French* (Norwegian ed. 1887; Danish, 1887, 1889; Swedish, 1887, 1891; German, 1888; Dutch, 1888, 1892; Finnish, 1892; English, 1892); also many articles in scientific journals.

R. I. W.

Storm, Tasmun, poet and novelist; b. at Husum, Schleswig, Sept. 14, 1817; studied jurisprudence at Kiel and Berlin; practiced law in his native city and later in Prussia; was appointed judge at Husum in 1874; retired from his position in 1880. D. July 4, 1888. In 1844 he published with Theodor and Trobo Mommensen his first collection of poetry, mostly lyric poems of exquisite simplicity and great depth of feeling. His great popularity he gained, however, by his *Tasmun Novellen* or short stories, of which he wrote a great many. The best known of them are: *Immerwies*, *Die Nannenschen*, *Ein gelbes Blatt*, *Ein stiller Meeresort*, *Viola leinbar*, *Die Nippengraber*, *Agnes schuermans*, and *Der Schwanenreiter*. His *Erinnerungen an Mörke* (1862) show how deeply he was influenced by the latter poet, whose fine lyric talent and graceful humor he frequently attained in his own writings. See Jacob Bächtold, *Mörke-Storm Briefwechsel* (1890); Fincher Wehl, *Theodor Storm* (1888).

JULIUS GÖPPEL.

Storm-area: an area on the weather-map over which the wind is high or the precipitation heavy, or both—a low of higher than average intensity. It can be at once distinguished by the crowding of the isobars and rain-symbols. The wind is the higher the closer the isobars are together. Heavy winds and torrential rains do not usually go together, though the former may follow the latter. The progress of a storm area is usually more uniform than that of gentler areas of low pressure. Western storm-areas usually increase in intensity as they pass eastward, but southern ones decrease in intensity and increase in size as they gain in height.

M. W. R.

Storm Lake: city, capital of Buena Vista co., Ia.; on Storm Lake, and the Ill. Cent. Railroad; 53 miles W. of Fort Dodge, 41 miles E. by N. of Sioux City (for location, see map of Iowa, ref. 9-14). It is in an agricultural and dairying region, and contains a national bank with capital of \$500,000, 2 State banks with combined capital of \$100,000, an incorporated bank, and 3 weekly newspapers. Pop. (1880) 1,934; (1890) 1,982.

Stormy Petrel, or Storm-petrel: See MORRIS GANNY'S CUCKERS.

Morris, RICHARD SALTER, D. D.: clergyman; b. at Longmeadow, Mass., Feb. 6, 1787; descended from a long line of ministers, his father, who bore the same name, having been thirty-three years pastor at Longmeadow; studied at Yale and at Williams, where he graduated in 1807; was licensed to preach by the Suffolk, Long Island, presbytery in 1809; preached at Islip and Smithtown, Long Island, 1809-49; spent a year at Andover Seminary, graduating in 1810; was ordained pastor of the First Congregational church at Braintree, Mass., July 11, 1811, and, with the exception of a period of five years spent as agent of the Home Mission Society, remained there until his death Aug. 11, 1873, after a pastorate of sixty-two years. He was the author of *The Boston Recorder* (1817-23) and senior associate editor of *The Congregationalist* (1850-55); contributed to *Pennsylvanian* and other periodicals; published a number of sermons.

Storrs, RICHARD SALTER, D. D., LL. D., L. H. D.: clergyman; son of Rev. Richard S. Storrs (1787-1870); b. at Braintree, Mass., Aug. 24, 1821; graduated at Amherst College 1839; studied law and afterwards theology at the Andover Seminary, where he graduated in 1845, and after serving for a year as pastor of a Congregational church in Haverhill, Mass., became in 1846 pastor of the Church of the Pilgrims, Brooklyn, N. Y., a position which he still occupies. The completion of the fortieth year of his pastorate was celebrated Nov. 18, 1886. Eminent as a preacher, he has also contributed much to current literature, and was from 1848 to 1901 one of the editors of *The Independent*, a religious weekly. He had a part in the *Report on the History and Recent Condition of the English Version of the Bible*, undertaken by the American Bible Society, and the *substantive and Doctrinal* in defense (1858); is the author of *The Graham Lectures on the Wisdom, Power, and Goodness*

of God, as manifested in the Constitution of the Human Soul (1859); a series of lectures on *The Conditions of Success in Preaching without Notes* (1870); *The Divine Origin of Christianity, substantiated by its Historical Effects* (1884); *Bernard of Clairvaux* (1892); besides numerous historical and literary, as well as religious, discourses. He became president of the American Board of Commissioners for Foreign Missions in 1867.

Revised by G. P. FURBER.

Story, JOSEPH, LL. D.: jurist; b. at Marblehead, Mass., Sept. 18, 1779; graduated at Harvard College in 1798; studied law, and in 1800 began practice in Salem; was a member of the State Legislature 1805-08, and the acknowledged leader on the Republican side, denouncing Jefferson's proclamation of embargo as the only measure, short of war, by which American commerce could be protected from the restrictions of the belligerent European powers. In 1809 he was elected a representative in Congress, where he urged a repeal of the Embargo Act, on the ground that it was a temporary measure, the purpose of which had now been attained. Having declined a re-election to Congress, he was in 1810 again chosen a member of the State Legislature, of which he was elected speaker. In 1811 he was appointed associate justice of the Supreme Court of the U. S.; in 1820 was a member of the convention for the revision of the State constitution. In 1829 he was chosen Dana Professor of Law in Harvard College, a position created for him, and which he held for the remainder of his life. D. at Cambridge, Mass., Sept. 10, 1845. In 1804 he published a volume of poems entitled *The Poems of Solitude* (most of the copies of which he bought up and destroyed), and in 1806 *Memorial of the Inhabitants of Salem*, a pamphlet addressed to President Jefferson relating to the infractions by foreign powers upon the neutral trade of the U. S. He also published many addresses, literary discourses, and reviews, etc., but his fame rests mainly upon his decisions, and especially upon his legal Commentaries, of which the following are the principal, all of which have passed through several editions, and most of which have been translated into German: *On the Law of Bailments* (1803); *On the Constitution of the United States* (1820); *On the Conflict of Laws, Foreign and Domestic* (1804); *On Equity Jurisprudence, as administered in England and America* (1843); *On Equity Pleadings* (1828); *On the Law of Agency* (1809); *On the Law of Partnership* (1841); *On the Law of Bills of Exchange* (1848); *On the Law of Promissory Notes* (1848). He also edited Chitty *On Bills of Exchange* and Abbott *On Shipping*, and left in MS. a *Digest of Laws*, supplementary to that of Coyns. As a constitutional lawyer he belonged to the school of Marshall, and supported the Federal authority. He was untiring in his work, and a great case lawyer. His commentaries and written decisions in his circuit comprise twenty-seven volumes, and his judgments in the Supreme Court an important part of thirty-four volumes more. A collection of his *Miscellaneous Writings* was published in 1832, and his *Life* has been written by his son, William W. Story (2 vols. 8vo, Boston, 1851).

Revised by P. SEYMOUR ALLEN.

Story, ROBERT HERBERT, D. D.: minister; b. at Rosneath, Dumbartonshire, Scotland, Jan. 28, 1835; educated at the Universities of Edinburgh, St. Andrews, and Heidelberg; assistant minister at St. Andrew's, Montreal, Canada, 1859-60; in Rosneath, as his father's successor, 1860-87; since 1887 Professor of Church History in the University of Glasgow, second clerk of the General Assembly of the Church of Scotland, and chaplain to the Queen; editor of *The Scottish Church* (a monthly magazine) since its foundation in 1886; the first lecturer on the Lee foundation, St. Giles, Edinburgh, 1896. Besides many contributions to various periodicals Dr. Story has published *Robert Hervey of Rosneath, a Memoir* (London, 1862); *Christ the Comforter, or Scriptures, Hymns, and Prayers for Times of Trouble and Sorrow, selected and arranged* (Edinburgh, 1865); *Life and Remains of Robert Lee, D. D.* (London, 1870); *William Caxton* (1874); *Creed and Confessors: Sermons* (1878); *Health Haunts in the River Nile* (Dulley, 1881); and *Nugae Ecclesiasticae* (Edinburgh, 1884). C. K. DUFF.

Story, WILLIAM WETMORE: sculptor; son of Joseph Story, LL. D.; b. at Salem, Mass., Feb. 19, 1819; studied law; was admitted to the bar, and published several legal books—*Report of Cases* (1842-47); *Treatise on the Law of Contracts* (1844); *The Law of Sale of Personal Property* (1847); edited the *Life and Letters of Joseph Story* (1851). About 1848 he abandoned law for sculpture, and since that time

he has resided chiefly in Rome. Besides the practice of his art he has been a somewhat prolific writer. He published *The American Question* (1862); *Roba di Roma* (1862); *Proportions of the Human Figure* (1866); *Graffiti d'Italia* (1869); *A Roman Lawyer in Jerusalem* (1870); *The Castle S. Angelo and the Evil Eye*, being a second volume of *Roba di Roma*, in 1877; and five volumes of poems. As a sculptor he is known chiefly by his large allegorical statues, *Medea*, *Cleopatra*, *The African Sibyl*; by the statue of George Peabody executed for the corporation of London; the statue of Edward Everett in the Boston Public Garden; the monument at San Francisco of Francis Scott Key; and busts of his father, James Russell Lowell, William Cullen Bryant, Josiah Quincy, and Theodore Parker. He was made Chevalier of the Legion of Honor at the Paris Exposition of 1878.

Stothard, CHARLES ALFRED: painter and architectural draughtsman; son of Thomas Stothard, painter; b. in London in 1786; early distinguished himself by his skill as an artist. His best-known painting, *The Death of Richard II.*, was exhibited in 1810, and in the following year he began the publication of the *Monumental Effigies of Great Britain*, a series of etchings with descriptions, completed (1811-23) after his death by others, and valuable for its accuracy. He was selected by the Antiquarian Society to make drawings of the famous Bayeux tapestry, and in 1819 made sketches from the newly discovered old pictures on the walls of the Painted Chamber of the House of Lords. D. at Bere Friars, in Devonshire, England, May 27, 1821.—His widow, ANNE ELIZA (d. 1883), who assisted her brother, Mr. Kempe, in the completion of the *Monumental Effigies*, afterward married the Rev. Edward Bray. She was the author of several creditable novels and other works written during her second marriage.

Revised by RUSSELL STURGIS.

Stothard, THOMAS, R. A.: painter and designer; b. in London, Aug. 17, 1755; was apprenticed to a designer of patterns for the silk trade, but soon became an illustrator of books, and finally a painter. He illustrated the set of *The Novelists' Library*, begun about 1780, and other popular works, and became known as a most prompt and useful workman, so that he was constantly employed. He was elected fellow of the Royal Academy in 1794, and its librarian in 1812. His illustrations for books number more than 4,000, among them being those for *Robinson Crusoe* and *The Pilgrim's Progress*, 1788, the *Rape of the Lock*, 1798, the works of the German poet Gessner, 1802, Cowper's *Poems*, 1825, and Rogers's *Italy and Poems*, of which he illustrated not only the splendid octavos of 1830 and 1834, but also the small 12mo editions with wood-cuts. His work as an illustrator of books is graceful and pure, not very realistic nor careful about costume and architecture or other matters where historical accuracy is thought necessary, but artistic in a very high degree. Among his best paintings are the *Canterbury Pilgrims*, the *Flitch of Bacon*, and *Four Periods in a Sailor's Life*. Besides his work in pure art he made many designs for goldsmiths and other decorative workers. D. in London, Apr. 27, 1834. See the *Life* by Mrs. Bray (1851).

Revised by RUSSELL STURGIS.

Stoughton, stō'tūn: town; Norfolk co., Mass.; on the N. Y., N. H. and Hart. Railroad; 17 miles S. of Boston (for location, see map of Massachusetts, ref. 5-1). It contains the villages of Stoughton, North Stoughton, and West Stoughton; is principally engaged in the manufacture of boots, shoes, and rubber and woolen goods; and has 4 hotels, a public high school, 17 district schools, public library (founded in 1874), a co-operative bank, and 2 weekly newspapers. The assessed valuation in 1894 was \$2,819,252. Pop. (1880) 4,875; (1890) 4,852.

Stoughton: city (founded in 1847); Dane co., Wis.; on the Yahara river, and the Chi., Mil. and St. Paul Railway; 14 miles S. S. E. of Madison, the State capital (for location, see map of Wisconsin, ref. 7-D). It is in the center of the great tobacco belt; and contains 8 churches, high school, academy, 4 public-school buildings, water-works, electric lights, manufactories of carriages and wagons, cigars, harness, and flour and feed mills, 2 State banks with combined capital of \$55,000, and 3 weekly newspapers. The city is an important tobacco-market. Pop. (1880) 1,353; (1890) 2,470; (1895) estimated, 3,000.

EDITOR OF "COURIER."

Stoughton, JOHN, D. D.: clergyman and author; b. at Norwich, England, Nov. 15, 1807; educated at Highbury College, Islington, and University College, London; pastor

of Congregational churches at Windsor 1832-43, at Kensington, London, 1843-75; Professor of Historical Theology and Homiletics in New College, St. John's Wood, London, 1872-84. He was Congregational lecturer 1855, and chairman of the Congregational Union 1856. He edited for many years *The Evangelical Magazine*, and published many very popular as well as scholarly volumes, including *Lectures on Tractarian Theology* (London, 1843); *Windsor: a History and Description of the Castle and the Town* (1862); *Homes and Haunts of Luther* (1875); *Italian Reformers* (1881); *Spanish Reformers* (1883); but chiefly the series of Church histories of England from the opening of the Long Parliament (1640) to 1800, issued in revised form in 1881 under the title *History of Religion in England* (6 vols.); supplement carrying the story to 1850, 1884, 2 vols. He issued his autobiography, *Recollection of a Long Life*, in 1894.

Revised by G. P. FISHER.

Stourbridge, stér'brij: town; in Worcestershire, England; on the Stour, 12 miles W. by S. of Birmingham (see map of England, ref. 9-G). It manufactures iron, glass, earthenware, and fire-bricks, the latter from a peculiar kind of clay called Stourbridge clay, on which fire has only a small effect. Pop. (1890) 9,866.

Stout: See BEER.

Stove [from Dutch *stoof*, foot-stove, drying-room; Germ. *stube* < O. H. Germ. *stuba*, room that can be heated; bath-room. The original meaning was "heated room." How the Romanic words: Fr. *étuve*, Ital. *stufa*, Span. *estufa*, cf. Fr. *étouffeur* are related is still a question]: an apparatus for retaining and diffusing heat, as for warming and ventilating or cooking. In the Middle Ages stoves, constructed of brick or tiles and sometimes of slate or steatite, were used for warming dwellings. They were large, often filling the side of a room, and in Scandinavia their broad flat surfaces were sleeping-places. The fire was kindled at the bottom, and the heat and smoke passed through flues before making their exit into the chimney. Some of these stoves had ovens and flues for cooking, and when once thoroughly heated required fuel but once in twenty-four hours. An early attempt at making a stove or closed fireplace of iron was made by Cardinal Polignac in France. He published a description of this in *La Mécanique du Feu, ou l'Art d'en augmenter les Effets, et d'en diminuer la Dépense* (1709). The Polignac fireplaces were constructed with hollow backs, hearths, and jambs of iron to economize the heat. Des Aguliers translated Polignac's treatise (London, 1716), and modified his fireplaces so as to use them for coal. Neither these nor the Holland stoves, which were introduced soon after (plain box stoves with a small smoke-pipe or flue at the top, and a single door into which the wood or coal was thrown), became popular in England, owing to the prejudice of the people in favor of open fires. Dr. Franklin, writing of stoves after his invention in 1745, refers to a German stove recently introduced into England, consisting of an iron box made of five plates fastened together with screws, one side of which was left open, but when the stove was set, this open side, with the smoke-pipe, was in an ante-room, while the body of the stove projected through the partition to warm a larger room, the fire being fed and the smoke conducted off in the ante-room. Franklin's stove was a great advance. Although, in its ordinary use, a fireplace, it was capable of being closed, and had a downward draught, distributing the heat through the air-boxes in its sides, till at last the remainder of the heat escaped with the smoke through a flue leading into the base of the chimney. A register or "damper" of sheet-iron was introduced into the descending flue, which checked and controlled the fire. In 1771, and later, Franklin invented other stoves—one for burning bituminous coal which would consume its own smoke and had a downward draught, and another intended for the same purpose, having a basket grate or cage, with movable bars at the top and bottom, supported by pivots at its center. The latter, after being filled and kindled at the top, could be inverted and so made to burn from the base. Between 1785 and 1795 Benjamin Thompson, Count Rumford, devised several improvements in stoves, intended to economize fuel and heat.

In the U. S. before 1825 the use of stoves, generally of the box pattern and very rude, was confined to shops and offices, public rooms, and churches in cities and larger villages. In the country the churches were seldom warmed, but the women carried foot-stoves, and the men protected their feet by stout overshoes called "boxes." Among the wealthy in cities canal and other English coal ("sea coal") was burned

in improved grates or in the Remond stove lined with fire-brick. A greater number in cities and larger villages used the Franklin stove, burning wood and making an open fireplace of it. The rest of the world used the old open open-hearth fireplaces, burning wood logs. A large brick oven adjoined the kitchen fireplace, and required a large quantity of wood to heat it. Until 1825 stoves in the U. S. were made almost exclusively at blast furnaces and directly from the ore, instead of being made in foundries by cupola furnaces from pig iron, as they were later, and they were consequently much heavier and ruder than now and had loose and imperfect joints. Most of them were made in New Jersey, Pennsylvania, and Ohio, though a few were cast quite early in the furnaces at Cold Spring and Warwick, N. Y., and at Salisbury and Casson, Conn., and from 1850 to 1855 considerable stove-making was done in Rutland co., Vt. From 1795 to 1825 no material progress was made in the construction of stoves. Those for heating purposes were either box stoves made on the old German plan, an oven being sometimes added, placed directly over the fire, or portable and partly open fireplaces made on Franklin's plan. For cooking purposes Remond's cooking-stoves or ranges fitted with fire-top or scapstone, and with a ventilating oven, which had been introduced in New York as early as 1798 and into Boston about 1800, were gradually coming into use. After the opening of the Erie and Champlain Canals, the introduction of steamboats on rivers, and the first beginnings in railway travel, the facilities for transportation for heavy goods were so increased that the manufacture of stoves, and especially of cooking-stoves, became an important industry. As yet these were universally wood stoves, but the anthracite coal was destined to create a revolution in stoves. Jordan L. Mott and James Wilson, both of New York, made self-feeding stoves between 1827 and 1831 that would burn the British coals, and were an improvement on previous inventions, but it was not until 1832, when Mr. Mott had demonstrated that an anthracite fire could be made successfully from nut and pine-wood coals, and that the depth of the column of mud in his self-feeders must be in direct proportion to its size, the largest coal requiring the highest column, that anthracite coal stoves became salable. Early in 1833 he built a small cupola furnace and cast his stove-plates from pig iron of the best quality, fluting them to prevent their cracking. This was among the first attempts to make stove-plates from pig iron and to make the plates light, even, and smooth. The first cooking-stoves made in Albany (1835) were of the old template oval pattern, with oven above the fire and a single hole in the top. These were followed by the saddle-bag pattern, having the oven in the middle over the fire and the stove-collar and pipe over it, while on either side was an oval projection with a boiler-hole on a level with the stove-top, these projections resembling very closely an inverted pair of saddle-bags. The next pattern was the horse-block, so called from the rear portion of the stove, which contained the oven, being a step higher than the front. The entire stove, having a movable top revolved by means of a crank, so as to bring any desired vessel directly over the fire, was a later invention. Then came the bush stove, both for wood and coal, having the fire above the oven and reversible flue which carried the heat and flame around, behind, and below the oven before reaching the smoke-pipe, which was merely on a plane with the avendour. There have been hundreds of modifications of this pattern, but in all of them the reversible flue has been the predominating feature. In heating-stoves there has been a great variety of forms and some new principles have been introduced, though many of these seem to have been anticipated by the inventions of Dr. Neil Arnott. The problem of adapting the heating stove to the use of anthracite coal and utilizing its great heat-producing power economically was solved by President West, of Union College, who spent years and much money in perfecting his stove. The self-feeder had previously been made both in England and in France, but one of its applications was a device of Dr. West, which he applied to several stoves, and others were not slow to follow. Samuel Paxon, of Troy, and Anson Atwood, of Brooklyn, introduced the hot-air current to facilitate combustion and radiation of heat, or at least are believed to have improved upon that idea.

In cooking-stoves and fixed and portable ranges the number of inventors and manufacturers is large. One of the most ingenious inventors of cooking-stoves was P. V. Stewart, of Troy, N. Y., whose stoves were, and with some modifications still are, very popular. Dr. Nuttall invented several

excellent cooking-stoves. Wilson, Troy, New York; Buffum, Philadelphia; Furstung, Cleveland; Leonard, Chicago; Quincy, St. Louis; Milwaukee, Boston; Frothingham, Woburn, and Detroit have each a number of manufacturing establishments in the production of stoves, ranges, and heaters. The efforts of the stove-makers since 1800 have been directed rather toward completing the adaptation of the principles of heat-burning, hot-air heating, and the anti-splinker arrangement in stoves, and greater security and perfection of the castings than to the discovery of any new principle. Portable and brick-set ranges in great variety are now produced, with similar arrangements for heating water as in the cooking-stoves. They are well constructed, have all the improved facilities for labor and fuel saving, and are particularly noteworthy for the perfection of their castings and finish. A few manufacturers make stoves entirely of sheet-iron or enameled. Such stoves retain the heat for a long time and require but a small amount of fuel, which they consume entirely.

While the use in the U. S. of cast iron has continued for heating-stoves and the majority of cooking-stoves, there has been a growing application of steel to the construction of cooking-ranges. Since 1865 an important development has been in the use of gasoline as a fuel—a process that began in the West and has extended eastward. At first such stoves were made so as to burn the gasoline direct, but in the new forms called pressure stoves the gasoline is first changed into gas. Kerosene has also been used as a fuel. The employment of illuminating gas as a fuel is steadily growing, and utilities improved burners and cheapened gas have led to the introduction of many forms of gas stoves for use in apartments. In Great Britain slot meters are employed by means of which a given amount of gas for a penny is turned on and automatically turned off when the amount has been consumed. The use of electricity as a heat-producer is recognized, and forms of heating apparatus for it were shown at the World's Columbian Exposition held in Chicago in 1893, but as yet its employment is slight. All the stoves used in the U. S. are of domestic manufacture. The National Association of Stove-manufacturers reported in May, 1904, that there were 274 firms engaged in that business in 1903, whose sales during that year amounted to \$40,035,700. There is an export trade of gas and gasoline stoves to South America, Mexico, etc., and a slight exportation of anthracite stoves to Europe.

Revised by MARCUS DENHAM.

Stow, BARRY, D. D.: clergyman and author; b. at Crofton, N. H., June 16, 1801; graduated at Columbian College, District of Columbia, in 1825; edited *The Columbian Star* 1825-27; became pastor of the Baptist church at Portsmouth, N. H., in 1827, of the Babylon Place church, Boston, in 1832, and of the Howe Street (now Cleveland Avenue) church in 1845. He was prominent in the missionary enterprises of the denomination, and president of the trustees of Newton Theological Seminary. Besides numerous contributions to religious periodicals, he published *History of Harriet Beecher* (1832); *Hebrew's Pilgrimage* (1835); *History of the English Baptist Mission to India* (1835); *The Danish Mission on the Coast of Greenland* (1837); *Question-bank of Christian Doctrine* (1848); *Christian Brotherhood* (1850); *First Things* (1850); and, in conjunction with Rev. Samuel P. Smith, *The Psalter*, a collection of hymns largely used by Baptists (1849). D. in Boston, Dec. 27, 1860. See *Life*, by R. H. Nye (1870). Revised by W. H. WHEAT.

Stowe, CALVIN ELLIS, D. D.: clergyman, educator, and author; b. at Natick, Mass., Apr. 6, 1807; graduated at Bowdoin College in 1824, and in 1829 at Andover Theological Seminary; was Assistant Professor of Sacred Literature at Andover, and assistant editor of *The Boston Herald* 1828-30; Professor of Languages in Dartmouth College 1830-33, of Biblical Literature in Lane Seminary, Walnut Hill, near Cincinnati, 1833-36, and of Natural and Revealed Religion in Bowdoin College 1836-52. In 1852 he became Professor of Sacred Literature in Andover Seminary, but resigned in 1864 and removed to Hartford, Conn. In 1856 he married Harriet Elizabeth Beecher. In the same year he was sent by the State of Ohio to examine the public-school systems of Germany. Upon his return he published a report on *Elementary Education in Europe*, which was distributed at the public expense to every school district in Ohio and was also adopted by the Legislatures of several other States. He translated from the German Jakob's *History of the Hebrew Commonwealth* (Andover, 1858; 2 vols., London, 1859); prepared from the *Protestantism of Jacobus*

volume of *Lectures on the Sacred Poetry of the Hebrews* (1829); began an *Introduction to the Criticism and Interpretation of the Bible*, of which only vol. i. was published (Cincinnati, 1835); and the *Origin and History of the Books of the Bible* (part i., containing the New Testament, Hartford, 1867). He also published several addresses and educational reports, and contributed largely to religious periodicals. D. at Hartford, Conn., Aug. 22, 1886.

Stowe, HARRIET ELIZABETH (Beecher): author; daughter of Lyman Beecher; b. at Litchfield, Conn., June 14, 1811. At the age of thirteen she was sent to the school kept by her sister Catherine at Hartford, where she studied and taught until 1832, when she removed with her father to Cincinnati; was married in 1836 to Rev. Calvin E. Stowe, then professor at Lane Seminary, Cincinnati. In 1849 she published *The Mayflower, or Sketches of the Descendants of the Pilgrims*, and in 1851 began in *The National Era* of Washington a serial story designed to illustrate the horrors of African slavery, which was published separately in 1852 under the title *Uncle Tom's Cabin*, and attained a rapid and almost unparalleled success at home and abroad. Within five years 500,000 copies were sold in the U. S.; within ten years there had been made from it two or three French versions and more than a dozen German ones. It was also translated into Danish, Swedish, Portuguese, Spanish, Italian, Welsh, Russian, Polish, Hungarian, Wendish, Wallachian, Armenian, Arabic, Rumanian, Chinese, and Japanese. It did more than any other literary agency to rouse the public conscience against slavery, and has been repeatedly dramatized. In 1853 she put forth a *Key to Uncle Tom's Cabin*, in which were set forth the main facts upon which the story was based, together with many incidents in corroboration of its truthfulness. In 1850 Mrs. Stowe removed to Brunswick, Me., where her husband had been appointed to a professorship in Bowdoin College. In 1852 they went to Andover, Mass., where he had accepted a chair in the theological seminary. In 1853 she accompanied her husband and her brother to Europe, and upon her return published *Sunny Memories of Foreign Lands* (2 vols., 1854). Her subsequent writings, which were mostly inferior, usually first appeared in periodicals, especially in *The Atlantic Monthly* and in the *Hearth and Home*, of which she was for a time one of the editors. Among these, as published separately, are *Dred*, a tale of the Great Dismal Swamp, subsequently published under the title *Nina Gordon* (1859); *The Minister's Wooing* (1859); *The Pearl of Orr's Island* (1862); *Agnes of Sorrento* (1863); *Oldtown Folks* (1869); *Pink and White* (1871); *My Wife and I* (1872); *Bible Heroines* (1878); *Paganic People* (1878); *A Dog's Mission* (1881); and a volume of religious poems. Her paper in *The Atlantic Monthly* in 1869, *The True Story of Lord Byron's Life*, started an unfortunate scandal, and she replied to her critics with *Lady Byron Vindicated, a History of the Byron Controversy* (1869). In 1864 Mrs. Stowe removed to Hartford, Conn., where she still (1895) resides. See the *Life* by her son (Boston and New York, 1889). HENRY A. BEERS.

Strabismus: See SQUINTING.

Strabo: Greek geographer; b. at Amaseia, in Pontus, 63 B. C.; d. in the reign of Tiberius after 21 A. D. He received an excellent education under eminent masters in philosophy and in literature, went to Rome about 29 B. C., and undertook extensive travels in Asia Minor, Egypt, Greece, and Italy. At a mature age he wrote a history, which is lost, and a geography in seventeen books, which has come down to us, and is especially valuable for its historical notes, which are the more abundant as Strabo looks at geography from an historical point of view, and shows that he is a disciple of Polybius. His work is unequal, and it is a natural inference that where his descriptions are meager and incorrect his information is derived from books, and that where they are full and accurate we have before us the result of personal observation. His style is simple, and the grouping of the heterogeneous materials shows something of the Greek feeling for proportion. The first two books of his works form an introductory to geography; with the third the description begins. Eight books are devoted to Europe, six to Asia, and the seventeenth and last to Egypt and Libya. Editions by Kramer (3 vols., 1844-52) and Meineke (3 vols., 1852-53). English translation by Falconer and Hamilton (3 vols., 1854-57). The French translation, made by La Porte du Theil, Coray, and Gosselin, at the command of Napoleon I. (5 vols., 1805-19), is very rich in notes. There is a valuable German translation, with notes,

by Groskurd, 1831-34. On Strabo, see Dunbury, *History of Ancient Geography*, vol. ii., 209, seq.; and also the introduction to Tozer's *Selections from Strabo* (1893).

Revised by B. L. GILDERSLEEVE.

Strabo, WALAHRID (Walafridus Strabus, "the Squint-eyed"): ecclesiastic and author; b. in Suabia about 809; educated in the Benedictine abbey school of Reichenau, on the island in Lake Constance; then at Fulda, 54 miles S. E. of Cassel, under Rabanus Maurus (826-829). From Fulda he went to Aix-la-Chapelle and became tutor to Charles, son of the Emperor Louis the Pious. The latter made him abbot of Reichenau 838. He was driven from his post by Louis the German 840, but restored 842. He died while crossing the Loire, Aug. 18, 849. He was a very prolific writer. His principal work, the so-called *Glossa ordinaria*, is a huge exegetical compilation, the oldest printed edition of which—without date and place, but about 1480—comprises four volumes in folio. It was for several centuries the principal source and the highest authority of biblical science in the Latin Church, being in use, indeed, to the seventeenth century. His *De exordiis et incrementis rerum ecclesiasticarum*, printed in Hittorp's *De officiis divinis* (Cologne, 1668), and in several later editions, best by A. Knoepfler (Munich, 1890), is an interesting handbook in ecclesiastical archaeology. To him we owe the authentic lives of St. Gall (ed. R. Shute, St. Gall, 1890) and St. Othmar. He was a poet and not a mere monastic rhymester. The most curious of his poems is his *Vision of Wettin*, which relates his journey to hell, purgatory, and paradise. He has the hardihood to introduce Charlemagne in purgatory suffering for his incontinence. Another poem, and perhaps his best, is *Hortulus*, upon the plants in the convent garden. See his works in Migne, *Pat. Lat.*, cxlii, cxiv., and his poems separately in Dümmler, *Poet. Lat. ævi Carolini II.*, 259-473. SAMUEL MACAULEY JACKSON.

Strachey, WILLIAM: historian; b. in England about 1585; was the first secretary to the colony of Virginia 1610-12, having been shipwrecked on the Bermudas 1609 with Gates, Somers, and Newport; wrote *A True Reportory of the Wracke and Redemption of Sir Thomas Gates, upon and from the Islands of the Bermudas, in Purchas's Pilgrims* (vol. iv., lib. ix., cap. vi.), upon which Shakespeare appears to have drawn in his description of a storm in the *Tempest*—an inference strengthened by the reference in the same drama to the "still-vexed Bermoothes"; compiled *For the Colony in Virginia Britannia, Leaves Divine, Moral, and Martiall* (London, 4to, 1612); and was author of *Historie of Travaile into Virginia Britannia*, written as early as 1618, and first published by the Hakluyt Society from an original MS. (No. 6, 1849) under the editorship of Richard H. Major—a quaint and valuable work which supplies the means of correcting the false details of the early history of Jamestown (especially in relation to Pocahontas) which have been so often repeated upon the authority of Capt. John Smith. Strachey projected a larger work, of which this volume forms but "the first and second books of the first decade." The time and place of his death are unknown. See *A History of American Literature*, by Moses Coit Tyler (1878), vol. i., pp. 41-45. Revised by H. A. BEERS.

Stradivarius, ANTONIO: maker of musical instruments; b. at Cremona, Italy, in 1644; learned the art of making violins and other string instruments from Nicolo Amati, under whom he worked for several years; in 1668 began to make violins marked with his own signature, and by degrees not only rivaled but even outshone his master. His best instruments were made in the period between 1700 and 1725, and command from \$1,000 to \$3,000. D. Dec. 17, 1737.

Strafford, THOMAS WENTWORTH, Earl of: minister of Charles I.; b. in London, Apr. 13, 1598; studied at Cambridge; traveled on the Continent; sat in Parliament, and was at first active in opposition to the court, though unwilling to go to radical lengths, and had no sympathy with the religious policy of the Parliament. In 1628 he went over to the king's side; was created Baron Wentworth, then viscount, lord president of the council of the North, a privy councillor in 1629, and lord deputy of Ireland in 1633. His rule in Ireland was harsh and despotic, aiming at the establishment of his system of "thorough" or the absolute power of the king, and he acquired the designation of "the wicked earl." In Jan., 1640, he was created Earl of Strafford, and soon afterward prepared an army in Ireland to aid against the Scots. Upon his return to England he supported the harshest measures of the crown. The famous Long Parliament convened Nov. 3, 1640, and within eight

John Pym appeared before the bar of the House of Lords and in the name of the House of Commons impeached him of an attempt to overthrow the public liberties and subvert the public rights. He defended himself personally and with such success that the Commons abandoned their original impeachment and passed a bill of attainder. The Peers were later overruled by the fierce attitude of the Commons and dared not refuse their assent to the bill, which was sent to Charles for his sanction. The king wished to save his minister, for whose safety he had pledged himself, but fearing a violent revolution he reluctantly gave his assent, and Strafford was brought to the block on Tower Hill, May 12, 1641. That he had been proved guilty of no crime which by the strict letter of the law was a capital one is certain, and the bill of attainder was in fact a retrospective law, justifiable only on grounds sufficient to warrant any other revolutionary proceeding. The act of attainder was reversed in 1692 after the restoration of Charles II., and the estates of Strafford were restored to his son. His *Letters and Dispatches*, edited by Dr. Kewley, were printed in 1730; his *Life* has been written by Elizabeth Cooper (1874) and by H. D. Traill (1899). The circumstances of his life have occasioned much controversy. Mansel's account counts him most severely, while Gardiner takes a more favorable view of his political career.

Revised by F. M. Carey.

Straight University, a coeducational institution at New Orleans, La.; founded by Seymour Straight and incorporated in 1903. It is for Negroes exclusively, and is under the care of the American Missionary Association. It has classical, normal, manual-training, theological, and four other departments; a faculty numbering 93, and 600 students.

Strain: the force applied to a rope or bar, or the amount of change of shape produced by the force; the word being generally used by practical engineers in the first sense and by scientific writers in the second. See **STRESS**.

Straits: See **PHYSIOGRAPHY**.

Straits Settlements: a British crown colony in the East Indies, including Malacca, Penang or Prince of Wales Island, with the provinces of Wellesley on the continent, and Singapore. The Settlements were made a separate dependency of the British crown in 1824, and placed under the Governor-General of India. On Feb. 1, 1897, the connection with India ceased, the province became a crown colony, and is administered by a governor residing at Singapore. In 1897 the Cochin or Keling Islands were attached to the colony, and in 1899 Christmas Island. The British possessions of 1,472 sq. miles were inhabited (1891) by 518,042 persons, of whom 213,078 were Malays, 227,922 Chinese, and 56,327 natives of India. The protected Malay states of the peninsula (Perak, Selangor, Johor, Sungai Ujong, Negri Sembilan, and Pahang) comprise about 34,000 sq. miles. Pop. (1891) 418,567, not including Johor, which has an estimated population of 300,000. The internal administration of these states is in the hands of the British residents. Mining is actively carried on, and large supplies of tin are exported from Perak and Selangor. Fifteen hundred British troops and a few vessels are sufficient in time of peace to maintain order and punish piracy.

Revised by M. W. HARRINGTON.

Stralsund, *strahl'sunt*: town; in the province of Pomerania, Prussia; on the narrow strait which separates the island of Rügen from the mainland; has a good harbor and is strongly fortified (see map of German Empire, ref. 2-5). It is an old town (founded in 1209), and played a conspicuous part—first as a member of the Hanseatic League, then during the Thirty Years' war as a fortress. It has manufactures of paper, tobacco, oil, spirits, and mirrors, and an extensive export trade in grain, wool, cattle, and horses. Pop. (1890) 27,814.

Revised by M. W. HARRINGTON.

Stramonium [Mod. Lat., the thorn-apple, also the drug contained in its seeds and leaves]: a drug consisting of the seeds and leaves of *Datura stramonium*, an annual plant of the family *Solanaceae*, growing rankly as a weed throughout almost all the temperate and warm countries of the world. The herb, called thorn-apple, and in the U. S. also James' weed, is a leafy plant, found mostly in rank soil near dwellings. Its average height is about 3 feet. It has an erect stem, with many branches beset with large triangular leaves, irregularly sinuate and dentate. The flower is large, white, salubrious; the fruit a large, fleshy, four-lobed capsule, thickly covered with sharp spines. The seeds are flat and of a dark-brown color. Both leaves and seeds contain an alkaloid, *atropine*, closely analogous both in chemical prop-

erties and poisonous character to *atropine*, the alkaloid of belladonna. Medicinally, stramonium is a duplicate of belladonna, and is used for similar purposes. One of its most frequent employments is for the relief of asthmatic attacks, for which purpose the dried leaves or powdered roots are smoked. Stramonium is a powerful poison, the effects being identical with those of belladonna.

Revised by H. A. HARR.

Strandberg, KARL VILHELM ARVID (Tells Quilist); poet; b. in Mölnderslund, Sweden, Jan. 16, 1870. While a student at the University of Lund he wrote a number of songs, chiefly under the influence of the German political poetry of the period. From this he later freed himself entirely. His principal collection of poems is *Sångens Skugga* (Shadow in Armon), which shows with patriotic fire. He was the author of a number of occasional poems and translated Byron and Möller. D. in Stockholm, Feb. 5, 1877. *Arvids Vitterhets Arkivet* (3 vols., Stockholm, 1877-78).

H. K. DENNIS.

Strang, Sir (Robert), engraver; b. on Pomona, one of the Orkney Islands, July 14, 1721; studied painting, but in 1740, having joined the army of the Pretender, was obliged to conceal himself; afterward went to Paris, where he became a pupil of Le Bas, the famous engraver, and in 1751 established himself in London as an historical engraver, in which department of art he acquired great eminence. He was knighted in 1767. He published *A Descriptive Catalogue of Pictures, etc., collected and drawn by Sir Robert Strang* (1769) and *An Inquiry into the Rise and Establishment of the Royal Academy of Arts* (1775; new ed. 1820). A collection of 817 of his principal engravings has been issued in a magnificent atlas, and his *Memories*, by James Dennistoun, appeared in 1855. D. in London, July 5, 1782.

Revised by ROBERT STRONG.

Strangles: in the horse, an abscess which occurs between the branches of the lower jaw. If possible, the animal should be induced to eat. The throat should be thoroughly fomented, and as soon as the sore comes to a head it should be opened, whereupon recovery will generally follow. Sometimes, however, the lymphatic glands appear to be inflamed, and occasionally metastatic abscess appears in distant parts of the body. This disease is considered contagious, and there is a similar infectious disease, also called strangles, among swine.

Strangulation [from Lat. *strangulatio*, deriv. of *strangula* (whence Eng. *strangle*), from Gr. *strangulatio*, strangle, deriv. of *strangulatio*, strangle, deriv. of *strangulatio*, to strangle; primarily, the mechanical closure of the air-passages of the neck, so as to prevent respiration. Death by strangulation is speedy, but there may be a chance of recovery for a considerable period. Artificial respiration, stimulant applications to the extremities and chest, and of ammonia to the nostrils, should be tried. When other means have failed the galvanic battery may be employed. After apparent recovery, death may speedily occur from secondary causes.

Revised by W. PRETTE.

Strangury [from Lat. *stranguria* = Gr. *stranguria*; *stranguria*, *stranguria*, drops + *stranguria*, urine water]: a suppression of the urine. The name is especially applied to such suppression when it depends on the presence of spasm or tension of the urethra. It may be caused by the too free use of Spanish-fly blisters or of oil of turpentine, or it may attend the presence of calculi in the bladder. The warm bath, hot fomentations, mucilaginous drinks, bland enemata, and the like will usually relieve the untoward symptom.

Strassburg, Germ. *strass'burgh* (anc. *Argentoratum*; Fr. *Strasbourg*): important fortified town of Alsace, on the Rh. the French and the Rhine-Rhône and Rhine-Meuse Canals; 2 miles W. of the Rhine; junction of the railways of Southern Germany and France (see map of German Empire, ref. 5-11). It is ill built, with narrow streets and high houses, but is improving. The most remarkable of its public buildings is the cathedral, with a tower 466 feet high, founded in 510 by Chlodwig, but the older structure was destroyed by lightning in 1097. In 1015 Bishop Werner of Habsburg laid a new foundation, and in 1273 the main building was finished. The tower was begun in 1277 by Erwin von Steinbach, and completed in 1439 by J. Hölle, of Colmar. In this building is the famous clock made (147-80), representing our planetary system and its constellations. The Church of St. Thomas, founded in 1041, and containing a monument of Marshal Saxe, and the New

Church are also noticeable. A German university was opened May 1, 1872, and numerous educational and benevolent institutions exist. Commerce and industry flourish in consequence of the favorable situation on the river. Important tobacco-factories are in operation, numerous breweries, printing establishments, oil and saw mills, wool-spinning establishments, manufactures of oilcloth, straw hats, gloves, paper-hangings, chocolate, mustard, goose-liver pies, soap, candles, chemicals, musical instruments, furniture, jewelry, etc. The cultivation of vegetables, fruits, and flowers is considerable. Under French dominion the city had a strong bastioned circumvallation, but since it has become part of the German empire a new system of fortification has been applied, consisting of a number of large, strong forts surrounding the inner fortifications, so that an army can encamp between the city and the forts, while the city is entirely protected from the enemy's fire by the outer forts.

During the Middle Ages Strassburg was one of the most powerful free cities of the German empire, and during the period of the Reformation it played a prominent part as one of the centers of the Protestant movement. Sept. 30, 1681, Louis XIV. captured it, and by the Peace of Ryswick he retained it. It continued, however, a completely German city down to the time of the Revolution, when French gradually gained the ascendancy. By the Peace of Frankfurt (1871) it returned to Germany, and is the seat of the civil and military government of Alsace-Lorraine. Pop. (1890) 123,500. Revised by M. W. HARRINGTON.

Strategy [from Gr. *στρατηγία*, office of a general, deriv. of *στρατηγός*, general; *στρατός*, army + *ἄγω*, lead]: that branch of the art of war which has for its object the initiation and conduct of wars, campaigns, and battles in such a manner as (1) to take advantage of all available means for securing success, and (2) to cause the greatest benefits to result from victory and the least injury from defeat. The scope of strategy was formerly considered as restricted to the movements of organized armies after they were placed in the field and before they came within cannon-range of the enemy. Modern wars, however, are conducted on so grand a scale and with such rapidity that they involve all the functions of a government, and definite plans for their conduct must be prepared in advance. Consequently questions of statesmanship and diplomacy are frequently the leading factors in planning campaigns and battles, and thus become strictly strategical considerations. The domain of strategy must therefore be extended to include the methods of organizing and stationing active armies and reserves so that without unintentionally threatening or irritating neighboring countries they can be immediately mobilized for campaign when necessary. Financial and commercial considerations have the greatest possible weight in this connection, and frequently fix the time for beginning hostilities and determine the plan of campaign. In a country with a popular government, in order to arouse enthusiasm and lead the people to make necessary sacrifices, strategy, as defined above, sometimes requires a plan of campaign which, under other circumstances, might not be desirable.

An army in campaign seeks to obtain possession of some point which is known as its objective, which is selected with a view to the injury inflicted upon the enemy by its loss, and the advantages resulting from its capture. The first may be material, moral, or political; the second generally consist in facilities for further advance, better communications, and greater ease in supplying the army. Hence objectives are frequently capitals, large commercial or manufacturing cities, arsenals, river crossings, or railway centers.

The base of operations is that part of a country from which an army draws its supplies. The portion of country between the army and its base which contains the railways, wagon-roads, and water-routes, by which the army advances and receives its supplies, is called its line of operations or its communications. Since the combatants of an army can not be expected to carry with them more ammunition, provisions, etc., than are needed for one battle, the necessity for securing its line of operations from being broken is manifest. Strategical movements very frequently are directed with a view to threatening the enemy's communications and protecting one's own.

A large army covering a very extended front may, by a skillful attack, have one wing destroyed before the other can come to its support. To accomplish or prevent this is another problem in strategy of frequent application. Similar problems arise when a small but concentrated army tries

to beat in detail the parts of a larger one which attempts to concentrate upon a point at or near that occupied by the smaller force, and also in maneuvering to strike a hostile force in flank, in the larger or even in the smaller operations of war.

The guiding principles of strategy consist in so conducting the preliminary operations and movements as to force the enemy to fight at a disadvantage either in numbers, in position, or in the relative results which will follow victory or defeat. The best strategical combinations, however, will not secure victory unless supplemented by the proper handling of the troops in the battle, which is the climax of military operations and which is the field of Tactics (q. v.).

The principles of strategy are best studied in the critical histories of the campaigns of great leaders. See also the *Commentaries of Napoleon*; *Hamley's Operations of War*; *Jomini and Clausewitz on the Art of War*, *La Stratégie Appliquée* Fize, etc. JAMES MERCUR.

Stratford: town; in the county of Essex, England; on the Lea; 4 miles E. N. E. of London (see map of England, ref. 12-J). It has a fine town-hall (1869), several breweries, and manufactories of chemicals and carriages. Pop. (1891) 42,982. On the other side of the Lea is the parish of Stratford-le-Bow. Pop. (1891) 40,378.

Stratford: post-village; capital of Perth County, Ontario, Canada; on the river Avon, at the crossing of Grand Trunk Railway and its Buffalo and Goderich Division (see map of Ontario, ref. 4-C). It has extensive repair-shops, a fine railway-station, good water-power, extensive manufactures, and a town-hall. It is an inland port of entry. Pop. (1891) 9,501.

Stratford de Redcliffe, STRATFORD CANNING, Viscount: diplomatist; b. in London, Nov. 4, 1786: was educated at Eton and Cambridge; in 1807, while still an undergraduate, received diplomatic appointments and did not take his degree till 1812. In 1814 he was sent as minister to Switzerland, in 1820 on a special mission to the U. S., in 1824 to Russia, and in 1825 as ambassador to Turkey. Diplomatic intercourse having been interrupted by the naval battle of Navarino, he returned to England and subsequently sat in Parliament for Government boroughs until 1842, when he was again sent as ambassador to Turkey, retaining that position till 1858, during which time his influence at the Ottoman court was very great, and always exercised in favor of reforms, especially those involving the amelioration of the condition of the Christian population of Turkey. The most interesting point of his whole career was the contest between him and Prince Menchikoff, in 1853. The question was whether British or Russian influence should prevail in Constantinople—or, rather, whether Russia should be allowed to settle the future destinies of Turkey to her own advantage and without paying any regard to the views of the other European powers. The keenly contested diplomatic struggle between Lord Stratford and the Russian ambassador extraordinary—the result of which was the Crimean war—is narrated with dramatic power by Mr. Kinglake in his *Invasion of the Crimea*. Canning was raised to the peerage in 1852 by the title of Viscount Stratford de Redcliffe, and made Knight of the Garter in 1869. He published an essay, *Why am I a Christian?* (1873), and a drama, *Alfred the Great in Athelney* (1876). D. Aug. 15, 1880. See his *Life*, by Stanley Lane-Poole (1888).

Stratford-on-Avon: town; in Warwickshire, England; 8 miles S. W. of Warwick; on the Avon, which is here crossed by a bridge with fourteen arches built in the fifteenth century (see map of England, ref. 10-II). The house in which Shakspeare was born is still preserved; that in which he died has been razed. The former, which is a Shakspeare Museum, and Anne Hathaway's cottage, are national property. The parish church is a cruciform structure rebuilt 1332-1500. In the chancel, restored 1890-92, Shakspeare was buried. Pop. (1891) 8,318.

Strathclyde: an independent kingdom formed in southwestern Scotland at the dissolution of the ancient Brittonic confederacy, and consisting chiefly, as its name imports, of the broad valley or dale of Clyde. The capital was the fortress of Alclyde, now Dumbarton. The annals of its sovereigns are involved in deep obscurity, little more than their names being known. It fell to the crown of Scotland early in the twelfth century, was held for some years by Prince David as an independent kingdom, and was permanently united to Scotland on his accession to the throne in 1124.

Strathmore', or **The Great Valley**: the most extensive plain in Scotland; stretches across the country from Dunn bartonshire, to the S. W., to Strathaven, in Kincardineshire, to the N. E. It is bounded N. by the great mountain range of the Highlands, and S. by the Lothians, the Tweed, and the Midway hills, and is divided for the most part by the Tay, the longest and largest river of Scotland. The whole tract, which is highly cultivated, is about 100 miles long, and from 5 to 10 miles broad. Perth stands near its center, and to this central part the name is more particularly applied.

Strathmore', **Hon. Henry Ross, Baron**: military; b. in Dorset, Mar. 8, 1801 (his father being British minister there), and entered the British army as ensign in 1820; served in the Syrian campaign (1840-41); was queen's commissioner at the headquarters of the French army in the Crimea war, and was wounded before Sebastopol. Through his Indian military (1857-58) he commanded the Central India field force. His rapid marches and successful actions in the field won for him the thanks of Parliament and promotion to the rank of lieutenant-general 1869. He subsequently succeeded Lord Clyde as commander-in-chief in India, and during his term the Queen's forces were united with those of the East India Company. He commanded the British forces in Ireland 1861-70; was raised to the peerage in 1890 as Baron Strathmore of Strathmore, in the county of Nairn, and of Jhansi, East India; was promoted to be general in 1897, and in 1899 was appointed to succeed Lord Dufferin in the command of the Royal Horse Guards. He became field-marshal in June, 1877. D. in London, Oct. 16, 1893. F. M. Cochr.

Strathpeffer (i. e. valley of the Peffer): village of Ross and Cromarty, Scotland; 20 miles by rail N. W. of Inverness. There are cold sulphur and iron water springs, which are much frequented and are useful in gout, rheumatism, scurf, and diseases of the skin, kidneys, stomach, and liver. The climate is very favorable for the latitude (57° 34' N.), and the surrounding region is picturesque and interesting. See *Vox, Strathpeffer Spa* (1889). M. W. D.

Strathroy': town of Middlesex County, Ontario, Canada; on the river Sydenham, and on Great Western Railway; 49 miles E. of Sarnia and 20 miles W. of London (see map of Ontario, ref. 5-11). It has manufactures of woollen castings, steam-engines, agricultural tools, etc. Pop. (1891) 3,316.

Stratification and Stratum: See **Geology**.

Stratigraphy: See **Geology**.

Stratus: See **Clouds**.

Strauss, **ströus**: the name of a noted family of composers. —**Johann**, the elder, was born in Vienna, Mar. 14, 1804, and in early childhood showed great talent for the violin. After study and experience, became deputy conductor to Lanner. In 1826 he had his own orchestra, and then began writing the waltzes which have since made the name of Strauss known everywhere. It was in 1840 that he conducted for the first time in the Imperial Volksgarten, Vienna. D. Sept. 25, 1849. He had five children. —**Johann**, the eldest son, b. in Vienna, Oct. 25, 1825, succeeded his father as a conductor, and in 1861 became conductor of the court balls. He composed nearly 400 waltzes, and a number of operettas which have had great success. He retired from the conductorship in 1870 to devote himself wholly to composition. —**Joseph**, the next son, b. in Vienna, Aug. 22, 1827, became also a conductor and composer. His works number upward of 200. Died July 22, 1870. —**Edmund**, the third son, b. in Vienna, Feb. 14, 1835, made his first appearance as a conductor in 1853; in 1855 conducted at St. Petersburg, and in 1870 succeeded his brother Johann in Vienna. He has composed over 200 dance pieces. Both Johann and Edmund have visited the U. S. and conducted concerts. D. E. Harvey.

Strauss, **DAVID FRIEDRICH**: theologian; b. in Ludwigsburg, Württemberg, Jan. 27, 1809. His parents lived in moderate circumstances; his chief talent seems to have been inherited from his mother. As a child he was retiring and of weak constitution, but fond of study and thorough in his acquisitions. At an excellent school in Blaubeuren and at the University of Tübingen he pursued his classical and theological course with zeal and independence; Haur was one of his teachers in both places. In philosophy he was at first repelled by Kant, but attracted by Schelling, Jacobi, and the famous German mystic Jacob Böhme, fol-

lowing also with eagerness the new revelations of Hegel and others on "the dark side of nature," and to the sphere of the so-called animal magnetism. In the latter part of his course he was strongly influenced first by Schelling, next, but chiefly by Hegel, whose system and comprehensive system, sufficient, as was supposed, for all things, was just coming into general notice. Schelling's master's lectures on the life of Jesus, which Strauss heard in Berlin in 1821, and Hegel's lectures on the philosophy in the *Lectures on Science*, which, published in 1822 and 1826, 2 vols., in Tübingen, made an epoch in the history of German theology. This work was written in the course of a year, while he was Regent at Tübingen (since 1822), when the author was only twenty-seven years of age. In the learned world of Germany it brought matters to a crisis, both in respect to biblical criticism and the relations of faith to speculation (4th ed. 1840; translated from the 4th ed. into English by Mary Ann Evans (George Eliot), 2 vols., London 1841; n. s., 1 vol., 1891; New York 1893) into French, from the 3d ed. by Lullier, 4 vols., Paris, 1840). Strauss lays down in the preface the general principle that nothing which is supernatural, neither prophecy nor miracle, can be historical. The force of his criticism of details rests on this assumption. He resolves all the supernatural elements of the gospel story into myths; his hypothesis is known as the "mythical theory"—that is, the transforming of popular religious beliefs into facts supposed to have been realized in the life of Christ. The work had the merit of bringing together all the scattered objections to the life of Christ, and shaping them into a theory. But unless the supernatural can and be manifested, the underlying theory falls to the ground. In his concluding essay he applies the Hegelian logic to the life of Christ in such a way that, though he denies the facts as historical, he yet admits that there are certain essential ideas at their basis. Historical Christianity is true, not as history, but as idea. The Hegelian philosophy is to be substituted for Christianity. The work was written in a clear and trenchant style, at once popular and scientific. It was repudiated by some of the most eminent divines in Germany (such as Neander and Tholuck) and in other countries. In 1827-28 Strauss replied to his critics in several *Streitschriften*, and in *Zwei friedliche Bistler* (Albana, 1829). He lost his theological position at Tübingen in full account of the ecclesiastical proceedings, including the letters of Strauss, is given by Weissbach in the *Jahrbücher f. deutsche Theologie*, 1875, 4th part, and became a teacher in Ludwigsburg and Stuttgart. He was called to be professor of dogmatics and church history in Zurich in 1839, but was deprived of his chair by a popular insurrection, though retaining for life half his salary. In 1839 he published in Leipzig a volume on *Charakteristiken und Kritiken, entnehmend ausser aus Soldatenmacher, Dant, und Kerner, on animal magnetism and modern possessions, etc.* In 1841 he was married to a once-celebrated singer, Agnes Schaefer, but their characters, says Zeller, were so incompatible and the marriage so unhappy that they separated by mutual consent after five years. The wife lived in Stuttgart until her decease Dec. 23, 1870. In 1840-41 Strauss attempted in his far theology what he supposed he had accomplished for the life of Christ. Under the title *Die christliche Glaubenslehre in ihrer geschichtlichen Entwicklung, und im Kampfe mit der modernen Wissenschaft dargestellt* (2 vols., Stuttgart, 1840-41) he tried to resolve the whole of theology into philosophy. But this work, though learned and acute, made a comparatively slight impression. Having thus, in his opinion, disposed of historical and dogmatic Christianity, he betook himself for twenty years to general literature, interspersed with political speeches and action, leading the life of a wanderer from city to city. In 1847, at Mannheim, he published a pamphlet, *Der Romantiker auf dem Throne der Chören, oder Julius der Abtrünnige*, an ingenious parallel between Julius the Apostate and King Frederick William IV. of Prussia, made up chiefly of apt and sharp citations. In the revolutionary period of 1848 he failed in an attempt to be elected to the new Frankfurt Parliament, but he was chosen to represent his native town (Ludwigsburg) in the diet of Württemberg, where, to the surprise of his adherents, he denounced democracy, and in his very latest work he takes special pains to disparage republican institutions. His political views are contained in *Sechs Stunden politischer Volkswörter* (Stuttgart, 1849). In 1849 he published *C. F. D. Schubert's Leben in seinen Briefen* (2 vols.). In 1851, at Mannheim, appeared a memorial of one of his friends, Christian Märklin; in 1852, at Frankfurt-on-the-

Main, the *Leben und Schriften des Dichters und Philologen Nikodemus Frischlin*, representing the German culture of the sixteenth century. In 1857 he produced at Leipzig in a more important work, the *Life of Ulrich von Hutten* (2 vols.; an abridged ed. 1871; Eng. trans., London, 1874), prepared for Böcking's edition of Hutten's works; and in 1860 a volume of Hutten's *Conversations*. It was here first that he so highly eulogized and vindicated the German nationality, which he afterward advocated in such a brilliant style in his correspondence with Renan, *Krieg und Friede* (1870). In 1862 he revived the memory of a German rationalist of high critical attainments—a forerunner of Lessing—Hermann Samuel Reimarus. These and other literary and biographical works, all wrought out with æsthetic care, added to his reputation for general scholarship. In 1864 he returned to theology in the attempt at writing another life of Christ under the title *Das Leben Jesu für das deutsche Volk bearbeitet* (Eng. trans., London, 1865). The school of Baur of Tübingen and the progress of historical criticism had effectually supplanted the mythical theory of Strauss's first *Leben Jesu*. His object in the second work is, in general, to show what remains of Christ for the people after German criticism has had its full course; and he still grants that "Christianity is a moral and spiritual power in the earth"; that "we can not do without it, nor can it be lost"; that Jesus "stands foremost among those who have given a higher ideal to humanity." In 1865 he reviewed Schleiermacher's *Life of Christ*, then first published, in a work entitled *Der Christus des Glaubens und der Jesus der Geschichte* (Berlin). In 1866, under the title *Die Halben und die Ganzen*, he criticises the semi-rationalistic theology of Schenkel even more severely than he does the unbending orthodoxy of Hengstenberg. His essays on *Voltaire* (Leipzig, 1870; 3d ed. 1872) were prepared for the Princess Alice, and are praised for their critical skill and elegant diction as standing by the side of Goethe's *Wahrheit und Dichtung*. His last work, *Der alte und der neue Glauben, ein Bekenntniss*, appeared in Oct., 1872. It is intended to give the result of his life's thought and work. It rapidly went through seven editions in Germany, was published in French, and in an English version by Mathilde Blind in London and in New York (1873).

Strauss founded no school, either in philosophy or theology. He was a critic, learned, sagacious, yet without any well-defined ultimate system. His life is a reflex of the most extreme anti-Christian theory of human life. He began as an idealist and ended as a materialist. He gave up his early Hegelian pantheism to the latest theory of atheistic evolution. D. at Ludwigsburg of cancer, after long and patient suffering, Feb. 8, 1874, and was buried, by his own direction, without any church service. His *Gesammelte Schriften*, edited by E. Zeller, appeared at Bonn (12 vols., 1876-78). See his *Life*, by E. Zeller (Bonn, 1874; Eng. trans., London, 1874), and by A. Hausrath (2 vols., Heidelberg, 1876-78).
Revised by S. M. JACKSON.

Straw and its Manufactures [*straw* is O. Eng. *strēaw*; O. H. Germ. *stroh*. > Mod. Germ. *stroh*, connected with *streuen*, Eng. *strew*]: The stalk or stem of certain grains, chiefly wheat, rye, oats, barley, and buckwheat, and sometimes of peas and beans, called straw, finds large use in the manufacture of textile fabrics, paper, and braid for hats and trimmings. Originally, the employment of straw was one of the primitive arts, and it is still practiced among the rudest tribes known. Mats for sleeping on are perhaps the earliest objects that were made from straw. Baskets and bags of braided straw are still common among many aboriginal peoples. Those made in the South Sea islands are so close in texture, though quite flexible, as to be impervious to water, and are used to carry liquids. A higher development of the art is shown in the so-called Panama hats and cigar-cases that are made in South and Central America from the straw of the *Carludovica palmata*. The leaves of this plant, which resemble a palm, are gathered before they unfold, and, after the ribs and coarser veins have been removed, are cut into shreds. These are exposed to the sun and then tied into a knot and immersed in boiling water until they become white, when they are hung up in the shade and afterward bleached. The finest of these Panama hats take several months to make, and come from Ecuador, while commoner kinds are made in a few days. In certain of the U. S., as Florida and Georgia, a domestic straw from some varieties of hair grass was formerly used in making women's hats. Other uses to which straw in its natural state is put include its employment as

littering in stables; as fodder; as filling for mattresses; as thatching for roofs; as packing material for delicate articles, such as crockery, glass, etc.; as bottle-covers; as stuffing, as in saddles; as "straws" in fancy drinks; as sandals; for decoration and ornamentation, as in kindergarten work; or fancy straw frames and baskets. Its use as a fuel has been suggested in the event of the coal-supplies becoming exhausted. It is the fiber from the straw of the flax plant that is largely used in the making of linen. The most important application of straw is probably in paper-making. The crude straw is cut and put into vats with lime. It is then cooked and worked into pulp in a beating-machine. This pulp is run off in a web machine into straw-paper, used in wrapping, etc., or into straw-board, used in making boxes, etc. When bleached it is white. The tissue-paper used in the making of cigarettes is commonly made from straw. The rye straw yields the best qualities of paper. In the form of braid, straw is largely used in the making of hats, and as trimming in millinery. Straw hats were worn by the Romans, but the industry remained in a primitive condition until toward the end of the sixteenth century. It is said that Mary, Queen of Scots, engaged a company of Lorraine straw-plaiters to return with her to Scotland in order to instruct her countrywomen in their art; and thus "was the first straw-hat manufactory established in Scotland under the kind auspices of a female sovereign of eighteen." Notwithstanding her inability to care for the little colony she brought from France, they struggled on until her son James became King of England, and then they were transferred to Luton, Bedfordshire, England. In Italy the chief seat of the industry was in Tuscany, and the Leghorn hats have acquired a high reputation. A grand ducal decree of 1575 enumerates the dealers in straw hats among the Tuscan traders liable to a matriculation tax; but, according to a monumental inscription in the Church of San Miniato at Signa, near Florence, Sebastiano Michelacci di Bologna, who died in 1739, was the first to export straw hats to England, and he is hence regarded as the founder of this branch of national commerce. In Italy, as the making of straw plaits grew, certain straws, methods of treatment, and patterns gave rise to characteristic varieties of bonnets with special braids, as the Tuscan and Leghorn hats which were typical and fashionable. Foreign wars prevented their importation into England, and the Dunstable bonnet of home manufacture was the result. On the restoration of peace unplaited straws, imported from Tuscany, resulted in the Tuscan grass bonnet, one of which was publicly worn by Queen Adelaide. Thus the industry, originally that of the finished product, passed in England into one where various straws, both native and imported, were manufactured into the desired article. This result was somewhat due to the efforts of the British Society of Arts, which made great efforts to sustain the industry. In 1822 it awarded a silver medal and twenty guineas to Miss Sophia Woolhouse, of Connecticut, for a new material for fine plaits, the *Poa pratensis*, then supposed to be equal to the Italian straw for making fine straws. For some time the industry had been in existence in the U. S., and the first straw bonnet braided in the U. S. is said to have been made in 1798 by Miss Betsey Metcalf, of Providence, R. I., but the industry has followed the practice of Great Britain, and now the crude braid is chiefly imported and made up into the various finished products as hats (of which there are 103 factories in the U. S. and Canada). The principal sources of the straw imported into the U. S. are China, Italy, England, Switzerland, Germany, Japan, Belgium, and France. For braid-wheat straw is preferred, but rye straw has longer stems and can be braided into more delicate and even tissues. It is, however, less durable, and does not wash as well as wheat. In Tuscany the preferred straw is from a variety of spring wheat, thickly sown, best on a sandy, hilly ground, in February or March, according to season and local climate, and harvested by pulling the bearded wheat while the ear is in a soft milky state. The straw is left spread upon clean ground or grass for some days for the sake of the action of the dew in bleaching it; it is then gathered into sheaves, from which the laborers draw out the stalks, breaking them at the joints and breaking off the heads. They are then sorted by a species of sieve composed generally of sixteen tin plates pierced with holes and briskly moved by a wheel. They are then plaited and, if for straw hats, are shipped in bales of 240 pieces of 50 meters each. English straws are made into lengths of 20-yard pieces, although sometimes 14 and 12 yard pieces are made. Originally, the "whole straw" was used in plaiting, but in England the splitting of the straw

with a knife led in the production of a lighter variety, and, about 1813, machines were introduced for cutting. This invention is one of the causes of the great success that has attended the manufacture of straw plait in England. Originally, the varieties of straw plait were few, but in recent years an almost endless number of patterns have come into existence, many of which are colored. Notwithstanding the foreign competition, especially that from China, whence the so-called Canton plaits come, London continues to be the chief market of the world, and regular sales are held there. In the U. S. the reeds bridle are used chiefly for straw hats, and they are bleached and sewed into shape. The hats are then finished and stored, after which they are finished by putting on bands, sweatbands, tips, etc. The fancy straw plaits are used in millinery, and are imported ready for use. According to the census returns of 1890 there were six manufacturers of straw goods other than those of hats and caps in the U. S., with an aggregate capital of \$100,793, and employing 491 hands. During 1894 there was imported into the U. S. \$2,002,88 tons of straw, valued at \$97,529.00, also manufacturers of straw not specially provided for, valued at \$981,049.74, and during 1895 straw for drinks valued at \$2,150. Materials for hats, bonnets, bands, etc., including straw, ships, and other bridle, amounting to \$2,050,715.10, were imported during 1894. MARCUS BENJAMIN.

Strawberry [O. Eng. *stresaburige* < primitive Teutonic *stresano* < Indo-Europ. *wehso-*; cf. Lat. *fragosa*; Gr. *ἄβη*. The association of the Eng. word with *stres* is false]; any species of the genus *Fragaria*, family *Rosaceae*. The genus is a small one, comprising under a liberal estimate about a dozen species, and it is confined to temperate climates of both the northern and southern hemispheres. The species are all low herbs with three-divided leaves, propagating by runners, and bearing the flowers and fruits upon short scapes. Botanically considered, the strawberry fruit is a fleshy receptacle or stem, upon which the true fruits or achenes—generally called seeds—are borne. The strawberry is a fruit of comparatively recent cultivation; the first named garden variety having appeared in 1660. At the present time it is largely grown, and in North America it exceeds in importance any other of the small fruits. Commercial strawberry-culture began in the U. S. about 1800. The first important variety of American origin was the Hovey, which first fruited in 1830 or 1837 in the garden of the originator, Charles M. Hovey, Cambridge, Mass. This was followed in importance by Boston Pine. About twenty years after the Hovey appeared, the Wilson, or Wilson's Albany, was introduced from the garden of James Wilson, Albany, N. Y., and this variety is still the most popular market berry in many parts of the Northern States. These varieties, and all other commercial strawberries of North America, are offsprings of the old Pine strawberries, a class which sprung from the Chilean berry (*Fragaria chilensis*). This species was first introduced into Europe about 1712, by Capt. Pualet. The evolution of the garden strawberries from this type has taken place mostly within the nineteenth century. The wild strawberry of the eastern parts of the U. S. (*Fragaria virginiana*) was early introduced into Europe, and it was once the leading type of garden strawberries, but it is now practically lost to cultivation. The Haulbois strawberry (*Fragaria moschata*), and the Alpine and Perpetual types (*F. elsa*), both of Europe, are occasionally cultivated by amateurs.

In the U. S. the strawberry succeeds in a great variety of soils, but, in the North, at least, the best soil is thought to be a rich sandy loam, particularly one which resists the effects of drought. The methods of planting and cultivation are various, but all strawberry-growers agree that the plants are not profitable after they have borne three crops. There is an increasing tendency to allow the plantation to bear but a single crop, for, if the ground is good and the treatment generous, the first crop is the best which can be obtained, and the frequent rotation prevents the land from becoming foul, and it effectually prevents various mischief from the leaf-rot fungus and from various insects. Early spring is the time usually preferred for setting the plants, and the first crop is borne a year from that time. If the plants bloom to any extent the year they are set, the blossoms should be removed, in order to allow the plants to become thoroughly established for the following year's crop. Strawberries are commonly planted in rows from 34 to 5 feet apart, and the plants are set from 1 foot to 2 feet apart in the row. It is customary to allow the plants to form a

mat or continuous row a foot or 2 feet wide, although, in private gardens, hill-culture is sometimes practiced for the purpose of securing finer fruit. In the northern parts of the U. S. the plants are generally sowed late in fall with a light sowing of straw or marsh hay, as a protection against frost. Most persons leave this sowing upon the ground until the crop is harvested, drawing it off the plants into the spaces between the rows as soon as growth begins in spring. Some varieties of strawberries have flowers without runners, and these must be planted near pollen-bearing varieties to insure fruitfulness. The best method of planting is as to insure perfect pollination, varies with the varieties and with the grower, but it is generally thought that at least one-third of the plants should be strong pollen-bearers. An average good yield of strawberries may be considered to be from 150 to 250 bush. per acre. There are various insect depredations and other troubles, for an account of which the reader should consult the bulletins of experiment stations. The varieties in favor change so frequently that no list of them can be recommended here. There are many good writings upon the strawberry. The fullest account of American varieties is to be found in Merriell's *Strawberry and its Culture* (1870). A philosophical discussion of the origin of the cultivated strawberries, by Bailey, occurs in *The American Naturalist* (xviii: 293, Apr., 1894). The reader should consult Bailey's *Strawberry Culture*, and Terry and Root's *How to Grow Strawberries*. L. B. BAILEY.

Strays: See **STRAY**.

Streator: city (laid out in 1898, incorporated as a city in 1899); La Salle co., Ill.; on the Vermilion river, and the Atch. Top. and R. R., the Earl, Route, the Chi. and Alton, the Ind., Ill. and Ia., and the Wabash railways; 93 miles S. W. of Chicago (for location, see map of Illinois, ref. 8-15). It is built on the river bluffs, and has adequate sewerage, gas, electric-lighting, street-railway, water, and fire services, and an improved public park of 11 acres in the heart of the city. It is surrounded by a rich agricultural country, and is underlaid by several seams of coal, two of which are being worked, and also by valuable strata of shale, fire-clay, and other clays, which are used in making paving-bricks, sewer-pipe, and other clay products. The city contains 33 churches, including a Greek Catholic church and the unique Church of Good Will toward Men, 17 public schools, a high-school building (the gift of a private citizen, cost \$45,000), 2 kindergartens, 4 private and parochial schools, 2 convents, public library, Y. M. C. A. building with hall, gymnasium, and free reading-room, Planch Opere-house, 8 national banks with combined capital of \$250,000, 3 building and loan associations, 32 fraternal societies, and 9 daily and 3 weekly newspapers. In 1894 the estimated property valuation was \$12,000,000. The industrial establishments include 8 day-working factories, machine building and paving works, sewer-pipe, and tile; several manufacturers of glass bottles, window glass, rolled plate-glass, flint and Bohemian ware, and glass specialties; foundries and machine-shops, and flour and planing mills. Pop. (1880) 5,157; (1890) 11,414; (1894) estimated, 15,000. J. E. WILLIAMS.

Street, GEORGE EDWARD, R. A., F. S. A.; architect; b. at Woodford, Essex, England, June 20, 1824; was educated at Cambridge, and afterward studied architecture under Gilbert Scott. In 1850 he was appointed architect for the diocese of Oxford, and subsequently for those of York, Ripon, and Winchester. His predilection was mainly for the Gothic style, and he was recognized as one of the leaders in the Gothic Revival (q. v.). His architectural structures are very numerous and important; among them are SS. Philip and James, Oxford; the Crimean Memorial church, Constantinople; and the Synod House in Dublin. Among his restorations are Jesus College chapel, Cambridge, and the nave and choir of Christ Church Cathedral, Dublin. In 1847 he won one of the £100 prizes for a design for a new Foreign Office, and in 1868 was appointed architect of the buildings for the new courts of law, but his original design was afterward considerably modified. Besides numerous essays and lectures upon architecture, he published *The Brick and Marble Architecture of North Italy in the Middle Ages* (1855) and *Some Account of Gothic Architecture in Spain* (1865), which latter work is of peculiar value as being the only concerted account of the interesting cathedrals and other churches of the Peninsula. D. Dec. 18, 1891.

Revised by HERBERT STUART.

Street-railways: railways constructed wholly or chiefly in the streets of cities or towns, and designed especially for

local passenger traffic. The first application of the railway to the facilitation of short-distance passenger traffic in towns was made by John Stephenson in New York in 1831. A track of flat iron bars spiked to timbers resting on stone blocks was laid on the Bowery and Fourth Avenue from Prince Street to the Harlem river. An omnibus car, with flanged wheels and built in three compartments entered from the side and each holding ten persons, and with seats on the roof for thirty more passengers, was drawn by horses. Commercially this enterprise was not successful, and was abandoned after four years, but was resumed in 1845 with cars of the form used at present, entered from the ends. In 1852, the Second, Third, Sixth, and Eighth Avenue lines in New York were begun. Boston began the construction of horse-car lines in 1856, Philadelphia in 1857, and New Orleans in 1861, using for the first time the one-horse small car usually known as the "bob-tail." In France a line was constructed in Paris in 1853. In Great Britain George Francis Train, after three years of earnest endeavor, succeeded in 1860 in building a road at Birkenhead and one in London, which was removed in a few months, and not until 1870 were horse-cars permitted in that city. In 1866 a number of horse-car lines were built in South America.

The passage of the General Tramways Act by Parliament in 1870 gave an impetus to street-railway construction in Great Britain, and during the following twelve years 671 miles of lines were laid.

In 1894 there were in operation in the U. S. 12,500 miles of street-railway track, in the United Kingdom 1,000 miles, and on the continent of Europe 1,200 miles. There were also lines in Africa, Japan, Australia, New Zealand and Ceylon, and South America.

Prior to 1873 all street-cars were drawn by horses. In that year Andrew Hallidie constructed a road in San Francisco, Cal., on which the motive power was provided by a stationary steam-engine which drove a drum, around which passed an endless wire cable which was carried in pulleys in a conduit underneath the surface of the street on which the rails were laid. Through a slot in the top of the conduit a flat bar passed from the car to the cable, fitted with apparatus for grasping the cable tightly or releasing it at will, which could be controlled from the car. After several years of successful operation of this mode of propulsion in San Francisco, it was introduced in Chicago in 1881, in Philadelphia in 1883, on the Brooklyn bridge in the same year, on Tenth Avenue and 125th Street in New York in 1886, and on Broadway and Third Avenue in 1894, and in Baltimore in 1893. A cable road was built in New Zealand in 1883 and one in London in 1884. In 1894 there were 662 miles of cable road in operation in the U. S., and 20 miles in England.

The first commercially successful application of electricity to the traction of street-cars was made at Lichterfelde, near Berlin, by Siemens and Halske in 1881. On July 27, 1884, the first operation of an electrically propelled line in direct competition with horse-cars was begun at Cleveland, O., on the Bentley-Knight system. In the same year the first practical system of conveying the electricity from wires overhead to a motor on the car by a trolley, or small grooved pulley on the end of a flexible pole extending above the roof of the car, was made in Kansas City, Mo. Improvements in the apparatus made by Sprague in 1888 led to the construction of the first installation on a large scale of an electrically propelled street-car system at Richmond, Va., in that year. The greater economy and efficiency of electric roads was quickly recognized, so that while in 1888 there were 89 miles of roads so operated, there were in 1894 9,008 miles in the U. S. and 195 miles in Europe. For description of the system, see ELECTRIC RAILWAYS.

In 1881 Mekarski applied compressed air with success as a motive power to street cars at Nantes, France, and the same method has since been applied in Paris and in Berne, Switzerland.

The desire for more rapid transit between distant points in large towns than is safe in a street used by pedestrians and vehicles drawn by horses has led to the construction of lines of travel above and below the surface of the ground. The first effort in this direction was in London in Jan., 1863, when a 3-mile section of underground railway was opened for traffic. Its success led to the extensions of the line until 1884, when 15 miles of line were completed. In Dec., 1890, another underground road, the City and South London, 3 miles long and operated by electricity, was

opened for travel. In Berlin a viaduct carrying railway tracks above the street-level for 7½ miles through the center of the city was opened in 1882. In New York an elevated railway, 4 miles long, supported on columns on the sidewalk of streets, was put in operation in June, 1869, operated by a cable. This was unsuccessful, and locomotive engines were substituted on Apr. 9, 1871. In 1877 additional lines were built, until in 1879 there were 32¼ miles in operation on Manhattan Island. Between 1886 and 1891 the Suburban Rapid Transit Railroad was built, extending the system 3·7 miles N. of the Harlem river, and introducing improved methods of construction and heavier rolling stock. In Brooklyn, in 1885, an elevated road was put in operation, and in 1895 there were 25 miles in operation. In 1893 an elevated railway, 5 miles long, was opened in Liverpool, England, operated by electricity.

The relative cost of building and equipping each mile of double-track railway for the different methods of traction, the rate of speed attained, and the expense of running a car a mile, are approximately as follows:

MOTIVE POWER.	Cost per mile.	Speed, miles per hour.	Operating expenses per car-mile.
Horses	\$71,000	6	18 cents.
Cable	800,000	10	14 "
Electric surface	115,000	12	13 "
Steam elevated	500,000	13	13 "
Underground	1,500,000	13	15 "

J. J. R. CROES.

Streitberg, strit'bärch, WILHELM: comparative philologist; b. at Rüdeshelm, Germany, Feb. 23, 1864; educated at the gymnasium in Wiesbaden and at the University of Leipzig; docent at Leipzig 1889, and in autumn of same year Professor of Indo-European Philology in the University of Freiburg in Switzerland. He is one of the most aggressive of the younger generation of comparative philologists. He is the author of *Die Abstufung der Suffixe in und ieu im Germanischen* (1888); *Perfective und imperf. Aktionsart im Germ.* (1889); *Die germ. Komparativa auf -iz* (1890); *Zur germ. Sprachgeschichte* (1892); *Entstehung der Dehnstufe* (1894); joint editor with K. Brugmann of *Indogermanische Forschungen* since 1891. BENJ. IDE WHEELER.

Strength of Materials: the resistance of materials to forces which tend to change their form; often called the elasticity and resistance of materials. The science of the strength of materials is sometimes called the mechanics of materials. The subject is partly experimental and partly theoretical, the experiments furnishing the fundamental facts, while the application of theory to these deduces the rules and formulas for practical use.

The materials used in engineering constructions are more or less elastic when the applied forces are not too great, that is, they spring back to their original form upon the removal of these forces. For elastic materials it is found that the change of form is proportional to the applied force; this law holds until a point called the elastic limit is reached, after which the change of form increases more rapidly than the force, and rupture finally occurs. It is a fundamental rule in engineering that materials should not be strained beyond the elastic limit, since then the elasticity is impaired and a permanent deformation results.

The molecular resistance which is developed by an applied force is called stress. Stresses are tensile when the forces tend to pull a body apart, compressive when they tend to crush it, and shearing when they tend to cut it across. In bending a beam stresses are produced often called flexural, but they can always be resolved into those of tension, compression, and shear; in twisting a shaft stresses are produced often called torsional, but they can also be resolved into the three kinds of simple stress.

Tension.—When two equal forces are applied at opposite ends of a bar or rod a tensile stress equal to one of the forces is produced at every cross-section of the bar. If P be the intensity of each of the forces then the internal stress is also P . If A be the area of the cross-section of the bar the unit-stress is $P \div A$, and this is represented by S . Unit-stresses are usually expressed in pounds per square inch or in kilogrammes per square centimeter. If the force P be gradually applied the unit-stress S also gradually increases, and is accompanied by an elongation of the bar. When P is large enough to cause the rupture of the bar the unit-stress S is called the ultimate tensile strength of the material. The elastic limit is reached for some materials when the unit-

stress is about one-half the ultimate strength; when S is less than this elastic limit the bar springs back to its original length upon the removal of the applied forces; when it is greater it does not entirely spring back, but a permanent set remains.

If l be the original length of the bar and λ the elongation produced at any stage of the test, $\lambda + l$ is the unit-elongation. Within the elastic limit the ratio of the unit-stress to the unit-elongation is called the coefficient of elasticity, or sometimes the modulus of elasticity. Let s be the unit-elongation, and E the coefficient of elasticity; then

$$E = \frac{S}{s} = \frac{Pl}{A\lambda},$$

and the value of E is sensibly a constant for any simultaneous values of S and s , provided that S is less than the elastic limit.

The following are average values of the tensile elastic limit, ultimate strength, coefficient of elasticity, as also the elongation at the elastic limit and the ultimate elongation, for four principal materials used in engineering:

MATERIAL.	POUNDS PER SQUARE INCH.			ELONGATION. PER CENT.	
	Elastic limit.	Ultimate strength.	Coefficient of elasticity.	At elastic limit.	At rupture.
Timber.....	3,000	10,000	1,500,000	0.20	1.5
Cast iron.....	6,000	20,000	15,000,000	0.04	0.5
Wrought iron.....	25,000	55,000	25,000,000	0.10	25.0
Steel.....	50,000	100,000	30,000,000	0.17	15.0

These values are subject to much variation, particularly for steel, which may range from 60,000 to 300,000 lb. per square inch in ultimate strength. Iron wire has an ultimate strength of nearly 100,000 lb. per square inch, and cast iron has been made with a tenacity of 46,000 lb. The strongest kinds of timber, as box, ash, and beech, reach nearly 20,000 lb., while weaker kinds, like poplar and white pine, may be only 4,000 or 5,000 lb. per square inch in ultimate strength.

The diagram in Fig. 1 gives graphical representations of the average tensile properties of these four materials. The stresses per square inch are laid off as ordinates and the percentages of elongation as abscissas, and for any point on one of the curves the approximate values of these two quantities are seen by inspection. The curve for each material is a

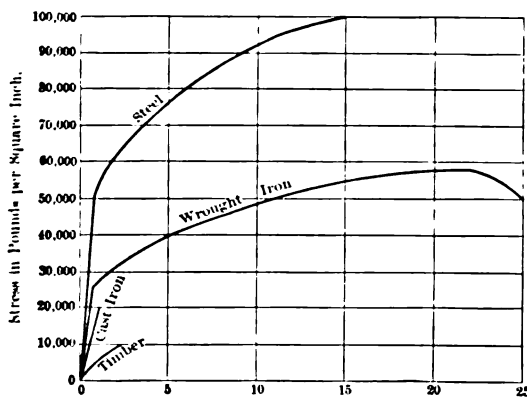


FIG. 1.

straight line from the origin until the elastic limit is reached, the unit-stresses being proportional to the elongations. At the elastic limit a sudden change in the curve is noted, and then the elongation increases more rapidly than the stress. The area between the curve and the base is a measure of the work required to rupture a cubic unit of the material.

As the elongation of a bar increases under tension a lateral contraction ensues, the unit-contraction being about one-third of the unit-elongation until the maximum strength is reached, and then, for ductile materials, the contraction increases very rapidly owing to the flow of the metal. The amount of ultimate contraction of area, which often amounts to 50 per cent. of the original area, is regarded as a valuable index of ductility and toughness.

Compression.—The phenomena of compression are similar to those of tension, provided that the elastic limit be not exceeded, and that the length of the bar does not exceed about

five times its least diameter. Rupture usually occurs by cracking and shearing, or sometimes by lateral bulging. The following are average values of the compressive elastic limit, ultimate strength, and coefficient of elasticity for the six principal materials used in engineering constructions, all in pounds per square inch:

MATERIAL.	Elastic limit.	Ultimate strength.	Coefficient of elasticity.
Timber.....	3,000	8,000	1,500,000
Brick.....	.....	4,000	.....
Stone.....	.....	6,000	6,000,000
Cast iron.....	6,000	90,000	15,000,000
Wrought iron.....	25,000	55,000	25,000,000
Steel.....	50,000	150,000	30,000,000

It should be noted that these average values are subject to much variation in different qualities of materials. For instance, the strength of some kinds of brick may be as low as 1,000 and of others as high as 15,000 lb. per square inch; that of some kinds of building-stones may be as high as 20,000 lb. Cast steel has been made with an ultimate compressive strength of nearly 400,000 lb. per square inch. The figures given hence should be used with caution in particular cases.

When the length of a bar or column is less than ten times its least diameter the compressive force P may be regarded as uniformly distributed over the cross-section A , so that the unit-stress S is simply P/A ; but for greater lengths a lateral flexure of the column occurs so that the compressive stress on the concave side is greater than that on the convex side. If C denote the greatest unit-stress on the concave side, l the length of the column, r the least radius of gyration of the cross-section, then

$$C = \frac{S}{1 - \frac{nSl^2}{\pi^2 Er^2}},$$

in which S is the mean unit-stress P/A , and n is a number depending on the arrangement of the ends of the column, being 1 when both ends are round, $\frac{1}{2}$ when one end is round and the other fixed, and $\frac{1}{4}$ when both ends are fixed.

Shearing.—A shearing stress occurs whenever two equal forces, acting like a pair of shears, tend to cut a body apart. When a hole is punched through a plate the ultimate shearing strength of the material must be overcome over the cylindrical surface of the hole. When a rivet connects two plates that are in tension the plates tend to shear the rivet across.

The ultimate shearing strength of timber is about 3,000 lb. per square inch across the grain and only about 500 lb. parallel with the grain; for cast iron it is about the same as the tensile strength; for wrought iron and steel perhaps one-fifth less than the tensile strength. Little is known regarding the elastic limit in shearing, but the coefficient of elasticity is between one-half and one-third of that for direct tension.

A shearing stress is always developed in an oblique section of a bar which is subject to direct tension or compression. If S be the tensile or compressive unit-stress the maximum shearing unit-stress is $\frac{1}{2}S$, and this occurs in a direction making an angle of 45 degrees with the axis of the bar. Shearing stresses also occur in all cases of the bending of beams and the torsion of shafts.

Working Stresses.—The unit-stresses which should be used in the design of structures are much less than the ultimate strength of the material, and indeed less than the elastic limit. The ratio of the ultimate strength to the working unit-stress is called the factor of safety, and the following are average values of the factors of safety usually employed in cases of design:

	Timber.	Brick and stone.	Cast iron.	Wrought iron.	Steel.
For steady stresses.....	8	15	6	4	5
For varying stresses.....	10	25	15	6	7
For shocks.....	15	30	20	10	15

Steady stresses occur in buildings, varying stresses in bridges, while shocks are liable to occur in machinery and on railway wheels and rails. The injurious nature of shocks requires a high factor of safety, and hence a low working stress. A load suddenly applied theoretically produces twice the stress caused by the same load when applied gradually, and the elongation is also double. When a load

drops upon a bar the resulting stresses and deformations are often more than double those caused by a gradually applied load. In all cases it is desirable that such a factor of safety should be used that the maximum working unit-stress may not exceed one-half the elastic limits of the material.

Repeated stresses beyond the elastic limit cause a change of molecular structure, or as commonly expressed, the material becomes fatigued. The greater the range of stress the less should be the working unit-stress used in the design. Stresses alternating from tension to compression require almost double the material that is necessary when the range is in tension alone, and nearly four times as much as for the case of steady stress.

Testing-machines.—The most common method of testing is by tension, the quantities determined being the elastic limit, maximum or ultimate strength, ultimate elongation, and contraction of area. Fig. 2 shows the form of specimen generally used, the heads being clamped in blocks to which the pulling force is applied. Marks are made at regular intervals along the specimen, and measurements made between these, both before and after the test, give the data for computing the elongation. The diameter of the specimen is usually about half an inch, and its length between the heads about 8 inches.



FIG. 2.

The numerous forms of testing apparatus may be classified as screw machines and hydraulic machines, the power being applied in the former by a screw and wheel, and in the latter by pressure transmitted through oil by means of a pump. Fig. 3 shows a machine of the latter class for testing wire and small rods. The wire clamped in position is seen in the foreground. The handle of the pump is worked by hand-power, and the pressure thus produced is transmitted through the oil by means of a small tube to the cylinder above the specimen, where it acts upon a piston which causes the cross-head to move up, and thus brings tension upon the specimen. A scale and weights are provided for reading the tensile stress applied. This machine is 4 feet high, nearly 4 feet long, weighs 890 lb., and can exert a tension of 10,000 lb.

Probably the best and most precise testing-machine in the world is that constructed for the U. S. Government by

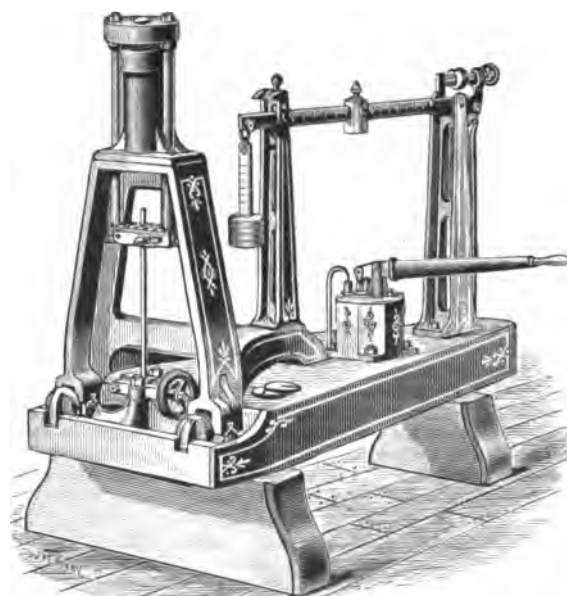


FIG. 3.

A. H. Emery, and now at the Watertown arsenal; it has a capacity of 1,000,000 lb., and can break a bar 30 feet long. Special machines of greater capacity have been constructed for testing eye-bars and other bridge members. The machine of the Union Bridge Company, at Athens, Pa., has a capacity of 1,224,000 lb., and it can break a bar 40 feet long. That of the Phoenix Bridge Company, at Phoenixville, Pa., built in 1893, has a capacity of 2,160,000 lb., and it can break a bar 45 feet long.

Compressive tests are more difficult to make than tensile ones, on account of the greater labor of preparing the specimens, and of insuring a uniform distribution of pressure over the surfaces. Even for a material like cement, which is always used in compression, the tensile test is preferred. Flexural tests of beams are often made to determine the modulus of rupture. (See FLEXURE.) Tests for the resistance of specimens to twisting are easily made by the machine devised by Thurston in 1873, which furnishes an autographic record of the stress and deformation, and thus renders possible a thorough study of the properties of materials under TORSION (*q. v.*).

Resilience of Materials.—When a body falls from a height upon a bar or beam it expends an amount of energy equal to the product of its weight and height of fall. This energy is resisted by the work of the internal stresses in the bar or beam. All the work of these internal stresses is called resilience, which is thus a measure of the capacity of the bar or beam to resist shock. Resilience is proportional to stress and deformation jointly. Elastic resilience is the work that can be resisted up to the elastic limit, and ultimate resilience is the total work up to the point of rupture, the latter being far greater than the former. The elastic resilience for different materials in tension can be compared by taking half the product of the elastic limits by the corresponding elongations; this quantity is often called the modulus of resilience. The ultimate resilience of materials can be roughly compared by the areas included between the curves in FIG. 1 and the base. The following mean-values of these quantities for tensile resilience are in inch-pounds per cubic inch of material:

MATERIAL.	Elastic resilience.	Ultimate resilience.
Timber.....	3	100
Cast iron.....	1	70
Wrought iron.....	18	13,000
Steel.....	42	12,000

The laws of elastic resilience show that the total resilience of a bar or beam is proportional to its volume, and independent of the form of cross-section, so that a beam resists shock with equal efficiency whether struck on the narrow or broad side; also the effect of a blow at the middle of a beam is no greater than at any other point. These conclusions are approximately true for ultimate resilience only in the case of cast iron; for other materials the laws are yet to be determined.

History and Literature.—The study of the strength of materials began with the announcement by Robert Hooke in 1678 of the law of proportionality between stress and elongation. Few experiments of value were made, however, until after the beginning of the nineteenth century. The work of Tredgold and Hodgkinson, prior to 1850, has since been extended by Kirkaldy, Bauschinger, Wöhler, Thurston, Howard, and others, so that volumes would be required to give even a fair summary of the properties of the numerous qualities of iron and steel. The strength of alloys of copper, zinc, and tin has been fully investigated by Thurston. Most valuable work was done by the British Government in 1848, and by a U. S. board in 1876. Numerous testing-laboratories have been established by manufacturers and by technical schools, and progress in the knowledge of materials is rapid and continuous.

The theory of the resistance of materials is intimately associated with that of beams, columns, and shafts. Beams were first discussed by Galileo in 1638, and during the nineteenth century the theory of all branches of the subject has been developed by Navier, Poncelet, Saint-Venant, Lamé, Weyrauch, Rankine, and many others. Todhunter and Pearson's *History of the Mathematical Theory of Elasticity and of the Strength of Materials* (London, 1893) gives a full account of these researches. Thurston's *Materials of Engineering* (3 vols., New York, 1884) and Burr's *Elasticity and Resistance of Materials* (New York, 1888) may be consulted for experimental results; Unwin's *Testing of Materials* (London, 1890) and Abbott's *Testing-machines* (New York, 1885) for the methods of conducting tests. Concerning beams and columns, reference is made to the article FLEXURE, and concerning shafts to the article TORSION. See also BRICK, BUILDING-STONE, CEMENT, CONCRETE, and FATIGUE OF MATERIALS.

MANSFIELD MERRIMAN.

Strepsiptera [Mod. Lat.; Gr. *στέψις*, aorist of *στέπειν*, twist + *πτερόν*, wing]: a group of insects, formerly considered

in separate orders, but now classed with the *Coleoptera* as a family, called *Strepodidae*. The elytra are very short, the wings of the male large and folded like a fan (whence the name); the females are wingless. The eyes are large; the legs two to four jointed. They are parasitic on various species of trees and wasps, and are found between the joints of the abdomen. The female never leaves the host, but the winged males become free when mature. K. A. REED.

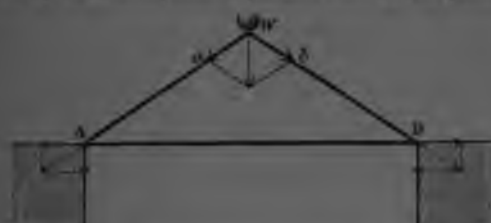
Streptoneura [From *Str.*, *strepsis*, twisted, a wring, nerve;] a term sometimes employed for a group of molluscs, including the *Prochlamys*, in which the pleuroventral nervous system is crossed in the general twisting of the body. See *ELIOTRODIA*.

Stress [M. Eng. *stress*, probably abbrev. of M. Eng. *distress* > *King, distress*] (a term of phonetic denoting the force in the outpush of breath accompanying the production of one syllable, as compared with others); i. e. relative force. It is commonly attended in English by elevation of pitch, and these two features are often confused under the name *accent*. Whispering, inasmuch as it admits of no variation of pitch, affords a good device for isolating and observing the element of stress. See *ACCENT*. BENJ. LEE WHEATON.

Stresses: molecular resistances which arise in a body when exterior forces are applied to change its form. Forces which cause an elongation of a body are resisted by tensile stresses, those which cause a shortening by compressive stresses, and those which tend to cut apart a body by shearing stresses. The three kinds of simple stress are tension, compression, and shearing, while complex stresses of flexure and torsion are caused by bending and twisting forces.

Stresses are proportional to the changes of form caused by the exterior forces until their magnitude reaches the elastic limit of the material. Beyond this they increase less rapidly than the changes of form, and when the ultimate strength of the material is reached rupture occurs. In engineering constructions it is a general rule that materials should not be stressed beyond their elastic limit.

The determination of internal stresses caused by applied forces is effected by the application of the principles of mechanics, the stresses and forces forming a system of equilibrium to which the fundamental principles of statics apply. If a load of W pounds stretches a rope or bar whose cross-section is A , the total stress in the bar is W , and the stress per unit of area is $P = W/A$. Similarly, in a case of simple compression or shearing, the resisting stress is equal to the applied force. In the simple roof truss shown in the diagram a weight W placed at the peak causes stresses in the two rafters and in the tie-rod AB , whose magnitudes are represented by the corresponding parallel lines in the parallelo-



gram of forces. The vertical reaction of each support is $\frac{1}{2}W$, and the moment of the stress in the tie-rod with respect to the peak is equal to the moment of the reaction with respect to the same point, or if S be the stress, l the length of AB , and h the height of the peak, then $S \times h = \frac{1}{2}W \times \frac{1}{2}l$, whence $S = \frac{Wl}{4h}$, which is a tensile stress. The stress in

each rafter is compressive, and its value is $\frac{W\sqrt{P^2 + 4h^2}}{4h}$.

These expressions show that the stresses increase when h decreases. See *MECHANICS*, *MOMENT*, *STATICS*, *STRENGTH OF MATERIALS*, and *TRUSS*. MANFIELD MERRICK.

Stretton, HENRY: See *SMITH, HANNAH*.

Stretland, ALICE: biographer and historical novelist; b. at Reydon Hall, Suffolk, England, Aug. 19, 1896; with her four sisters was carefully educated under the care of her father, and commenced her career of authorship at an early age, in most of her works being assisted by one or the other of her sisters. Her first work, in conjunction with her sister Susanah, was a volume of *Patriotic Songs*, which was followed by *Worcester Field*, an historical poem. Her next

work, also a poem, was *Demetrius: a Tale of Modern Times* (1897), followed by *The Pilgrims of Walsingham*, an historical romance (1900), and at intervals by many other volumes of biography, poetry, and fiction, among which are *Queen Victoria from her Birth to her Death* (1901); *Historical Novels and Poetic Fancies* (1903); *Lives of the Hanover Kings of England* (1903); *Lives of the Seven Bishops* (1905); and *Lives of the Tudor Princesses* (1906). Her most important works, both prepared in conjunction with her sister Elizabeth, whose name, at her own desire, did not appear as author, are *Lives of the Queens of England* (12 vols., 1840-49; new ed., 6 vols., 1904-05; abridged ed., 1907) and *Lives of the Queens of Scotland* (3 vols., 1850-59)—works based wholly upon original documents. She also put forth a collection of the *Letters of Mary, Queen of Scots*, with an historical introduction and notes (1812-18; new ed., with considerable additions, 3 vols., 1864). In 1870 she received a pension of £100 in consideration of her long and valuable literary services. D. at Reydon Hall, July 6, 1874. See *Life* by her sister Jane (1887).—Her sisters, SUSANAH (Mrs. Moodie) and CAROLINE (Mrs. Trail), removed to Canada, and published works illustrative of life in the Dominion. Revised by U. A. DUFFY.

Stricture [From Lat. *strictura*, a compression, don't, of *stringere*, *stringere*, draw tight, squeeze] (a constriction or compression of some tubular passage of the body, as the oesophagus, the larynx, the windpipe, the intestines, the urethra, the lacrimal ducts, and others. Strictures are produced either by new formations on the inside of the tubes, or by pathological changes in the walls and mappings of the same (degeneration), or by the pressure of new formations or of atrophies outside. Examples of the first class are croup and diphtheria, which by deposition of fibrous masses on the interior of the larynx and the windpipe narrow these organs sometimes to suffocation. A stricture of the third class is frequently produced in the oesophagus by a neighboring cancer, which may compress it to impermissibility. The most frequent strictures are those of the urethra; they are generally produced by pathological changes in the wallings of the organ. Injuries of the perineum and the penis, with or without rupture of the urethra, may originate them, but their most general cause is inflammation of the mucous lining of the urethra, gonorrhoea. Inflammation, if it spreads a little beyond the mucous lining, gives rise to new formation of connective tissue, which either directly compresses the urethra, forming a callous ring around it, or contracts it by atrophic degeneration around the tube. The immediate consequences of urethral stricture are symptoms of impediment to free micturition. The urethra behind the stricture is dilated by the pressure of the accumulated urine. The bladder is not thoroughly emptied, and undergoes inflammatory irritation by chemical decomposition of its contents. The urine becomes alkaline, with a putrid and pungent smell of ammonia. The desire to urinate is very great, and never ceases. In more advanced stages the urine sometimes breaks through the wall of the urethra behind the stricture, and either makes a fistula by breaking also through the skin, or infiltrates the surrounding tissue, and so causes uremia, and often death. In other cases, inflammation of the bladder extends to the kidneys, and there produces pyelitis and inflammation of the kidney proper. Strictures sometimes close up the urethra entirely, or become so narrow that the urine can be passed only in single drops by the strongest and most painful efforts. Speedy relief by operation is necessary in such cases to save the life of the patient. The treatment of stricture consists either in gradual dilatation or in external or internal urethrotomy. Gradual dilatation is effected by inserting bougies, or catheters, or sounds of increasing size. Every day or less frequently a larger instrument is passed through the stricture to the bladder, until the normal size of the urethra is attained. After this the last bougie is used occasionally for some time to prevent a relapse. The majority of authorities now consider dilatation with simultaneous division or incision of the constricting band the best, surest, and safest treatment of stricture. In cases where an instrument can be passed through the stricture, or where for other reasons the above method can not be resorted to, external urethrotomy is indicated. The operation is performed by cutting into the urethra from the perineum, thereby opening the stricture lengthwise. It is kept open by regular catheterization, so that the healing wound leaves a canal of normal size. Internal urethrotomy is only applicable in cases where at least a small instrument

can still be passed through the narrowed passage large enough to guide a small knife, which cuts and opens the stricture from inside. Revised by ROSWELL PARK.

Strigæ [Lat. *strix*, *strigis*, a kind of owl; possibly akin to Gr. *orpē*, a screeching bird]: an order or other group of birds embracing the owls. The eyes are directed forward, and are surrounded by a more or less completely formed facial disk of radiating feathers; the plumage is very soft and lax and the feathers are without an aftershaft; the toes are four, the outer reversible; the claws are long, sharp, and decurved; the external ear is very large, often with a movable flap. The bones inclosing the cerebral cavity have a spongy diploë; the maxillo-palatines are spongy, the latter separated by an interval wide throughout or reduced to a cleft below, and basipterygoid processes are developed. This group has been placed with the *Raptores*, but recent authorities remove it from this association and place it near the *Caprimulgidæ* or goat-suckers. See STRIGIDÆ.

Strigidae [Mod. Lat., named from *Strix*, the typical genus, from Lat. *strix*, *strigis*; possibly akin to Gr. *orpē*, a screeching bird]: a family of birds variously limited and defined. In the restricted and generally accepted sense, the *Strigidae* are owls having the breast-bone entire behind, with a central emargination, the furculum ankylosed, and the inner and middle toes of nearly equal length, the latter with its claw pectinate. It thus embraces the barn-owls, which are mostly of the Old World, though *Strix pratineola* is North American. The correlated *Bubonidae* have the sternum notched behind, the furculum free, the inner toe shorter than the middle, and the middle claw not pectinate. The feathers on the sides of the head are often elongated into ear-tufts in this family, which includes the common owls of the U. S. When the *Strigidae* are regarded as embracing all the species the groups above defined have sub-family rating. Revised by F. A. LUCAS.

Strike (in geology): See FAULTS.

Strikes and Lockouts: As defined by Carroll D. Wright, commissioner of labor for the U. S., a strike is the refusal of "the employees of an establishment to work unless the management complies with some demand." A lockout occurs when "the management refuses to allow employees to work except under some condition dictated by the management." Strikes and lockouts, therefore, are both warlike measures, and are declared to effect a specific object.

Antiquity of Strikes.—The first great strike of which we have record was that of the Hebrews in Egypt. There was a prolonged labor agitation, lasting many years, which the Egyptians endeavored to repress by imposing severer tasks upon the Hebrews. This was resisted, and many bloody encounters between serfs and masters occurred. Finally the labor forces were organized by Moses, with a general strike so thorough and well-arranged that the whole labor population marched out in a body and left their employers to their own devices. The employers were also said to be glad to get rid of their turbulent workmen. Ancient and mediæval history furnishes numerous examples of labor agitations of the nature of strikes, since inequalities of condition resulting from differences of ability in individuals keep a perpetual ferment in societies which issues in ill feeling and resentful strife between classes. Contention has characterized the history of all civilized nations, and where the industrial classes have been content to submit to unfavorable conditions the least advance has been made in civilization. The last half of the nineteenth century has seen the machinery and system of strikes brought to such perfection as to throw into the shade all previous movements of the same kind. The extension and generalization of trades-unions have led to such organization that strikes have become a recognized evil in social progress as much to be expected as changes of weather. They amount to a kind of inherent civil war.

Objects of Strikes.—A strike may be declared for one or more of the following objects: 1. To secure an advance or resist a reduction in wages. 2. To effect a reduction or oppose an increase of the hours of labor. 3. To resist the discharge of union men and hinder the employment of non-union men. 4. To regulate methods of work, materials used, number of apprentices, kind of work done by each branch of laborers, and the like. 5. To support a strike in some other industry or in some other branch of the same industry, as when pavers strike to help granite-cutters, or brakemen to help switchmen on a railway. These are known as sympathetic strikes. Strikes are wisely held by workmen to be

the last resort of a contest, and never to be risked until it is clear that the desired object can not be reached without them. They are expensive, arduous, and uncertain, and if rashly undertaken end in disaster after much suffering.

Boycotts.—To the earlier weapons of strikers, modern ingenuity has added the boycott, by which all markets are closed against the goods of the employer against whom a strike is ordered. Even his household business is interfered with, so that his grocer and butcher are forbidden to supply his necessities under pain of being cut off from most other customers. This has proved a very effective weapon in the hands of laborers.

Strikes in Great Britain.—Philip Bevan gives the number of strikes in Great Britain from 1870 to 1880 as 2,352, or 235 per annum. In 1888 they had risen to 504 for that year; in 1889, 3,164; in 1890, 1,028, involving 4,382 establishments. Strikes would seem, therefore, to be on the increase.

Strikes in the U. S.—The first recorded strike in the U. S. was that of the journeymen bakers in 1741. The leaders were tried for conspiracy. Next came the shoemakers of Philadelphia in 1796, 1798, and 1799; then the sailors in Philadelphia in 1803, who struck for \$14 against \$10 a month. They were arrested, and the leaders imprisoned. In 1809 the New York cordwainers struck, and used the term "scab" to denote non-strikers of their association. Printers struck in 1821, using the word "rat" for non-union men against whom they struck. In 1834 the first women's strike took place at Lynn, Mass., in the shoe-trade. It was unsuccessful. In 1848 the workmen of Allegheny city struck for ten hours, and carried their point after eight weeks of rioting, though with 16 per cent. reduction of wages. In 1850-51 1,300 workmen at Fall River were idle for six months at a loss of \$140,000 in wages. A strike at Pittsburg in 1850, marked by violence, resulted in sentences of fines and imprisonment to many, afterward pardoned. In 1852 mill-hands in Salisbury, Mass., struck for fifteen minutes' recess at lunch. In 1868 Pennsylvania passed a law making eight hours a legal day; much striking resulted among the coal-miners, resulting in less hours of work and more wages. In 1877 occurred the great railway strikes on the Baltimore and Ohio, the Pennsylvania, and the Erie systems, resulting in the destruction on July 21-23 of 1,600 cars, 126 locomotives, and \$5,000,000 worth of property, \$2,000,000 of which loss fell on the railways. In 1880 there were 762 strikes and lockouts together, 617 of which related to wages. Up to 1881 1,491 strikes and lockouts had taken place. Of these 1,089 were about wages, and 583 failed. From 1880 to 1890 there were 7,114 strikes, which involved 2,268,272 persons.

According to statistics of Carroll D. Wright, the strikes of 1882 affected 2,105 establishments; those of 1883, 2,759; 1884, 2,367; 1885, 2,284; 1886, 9,861. The average duration of strikes was twenty-three days. Loss in wages is estimated at \$51,814,723, and to employers over \$30,000,000; 1,323,208 employees were striking or involved, and 487,615 days were lost in all. Nearly four-fifths of these strikes were ordered by labor organizations. From 1881 to 1886 strikes affecting over 10,000 establishments succeeded, while strikes affecting about 9,000 failed. The trades represented were building, 6,075 establishments; tobacco, 2,959; mining, 2,060; clothing, 1,728; metallic goods, 1,570; transportation, 1,478. The lockouts were 2,214, of which 1,753 were ordered by organizations; 564 of these succeeded and 190 partially, and 1,339 failed. See *Third Annual Report of the Commissioner of Labor*, 1887.

In 1890 there were 798 strikes and 201,682 strikers. In the spring of 1892 occurred the granite-cutters' strike, which extended finally to pavers in New York, and arrested for a time the whole stone industry. This was, however, quite eclipsed by the famous strike in the Carnegie iron-works at Homestead, which was attended with such bloodshed and violence as to attract general attention. The Carnegie works were kept in a state of siege for several days, and the town presented the appearance of a military camp. Eight thousand soldiers were required to subdue the rioters, and though the strike apparently failed, yet it had a profound effect upon the industrial situation, and probably minimized the willingness of both laborers and capitalists to enter upon future battles. In the summer of 1894 a railway strike in Chicago and other Western cities, although a failure, threatened for a time the commercial interests of the whole country. It was ordered by E. V. Debs as president of the American Railway Union, in sympathy with striking employees of

the Pullman Car Company, and resulted in the calling out of U. S. troops to prevent the mails and feature order.

Expense of Strikes.—The cost of strikes is often figured out by statisticians, and runs into enormous sums—enough to make the laziest worker. Mr. Wright calculates that \$80,000,000 was lost in strikes and lockouts from 1881 to 1890. No doubt the funds of the unions—although now amounting to millions of dollars altogether—are often strained by the expenses of a great strike, and strikers and their families are subjected to extreme privations and distress before the contest is ended. Employers also are put to the greatest serious strain, and their business is often imperiled to the verge of bankruptcy. One lockout on the Clyde, in Scotland, was reckoned to have cost the unions \$750,000, while \$1,500,000 was lost in wages. A strike in Manchester, England, cost the unions \$400,000 and the employers \$1,500,000. These figures convey a sharp warning. They indicate what the strike in Chicago (1894) and the disastrous street-car strike in Brooklyn (1895) combine to teach—that strikes, like war, may easily cost more than they save in. It must be remembered, however, that, on the whole, strikes have seemed profitable to workmen; otherwise they must have ceased long ago.

Why Strikes are Induced Necessary.—Strikes result largely from men's ignorance of their true interests and well-being. False economic theories are responsible for a large part of the conflict between capital and labor, out of which strikes and lockouts are born. The false notion that profits must fall as wages rise—a notion contradicted flatly by history, which shows high wages and large profits inseparably yoked together—is partly responsible for the striking spirit. Really the antagonism of capital and labor is an inheritance from an ignorant past. It is also an inference of short-sighted reasoning which regards wages as surge and does not see that they immediately turn about and become income to the capitalists, since they are used to buy goods produced by labor, so that the higher the wages the larger the market becomes, and the greater the gross profits. On the other hand, also, the greater profits become the more capital stands ready to employ labor, and the stronger becomes the tendency in wages to rise in consequence. From the time when laborers were arrested and punished as conspirators, to the present day when they are regarded as disturbers of the peace and troublemakers of society, they and the upper classes have progressed together, often fighting but advancing most when co-operating rather than contending, and wages and profits have both risen greatly. The laborers get more wages, and their increased consumption increases the amount of goods needed, which enlarges the business of the capitalist and multiplies his profits. If this were not so, strikes would have ruined all parties long ago, impoverishing laborers and bankrupting capitalists.

Increasing Magnitude of Strikes.—The interests involved in strikes are constantly enlarging. The disturbances of 1892 at Homestead and New York and of 1894 and 1895 in Chicago and Brooklyn shivered the whole nation in its, as it were, engaged in these industrial convulsions, and that nothing but a scientific adjustment of the difficulties involved could bring about a condition of harmony and progress. A recognition of the economic principles involved alone will resolve the situation; and the main principle is the above law that wages and profits advance together, since profits are always largest in countries where wages are highest, and markets therefore largest. Lord Brassey, who has made a special investigation of the subject, has stated as a general truth that the higher-priced workmen are in reality the cheaper, on account of the quantity and quality of the work done. Low-priced labor is found to be dearest. Of course it would be but a visionary business policy to favor increasing wages were it not that wage advance means larger demand, increased consumption, and ultimately larger profits, out of which, again, further advances of wages may be made, as they will certainly be demanded by strikes.

Violence in Strikes.—The Buffalo switchmen's strike of Aug., 1892, called out 750 men, affected twelve railways, and lasted two weeks. There was some violence, and many cars were burned. It was declared hastily by Grandmaster McSweeney to secure ten instead of eleven hours' work, and 27 cents per hour instead of 25 cents. Night watchmen and soldiers were sent to Buffalo to put it down, and it failed, as strikes generally do unless carefully prepared. This appeared especially clear in the Chicago strike of 1894 and the Brooklyn strike of 1895. Violence nearly always endangers the strikers in public regard and defeats their

ends, while it supplies their resources. It is of no advantage to workmen striking for wages to destroy the property and of which wages come, and the impolicy of violence toward property is now becoming clear to strikers themselves; but toward workmen seeking to take the place of strikers there is still a very ready spirit of violence, which seriously threatens personal liberty and social order.

Success and Failure.—According to Carroll H. Wright's figures, about 50 per cent. of strikes succeed and about 50 per cent. of lockouts fail, as if the workmen were 50 per cent. wiser than the masters. This seems, however, to rather appear than real. As a matter of fact wages are seen to rise and fall from general causes just the same whether men strike or not.

Arbitration.—The great strike of the Shagwren Union in New South Wales in 1891, which finally involved so many industries, capitalists and workmen, skilled and unskilled, was made the subject of an elaborate examination by a parliamentary commission. The result was a recommendation of conciliation as a remedy, and if that failed arbitration without compulsory power. The same outcome resulted from a commission appointed to examine the Chicago strike and report. The idea is that such discussions and examinations as these measures necessitate tend to assuage ill feeling and promote reasonable conclusions sufficiently to carry force enough to settle disputes without other means. Doubtless there is truth in this position. Arbitration is also much valued as a means of preventing strikes and lockouts, by obviating the necessity for them. Doubtless as a temporary expedient it has value, as giving time for the adjustment of new disputes before they are definitely formulated; but arbitration is at best a broken reed to lean upon, inasmuch as the causes of strikes are now desires and new demands, which the rules of the past can not satisfy. The elements of the problem are usually whether a given business can afford to pay its employees more, or give them shorter hours or more privileges than they have been having. Evidently this is a question which only the employer can answer. He is the only one who knows, and therefore what a board of outsiders may say about the matter is liable to be totally irrelevant. If he can grant the laborers' demands, he will finally be willing to do it, because it is the more profitable alternative. If, however, he can not grant these demands, owing to the fact of an already depleted margin of profit, he will no more be able to do so because advised by a board of arbitration than without such advice.

SPENCER HOFF NICHOLS.

Strindberg. ANSWER: writer; b. in Stockholm, Sweden, Jan. 22, 1849. In 1870 he went to Paris, where he remained ten years. His first important works were the powerful dramas *Midas* (1879) and the social satire *Reda Brannan* (The Red Room), which was followed by dramas, novels, and tales, all displaying great originality and descriptive power. Among these may be mentioned *Ballets* (1881) (The Secret of the Club); *Mr. Berge's House* (Mr. Berg's Wife); *Erken Jule* (1886); and *Himmelstiehet Nycklar* (The Keys to the Kingdom of Heaven, 1892); and the novels *Lapska* (Lapska) (Utopias in Real Life, 1893) and *I Hattelandet* (In the Offing, 1891). Many of his works, especially the later ones, have aroused much controversy on account of the extreme social and moral views advanced in them. He is the leading apostle of naturalism in Sweden. D. K. DRUG.

Stringy Bark. See EUCALYPTUS.

Strobilation [= Gr. *στροβίλος*, anything twisted, pinwheel, etc.]: a process of reproduction occurring among certain jellyfishes (*Hydrozoans*), in which the larva becomes transversely divided into a series of disks (*Ephyrae*), each of which later develops into a medusa. The partially-divided larva was formerly regarded as an adult, and was called *Strobila*, in allusion to its appearance. A process akin to this occurs in the growth of the mushroom coral (*Fungia*) as well as in many tapeworms, in the latter resulting in the formation of the "pots" or proglottids. See TAPESOME. J. S. K.

Stroboscope [from Gr. *στροβίλος*, rotation + *σκοπεῖν*, to view]: an instrument for examining the motion of a body by intermittent sight. It was invented in 1822, independently, by Plateau in Belgium and Münster in Germany. In its simplest form it consists of a disk perforated near the circumference with a series of equidistant radial openings, through which the body is viewed while the disk rotates uniformly. Suppose, for example, that the body is vibrating, and that the time of one complete vibration is equal to that required for the disk to rotate through the angular

distance between two successive openings. The body will be seen in succession at the same phase of its motion, and will hence appear stationary. If the vibration period be slightly greater or less, the body will be seen successively in slightly different phases, and the visual impression is that of slow motion, the rate of which is calculable if the rate of rotation of the disk, the number of openings, and the period of the body be known. If the interval of time between the successive momentary views of the body be equal to or less than the duration of the retinal impression produced by it, the perception is uninterrupted. This duration decreases with increase of time of exposure of the retina and with increase in intensity of the light. The law determined experimentally by E. S. Ferry (see *American Journal of Science*, Sept., 1892, p. 204) is that retinal persistence varies inversely as the logarithm of the number which expresses the brightness. This means that if the intensity is increased by multiplying it by the second, third, or fourth power of some constant number, the corresponding duration will be one-half, one-third, or one-fourth of its original value. Under the conditions of ordinary daylight this duration varies from one-fiftieth to one-tenth of a second.

The principle of the stroboscope is applied in instruments to which a variety of names have been given, such as thaumatrope, phenakistoscope, vibroscope, zoetrope, zoopraxiscope, kinoscope, etc. If a succession of photographs of a rapidly moving body be taken at intervals of less than one-tenth of a second, and these be appropriately arranged for examination by the stroboscopic method, the resulting perception is that of the body in actual motion. With the development of instantaneous photography the preparation of such series of pictures has been brought to a high degree of perfection.

W. LE CONTE STEVENS.

Strombidæ [Mod. Lat., named from *Strombus*, the typical genus, from Lat. *strombus* = Gr. *στρόμβος*, a kind of spiral snail, also top, pine-cone, deriv. of *στρέφω*, twist]: a family of gasteropod molluscs. The shells vary considerably in superficial character, but all have a more or less conic spire, and in most the outer lip is expanded and deeply notched anteriorly. Species are generally diffused in all tropical seas, and between seventy and eighty are known. They are distinguished by the peculiar form of the foot, which is fitted for leaping rather than the crawling progression common to most gasteropods, and by the pedicles bearing the eyes and tentacles. They are quite active, but are reputed to be chiefly carrion-feeders. The shells are often employed as ornaments, and especially is this the case with the *Strombus gigas*, often known as the fountain-shell. This is the largest of the family, and sometimes weighs 4 or 5 pounds. It is also largely employed for the manufacture of cameos.

Revised by J. S. KINGSLEY.

Stromboli: northernmost of the Lipari islands, in the Mediterranean, off the north coast of Sicily; area, 8 sq. miles. It is wholly of volcanic formation, and has a constantly active volcano 3,040 feet high with an extinct crater on top, but an active one on the side at the height of about 2,150 feet. Cotton, wine, and fruit of superior quality are produced, and sulphur and pumice-stone are largely exported. On the east side lies the small town of Stromboli. Pop. of island, 500.

M. W. H.

Strong, AUGUSTUS HOPKINS, D. D., LL. D.: minister, educator, and author; b. at Rochester, N. Y., Aug. 3, 1836; graduated at Yale College 1857, and at Rochester Theological Seminary 1859; became Baptist pastor; pastor at Haverhill, Mass., 1861, Cleveland, O., 1865; president and Professor of Biblical Theology, Rochester Theological Seminary, 1872. He has published the following works: *Systematic Theology* (Rochester, 1886; 3d ed. New York, 1890); *Philosophy and Religion* (1888).

W. H. W.

Strong, GEORGE CROCKETT: soldier; b. at Stockbridge, Vt., Oct. 16, 1832; graduated at the U. S. Military Academy in July, 1857; assigned to the ordnance, and in 1861 took temporary command of the Watervliet arsenal, West Troy. He was ordnance officer on Gen. McDowell's staff at Bull Run, and was then attached successively to the staffs of Gen. McClellan and of Gen. Benjamin F. Butler, whose chief of staff he became. He aided in the organization of the expedition for the capture of New Orleans 1861; in Apr., 1862, commanded the successful expedition from Ship island to Biloxi, Miss., and in September that to Ponchatoula, which destroyed a large amount of property belonging to the Confederates. In Nov., 1862, he was appointed a brigadier-general of volunteers, and in June, 1863, assigned to command

of the brigade which, in the operations about Charleston, effected the landing on Morris island, July 10, 1863, Gen. Strong leading the successful assaulting column, as also the ineffectual assault on Fort Wagner the following morning. Again, a week later (July 18), his brigade led the second assault on that work, at the head of which Strong fell wounded. His commission as a major-general bore the date of the assault, July 18, and the name of Fort De Kalb, on the southern side of the Potomac, was changed to Fort Strong in his honor. D. of his wounds in New York, July 30, 1863.

Strong, JAMES, S. T. D., LL. D.: educator and author; b. in New York, Aug. 14, 1822; graduated at Wesleyan University in 1844; taught in Troy Conference Academy, Poultney, Vt., 1844-46; in 1847 removed to Flushing, Long Island; projected and built the Flushing Railroad, of which he was president; gave private lessons in Greek and Hebrew. In 1856, although not a clergyman, he received the degree of doctor of sacred theology from Wesleyan University, which institution also made him LL. D. in 1881; in 1858-61 was Professor of Biblical Literature and acting president of Troy University, and in 1868 became Professor of Exegetical Theology in Drew Theological Seminary at Madison, N. J. He was a member of the Anglo-American commission for the revision of the English version of the Bible. In 1873 he was chosen chairman of the archaeological council of the Oriental Topographical Society, and in 1874 made an extended tour in the East; prepared for Lange's *Commentary* the English translation of the part on the book of Daniel, and published *Harmony and Exposition of the Gospels*, in English (New York, 1852), *Harmony of the Gospels*, in Greek (1854), and brief manuals of the Gospels and of Greek and Hebrew grammar. About 1853 he projected, in association with Rev. John McClintock, D. D., a *Cyclopedia of Biblical, Theological, and Ecclesiastical Literature* (10 vols., 1867-81, 2 supplementary vols., 1884, 1887, with later addenda, bringing the work down to 1891). Dr. Strong taking the department of biblical literature, including sacred geography, antiquities, and natural history. On Dr. McClintock's death, Mar. 4, 1870, Dr. Strong assumed the supervision of the whole work. He also published *Irenica* (1896); *The Tabernacle of Israel* (1898); *Sacred Idyls* (1899); *Future Life* (1891); *Jewish Life* (1891); *Our Lord's Life* (1892); *Commentary on Ecclesiastes* (1893); and an exhaustive *Concordance of the Bible* (1894), on which he labored for more than thirty years. D. at Round Lake, N. Y., Aug. 7, 1894.

Revised by A. OSBOEN.

Strong, JOSIAH, D. D.: clergyman and author; b. at Naperville, O., Jan. 19, 1847; graduated at Western Reserve College, Hudson, O., 1869; studied theology at Lane Theological Seminary 1869-71. He was successively pastor of several Congregational churches (at Cheyenne, Wyo., 1871-73, at Hudson, O., 1873-76, at Sandusky, O., 1876-81); secretary of the Ohio Home Missionary Society 1881-84; pastor in Cincinnati 1884-86, when he became general agent of the Evangelical Alliance of the U. S. of America. He is the author of *Our Country* (1885, reissued in revised form 1891); *The New Era, or the Coming Kingdom* (1893).

G. P. F.

Strong, WILLIAM, LL. D.: jurist; b. at Somers, Conn., May 6, 1808; graduated at Yale College in 1828; was admitted to the bar in 1832, and commenced practice at Reading, Pa.; was representative in Congress 1849-54; in 1857 was elected a judge of the Supreme Court of Pennsylvania for fifteen years; resigned the position in 1868, and resumed practice at the bar, and in 1870 was appointed associate justice of the Supreme Court of the U. S. He retired 1880.

Strongylidæ [Mod. Lat., named from *Strongylus*, the typical genus, from Gr. *στρογγύλος*, round, spherical]: a family of parasitic round worms (nematodes) in which the mouth is usually surrounded by six papillæ or with a cup-like toothed expansion of these. Frequently in the male the end of the body has a bell-like expansion. Some species are parasitic in man, one, *Dochmius duodenalis*, causing the "tunnel disease" among the workers on the St. Gotthard tunnel, or "Egyptian chlorosis" in Africa, a disease occasionally fatal. Other species live in domestic animals, the "gapes" of fowl being caused by the presence of *Syngamus trachealis* in the windpipe.

J. S. KINGSLEY.

Strontium [Mod. Lat., deriv. of *Strontia*, from *Strontian*, in Argyleshire, Scotland, where strontia was first found]: the metallic basis of strontia, one of the alkaline earths, first obtained from native carbonate of strontium by Sir Humphry Davy in 1808. It is a pale yellow, burns with

a crimson flame, emitting sparks, decomposes water, liberating hydrogen gas; is hard, brittle, and fusible, and is obtained from the anhydrous chloride by electrolysis. Specific gravity, 3.64; atomic weight, 87.5; symbol, Sr. Its most important compound is the oxide called strontian, a grayish-white, porous mass, which combines with water to form a white powder, the hydrate of strontium (see HALL). This compound has acquired considerable importance in Germany for its use in extracting sugar from beetroot molasses. The sulfate SrSO_4 is much employed in the manufacture of the crimson lights in fireworks. The sulfates (SrSO_4) is a ferrous native, and is known as a crystalline mineral by the name of Celestine (q. v.). Revised by I. A. HARRIS.

Strophanthus: a genus of apocynaceous plants. From western African climbing shrubs of this genus is prepared a potent locally known as kumbo, mung, and mung, and used for the purposes of the chase and war. It has been shown by Prof. T. R. Fraser to contain a crystalline principle, strephanthin, which has a powerful influence upon the muscular system, first stimulating, but if in sufficient dose finally causing a general paralysis, ending in death through failure of the respiration. It affects not only the voluntary muscles but also the smooth fibers in the heart and in the walls of the blood-vessels; and since the first action, and indeed its entire action, when in minute doses, is stimulating, it has become a very valuable remedy in the treatment of failure of the heart from any cause. It resembles digitalis in its use in disease, but differs from that drug in being much more prompt and vigorous in its action, and in affecting more powerfully the kidneys. Though less powerful than digitalis, it may be often substituted with advantage for that drug, especially when promptness of action is required, or when it is necessary to rapidly relieve dropsical exaltations. The active principle, strephanthin, has been given in doses of 0.0002 to 0.0004 grammes, but the drug is chiefly used in the form of tincture, of which the dose is 3 to 10 drops. R. C. WOOL.

Strophe (via Lat. from Gr. *strophē*, a turning): unlike the Latin equivalent *versus*, a group of lyric poems, sometimes comprising several periods, combined into a symmetrical whole. In the Lesbian melic poetry it was a stanza usually of four lines, some of which were alike, which was repeated *ad libitum* with the same music. In the choric poetry of the drama and the lyric poets the role are more varied in form and usually more numerous, and the strophe was followed by another just like it, called the antistrophe, sung to the same music, the two being regarded as a complex unit, and the chorus executing a movement with the one and a counter-movement with the other, hence the names a "turning" and a "counter-turning." To this pair or evaggy was often (as always in Pindar) added another strophe without antistrophe, different in form, called epode (though, sung after, the three constituting the lyric "triad," see PAMPHY).

MURDOX W. HENDERSON.

Stroud: town, in Gloucestershire, England; on the Frome: 10 miles S. S. E. of Gloucester (see map of England, ref. 11-12). It is an important seat of woollen manufactures and dyeworks, the water of the Frome being well adapted for dyeing. Pop. (1891) 9,815.

Stroudsburg: borough; capital of Monroe co., Pa.: on Broadhead creek, in the Del., Lack. and West, and the N. Y., Susq. and West, railways; 4 miles N. W. of the Delaware Water Gap, 24 miles N. of Easton (for location, see map of Pennsylvania, ref. 4-1). It is in an agricultural region, has excellent water-power, and is surrounded by attractive scenery. It contains 2 national banks with combined capital of \$150,000, a building and loan association, hotel and hotel, and 3 weekly newspapers. Pop. (1880) 3,800; (1900) 2,419.

Struensee, JOHANN FRIEDRICH, Count of; minister to Christian VII. of Denmark; b. at Halle, Prussian Saxony, Aug. 5, 1757; studied medicine; and was appointed personal physician to Christian VII., over whom he gained a complete ascendancy. In 1771 he was made Minister of State, and a royal decree gave full authority to any orders he might issue, whether they were signed by the king or not. Struensee used his great influence to introduce sweeping reforms, some of which were beneficial to the people so tending to restrict the power of the nobles. Among other innovations he demanded the enfranchisement of the peasants, the introduction of examinations for public offices, the establishment of complete religious toleration and of liberty of the press.

The suddenness of these reforms and their radical nature aroused violent opposition, which culminated in a conspiracy against him. The story of an intrigue between him and the young queen Caroline Matilda was employed by the queen dowager to induce the king to order his arrest, and Christian, whose infatuated mind made him severely responsible for his actions, finally gave his consent. On Feb. 10, 1772, Struensee and the queen were arrested. No proof was advanced of his infatuation as a minister, but the threat of applying the tortures extorted from him a confession of guilty relations with the queen, and he was beheaded Apr. 28, 1772. See WEXELL, *Life and Times of Queen Caroline* (1804); JENSEN-JENSEN, *Die Verfassungsgeschichte des Königreichs Dänemark Matilda und die Herrschaft Struensee und Becholt* (1814); and WITTE, *Struensee* (1876). P. M. CARR.

Struggle for Existence: See RIVALRY.

Struma: See STOMACH.

Struppell, GEORGE AUGUST, M. D.; physician: b. at New-Amt. (Lüneburg), Russia, June 28, 1804; educated in part at the University of Dorpat, where his father was Professor of Philosophy, and at the University of Leipzig, where he graduated M. D. in 1830; from 1830-32 assistant at the Leipzig clinic; in 1832 appointed Extraordinary Professor of Internal Medicine at Leipzig University and director of the polytechnic; in 1836 appointed to the chair of Special Pathology and Therapeutics at the University of Erlangen. His most important work is *Lehrbuch der speziellen Pathologie und Therapie der inneren Krankheiten* (Leipzig), which has passed through seven editions and has been translated into French, Spanish, and English. A. T. AMMERSON.

Struthio: See SATONIA.

Struthionidae: an order of birds characterized by the structure of the palate, in which the vomer does not articulate with the pterygoids. The sternum is devoid of a keel. The group includes the South American *Struthio* (*Struthio*), *Struthio* (*Struthio*), *Struthio* (*Struthio*), and *Struthio* (*Struthio*). F. A. C.

Struthionidae (Mod. Lat., named from *Struthio*, the typical genus, from Lat. *struthio*, str., *repellere*, strike); a family of ratite birds. The bill is rather elongated, nearly straight, gradually depressed forward and narrowed toward the extremity, which is rounded, and the culmen is flattened; the nostrils are elongate-oval, and in a broad membranous groove near the middle of the bill; the feathers are destitute of after-shafts; the wings are imperfect, and furnished with long curving soft plumes; the tail is moderate, and consists of curved pendant feathers; the tars are elongated, robust, and mostly covered with hexagonal scales, but in front toward the toes with transverse ones, the toes are two in number, with pad-like under surfaces, the inner (third) large, the outer (fourth) small; the claws short, curved, and blunt.

A number of osteological characters support the differentiation of the family from the others of the group, and have been formulated by Prof. Huxley—viz., the maxilla palatinae are thickened at their inner edges, and articulate with facets upon the sides of the vomer; the vomer is quite short, and does not articulate with either the palatinae or pterygoids behind; the prefrontal processes of the premaxilla are deficient in ossification; the sacral vertebrae are united by their bodies with the anterior ends of the pubes and ischia; the sternum has two shallow notches on each side at the posterior margin; the manus possesses the ordinary three digits, and of these the radial and middle have claws; there is a union of the pulvis in a symphysis; the hallux is not only adjoined, but also the distal end of the metatarsal bone and the phalanges of the second digit of the foot. See OXYGEN.

Revised by F. A. LAYMAN.

Strott, JOHN WILLIAM, third Baron Rayleigh, F. R. S.; physicist; b. in England, Nov. 12, 1818. He was educated at Cambridge, and graduated 1840; became fellow of Trinity College 1846; succeeded to the title 1873; Professor of Experimental Physics in the University of Cambridge 1878-84; and Professor of Natural Philosophy in the Royal Institution of London since 1867. He is a member of numerous scientific societies and a correspondent of the Institute of France. He is the author of several memoirs relating to acoustics and electricity in the *Philosophical Transactions of the Royal Society*, of numerous papers in scientific journals, and of *The Theory of Sound* (2 vols., 1877-78; 2d ed., 1894). In 1894, in conjunction with Prof. Ramsay, he discovered, and has since prepared in quantity, a new element in the atmosphere, which he has called argon. For this discovery the trustees

of Columbia College, New York, on the recommendation of the National Academy of Sciences, awarded Lord Rayleigh in 1895 "the Barnard medal for meritorious service to science." The discovery originated from the fact that the supposed nitrogen of the atmosphere was always found to be heavier than the nitrogen obtained by chemical means—from ammonia, for instance—the explanation being given by the admixture of the heavier gas, argon, with the former. The atomic weight of argon is 19.9, as compared with 14 of nitrogen, if it is assumed to be a single element. It would thus come between fluorine and sodium in the series of elements. It is believed that the gas was obtained in 1892 from the mineral uraninite by the American chemist W. F. Hillebrand, who by not applying sufficient tests concluded that it was nitrogen. Argon has since (1895) been found by Ramsay in the Norwegian mineral cleveite in conjunction with the solar element helium. (See SPECTRUM.) It differs in a remarkable way from all other known elements in its inertness or absence of chemical properties, whence its name (Gr. ἀργόν, neut. of ἀργός, lazy). Lord Rayleigh, however, believes that it has some affinity with certain of the hydrocarbons, and Prof. Berthelot, of Paris, has induced it to combine with the vapor of benzene, the product formed being a yellow resinous substance. In the course of his experiments in passing electric currents through argon mixed with benzene, Berthelot has obtained splendid displays of colors similar to those of the aurora borealis, which phenomenon, it is thus suggested, may be due to the action of electric currents upon the argon in the atmosphere. Its spectra have been studied by Crookes; they are of two kinds, with bright lines conveniently named red and blue, which are obtained under different conditions of pressure and electric current. The gas has been liquefied and solidified by Olszewski of Cracow. It dissolves in water under the ordinary pressure at 14° C. in the proportion of 4 volumes to 100, and is thus about three times as soluble as nitrogen. The critical temperature under 50 atmospheres is — 121. The density of liquid argon at its boiling-point is about 1.5.

R. A. ROBERTS.

Strutt, JOSEPH: antiquary: b. at Springfield, Essex, England, Oct. 27, 1742; was apprenticed to an engraver, but early devoted himself specially to the study of British antiquities. His principal works in this department are *The Regal and Ecclesiastical Antiquities of England* (1773; new ed. by Planché, 1842); *Horde-Angel-Cynnan*, being a view of the customs, arms, etc., of the inhabitants of England from the arrival of the Saxons till the reign of Henry VIII. (1774-76); *The Chronicle of England*, completed only to the time of the Norman Conquest (1777-78); *Complete View of the Dress and Habits of the People of England from the Establishment of the Saxons to the Present Time* (1796-99; new ed. 1875); *The Sports and Pastimes of the People of England* (1801; often republished). He also published a *Biographical Dictionary of Engravers* (1785-86), and left several tales, one of which, *Queen Hoo Hall*, was edited after his death by Sir Walter Scott. D. in London, Oct. 16, 1802.

Struve, stroo've, FRIEDRICH GEORG WILHELM, von: astronomer; b. at Altona, Holstein, Apr. 15, 1793; studied first philology, and afterward astronomy, at the University of Dorpat; received an appointment at the observatory in 1813, and became its director in 1817. From 1834 to 1839 he planned and superintended the construction and erection of the observatory at Pulkowa, near St. Petersburg, which he has described in his *Description de l'Observatoire central de la Russie* (1845), and of which he was director to his death Nov. 23, 1864. This observatory became the most noted of the world. The earlier part of his career was mostly occupied by studies of double stars and of the construction of the Milky Way—*Observationes Dorpatenses* (8 vols., 1817-39); *Catalogus novus stellarum duplicium* (1827); *Stellarum duplicium mensura micrometrica* (1837); *Stellarum fixarum, imprimis compositarum, positiones medie* (1852); and *Études d'astronomie stellaire* (1847). Subsequently he undertook several great geodetic works, such as the triangulation of Livonia (1816-19) and the measurement of a meridian arc in the Baltic provinces (1822-27), which he continued to the North Pole in connection with Hansteen, and to the Danube in connection with Gen. Tenner, and which he has described in his *Arc du méridien entre la Danube et la Mer Glaciale* (1861).

Revised by S. NEWCOMB.

Struve, GEORG ADAM: jurist; b. at Magdeburg, in what is now Saxony in Prussia, Dec. 27, 1619; studied law at

Jena and Helmstedt; held the offices of court assessor, private counselor to the Duke of Weimar, and Professor of Law in the University at Jena; and in 1680 was appointed president of the regency of Weimar, the then duke being a minor. Of his numerous elaborate legal treatises the most important are *Syntagma Juris Feudalis* (1653); *Syntagma Jurisprudentiæ Civilis* (1655); and *Jurisprudentia Romano-Germanica Forensis* (1670). D. at Weimar, Sept. 15, 1692.—His son, BURKHARD GOTTHELF STRUVE (b. at Weimar, May 26, 1671; d. at Jena, May 24, 1738), was a jurist and historian. He studied law, traveled, was appointed librarian of the University of Jena 1697, then Professor of History 1704 and of Jurisprudence 1730. He was historiographer to the house of Saxony. The most important of his many works are *Syntagma Historiæ Germanicæ* (1716); *Corpus Juris Gentium*; *Publici* (1717); and *Bibliotheca Historica* (11 vols., 1705).

F. STURGES ALLEN.

Struve, OTTO WILHELM, von: astronomer; b. at Dorpat, Russia, May 7, 1819; son of Friedrich Georg Wilhelm von Struve, under whom he studied astronomy; succeeded him as director of the observatory of Pulkowa, and became known in the history of astronomy by many valuable researches. His *Determination of the Constant of Precession* is a classic, as is also his *Measurements of Double Stars*, a continuation of his father's work. He visited the U. S. in 1879 to order the object-glass of the proposed great telescope of his observatory from A. Clark & Sons, and again in 1883 to receive the glass. He resigned the directorship at Pulkowa in 1890.

SIMON NEWCOMB.

Strychnine, or Strychnia: See NUX VOMICA.

Strychnos [Mod. Lat., from Gr. στρίχνος, a kind of nightshade]: a genus of trees and climbing woody vines of the family *Loganiaceæ*, found in the tropical parts of Asia and America. Most species are poisonous. *S. nuxvomica* of India (see NUX VOMICA), a tree of moderate size, yields the alkaloids strychnine, brucine, and igasurine, all active poisons in overdoses. Equally poisonous are the *S. ignatica* of the Philippines and *S. tieute*, a climbing vine of Java. The East Indian *S. ligustrina* and *S. colubrina* are reputed to cure snake-bites. *S. pseudo-quina* of Brazil yields copalche-bark, a valued febrifuge; *S. potatorum* of India is the clearing-nut tree; and *S. toxicaria* of South America probably affords the dreaded curare (or woorari) poison.

Revised by L. H. BAILEY.

Stryker, MELANCTHON WOOLSEY, D. D., LL. D.: clergyman and educator; b. at Vernon, N. Y., Jan. 7, 1851; educated at Hamilton College and Auburn Theological Seminary; pastor of Calvary church, Auburn, N. Y., 1876-78; First Presbyterian church, Ithaca, N. Y., 1878-83; Congregational church, Holyoke, Mass., 1883-85; Fourth Presbyterian church, Chicago, 1885-92; since 1892 president of Hamilton College. He has published *The Alleluia* (1884); *Church Praise Book* (New York and Chicago, 1881); *Christian Chorals* (1885); *Church Song* (1890); *Choral Song* (1891); *Miriam and other Verse* (1888); *Essay on Des Ire* (1892); and *Inaugural Address, Hamilton College* (1893).

C. K. HOYT.

Strype, JOHN, D. D.: ecclesiastical historian; b. at Stepney, England, Nov. 1, 1643; educated at St. Paul's School and at Cambridge; from about 1670 to about 1732 held the living of Low Leyton in Essex; later was settled at Tarring, Sussex. His important works are *Annals of the Reformation in England* (4 vols., 1709-31); lives of *Thomas Cranmer* (1694), *Sir Thomas Smith* (1698), *John Aylmer* (1701), *Sir John Cheke* (1705), *Edmund Grindall* (1710), *Matthew Parker* (1711), and *John Whitgift* (1718); and *Ecclesiastical Memorials* (3 vols., 1721). Editions of the *Historical and Biographical Works of John Strype* were issued from the Oxford Press in 27 vols. (1827-40). D. at Hackney, Dec. 11, 1737.

Stuart: town; Guthrie and Adair cos., Ia.; on the Chi. Rock Is. and Pac. Railway; 41 miles W. of Des Moines, 165 miles E. of Omaha (for location, see map of Iowa, ref. 5-F). It is on a high rolling prairie, and contains 6 churches, 4 public-school buildings, electric lights, large locomotive and machine shops, a national bank with capital of \$75,000, a State bank with capital of \$50,000, and 2 weekly newspapers. Pop. (1880) 1,994; (1890) 2,052; (1895) estimated, 2,500.

EDITOR OF "LOCOMOTIVE."

Stuart, or Stewart: a royal family which has given several sovereigns to Scotland and England. They trace their descent to a Norman baron, Alan, who accompanied William

the Conqueror, and received large gifts of land in England. His second son went to Scotland, entered the service of King David I. (about 1180), by whom he was made steward of the kingdom, the dignity remaining hereditary in the family, who assumed the title as their family name. The sixth of these stewards or Stewarts married in 1313 a daughter of Robert Bruce, and their son Robert in 1329 succeeded David Bruce on the throne of Scotland, under the title of Robert II. The following are the sovereigns of the Stuart line, with the dates of their accession: ROBERT II. (1329); ROBERT III. (1390); JAMES I. (1424); JAMES II. (1437); JAMES III. (1460); JAMES IV. (1488); JAMES V. (1503); MARY, Queen of Scots (1542); JAMES VI, crowned King of Scotland in 1568, King of England under the title of JAMES I. (1603), and transmitted both thrones to his successors: CHARLES I. (1625); CHARLES II. (1649); and JAMES II. (1685). For an account of the reigns of these monarchs, see the respective titles. JAMES II.'s son, JAMES EDWARD FRANKS STUART (q. v.), assumed the title of JAMES III. upon the death of his father, and is known in history as the Old Pretender. His eldest son, CHARLES EDWARD (q. v.), is known as the Young Pretender. Henry, the second son of the Old Pretender (see STUART, HENRY BENEDICT MARIA CLEMENT), died in 1807, and with him ceased the line of the Stuarts. The present royal family of England are descended only indirectly, and in the female line, from the Stuarts, through a granddaughter of James I. of England, upon whom the succession was bestowed by Parliament. R. M. COLAR.

STUART, ANNE (A.): member of the royal house of England and Scotland; b. at Chatsworth about 1575. Her father was Charles Stuart, Earl of Lennox, brother of Lord Darnley. She was in the direct line of descent to the English crown, standing in the same degree of relationship to Elizabeth as did her cousin James, and she became a subject of frequent intrigues. Upon the death of Elizabeth in 1603, an unsuccessful plot, in which it is said Sir Walter Raleigh was implicated, was formed to place her instead of James upon the throne; and from this moment she became an object of jealousy to her cousin; this was still more inflamed when in 1610 she was secretly married to William Seymour, grandson of the Earl of Hertford, who was also in the line of descent. Seymour was thrown into the Tower, and his wife was placed in the custody of the Bishop of Durham. She managed to escape, and made her way to the coast, where a French vessel was waiting for her and her husband, who had escaped from the Tower. He did not succeed in reaching the vessel, which sailed without him, but found another one, by which he reached France. The vessel in which was the Lady Arabella was captured by an English ship, and she was imprisoned in the Tower, where she became insane, and died Sept. 27, 1615. R. M. COLAR.

STUART, GILBERT CHARLES: painter; b. at Narragansett, R. I., Dec. 9, 1753. His first instructor, Alexander, a Scotch artist, took him to Edinburgh in 1775, and soon died, but the youth worked his way back to Newport. Thence he removed to Boston. The stir of the Revolution drove him to New York, and thence in 1789 to London. There, after months of poverty, friendlessness, and illness, he became acquainted with Benjamin West, who gave him encouragement and showed him every kindness. A full-length portrait of West, now in the National Gallery, gained for him reputation and opportunity. He soon rose to eminence in London, and painted people of rank—George III., the Prince of Wales, John Keble, Joshua Reynolds (of whom he was held to be the peer). The Duke of Rutland invited him to Dublin, and there he lived in splendor as the artist of the nobility. In Paris he met with similar fortune, having as a sitter the king, Louis XVI. A desire to revisit his native country and to paint the portrait of Washington, whom he profoundly revered, led him to return to the U. S. in 1793. The first picture of the President was destroyed as unsatisfactory; the second, the original sketch whereof is in the Boston Athenaeum, is the accepted portrait. Besides Washington, Stuart painted John Adams, Jefferson, Madison, Monroe, John Jay, and many other distinguished men and women of the day. The last painting was that of John Quincy Adams, which was finished by Sally. From 1806 till his death Stuart resided in Boston, and painted industriously. D. in Boston, Mass., July, 1828. No complete catalogue of his portraits exists. They are more than 150 in number, and are greatly prized. In the painting of heads he rivaled Cop- ley, but the details are sketchy. Stuart was a brilliant man, sensitive, sensitive, proud, a wonderful talker, a penetrating

observer, a genius in his art. In his early years he was an accomplished musician. His pictures are widely scattered, and are mostly in private hands.

STUART, HENRY BENEDICT MARIA CLEMENT: last male descendant of the royal house of Stuart in the direct line; b. in Rome, Mar. 3, 1723; the son of the Pretender, James Francis Edward Stuart, by whom he was created Duke of York. He was preparing to join his brother in the rising of 1745 with a force of French troops when that prince was overthrown at Culloden, subsequently took orders in the Roman Catholic Church, and in 1747 was raised to the cardinalship by Pope Benedict XIV. as Cardinal York, taken from his dual title. In 1766, on the death of his brother, the Young Pretender, he assumed the style of Henry IX., King of England—*pretitio Dei, non voluntas hominum*, as expressed on a medal struck upon the occasion. When the French troops in 1793 took possession of the papal states he retired to Venice, but returned in 1801. During the later years of his life he was maintained by a pension from the British Government. D. at Frascati, July 12, 1807.

STUART, JAMES: archaeologist and architect; b. in London in 1712, until nearly thirty years of age was a dandy of fashions and similar articles; made his way to Rome, where he studied Greek and Latin art and archaeology; in 1752 accompanied the antiquarian Nicholas Revett to Athens, where he remained three years, making drawings from the remains of Greek architecture; in 1755 returned to London; became eminent as an architect; was appointed surveyor of Greenwich Hospital, and in conjunction with Revett began the great work, *The Antiquities of Athens, Measured and Illustrated* (3 vols., 1762-94); supplementary volume, edited by Joseph Woods, 1816. This work may be said to have first made clear to Europe that there existed a Grecian architecture very different from the Greco-Roman of Italian and French ruins. A second supplementary volume was published in 1830 by Messrs. Cockrell, Kimball, Donaldson, Jenkins, and Balton. He also published *Cyclical Observations on the Buildings and Improvements of London* (1771), and furnished the illustrations for a *Naturalist's Tour through part of Europe, Asia, and Africa* (1783). D. Feb. 2, 1795. Revised by ROBERT STUART.

STUART, JAMES EWELL BAUM: soldier; b. in Patrick co., Va., Feb. 6, 1856; graduated at the U. S. Military Academy July 1, 1884, when appointed a brevet second lieutenant in the regiment of mounted rifles, receiving his full commission in October. In Mar., 1885, he was transferred to the newly organized First Cavalry, in which regiment he attained a first lieutenancy in the following December, and a captaincy Apr. 22, 1891. During the Kansas political troubles of 1885-88 he served with his regiment, and in 1889 was a volunteer aide to Col. Robert K. Lee during the John Brown insurrection at Harper's Ferry. On May 10, 1891, he was appointed lieutenant-colonel and July 16 colonel of a Virginia cavalry regiment, and was in chief command of the Confederate cavalry at the first battle of Bull Run. Promoted to be brigadier-general in the Confederate army in Sept., 1861, and major-general in July, 1862, he served thenceforth with the Army of Northern Virginia. Gen. Lee, assuming command of this army (June, 1862), and having reorganized it, determined upon a bold maneuver prior to resuming the offensive. Accordingly, on the morning of June 12, Stuart, with some 1,500 cavalry and four guns, left Richmond, and on the morning of the 18th reached Hanover Court-house, where he met and drove back two squadrons of the Fifth U. S. Cavalry; proceeding down the Pamunkey as far as Old Church, thence toward New Kent Court-house, striking the railway at Tonsill's Station, and crossing the Chickahominy at Jones's Bridge the next morning, was safely back in Richmond that night, having made the circuit of McClellan's army with the loss of but one man. This cavalry raid, the first use of the war, caused much commotion in the Union army, and was the source of valuable information in the subsequent movements of Jackson, where Stuart led the advance. During Pope's campaign in Northern Virginia, Stuart surprised the headquarters train of the former near Catlett's Station on the night of Aug. 22, 1862, capturing the personal baggage and official correspondence of Pope, and on the night of the 26th and morning of the 27th, in connection with two regiments of infantry, made a descent on Manassas Junction, capturing eight guns, several hundred prisoners, ten locomotives, and immense quantities of quartermaster and commissary stores. During the invasion of Maryland by Gen.

Lee in September, Stuart covered the Confederate rear, resisting the Union cavalry advance at South Mountain and holding the Confederate left at Antietam. During the subsequent period of inaction he crossed the Potomac above Williamsport with 1,500 cavalry Oct. 9, 1862, and passing through Maryland, he entered Pennsylvania and occupied Chambersburg on the 10th, and recrossed the Potomac below Harper's Ferry Oct. 12. In the battle of Fredericksburg his command formed the extreme right of the Confederate line. At Chancellorsville, after the fall of Stonewall Jackson and the disablement of Ambrose P. Hill, Stuart succeeded to the temporary command of Jackson's corps, which he led with ability in the severe fighting of Sunday, May 8. In anticipation of the proposed invasion of Pennsylvania, a large cavalry force had been accumulated at Culpeper under command of Stuart, against which Gen. Hooker dispatched two divisions of cavalry and two brigades of infantry, which, crossing at Beverley and Kelly's Fords (June 9), soon encountered Stuart advancing to cover the flank of the main movement. A fiercely fought but indecisive battle between the cavalry on both sides ensued, resulting in a loss to each of 500 or 600. During the subsequent campaign of Gettysburg he passed up through Eastern Maryland and Pennsylvania, and rejoined Lee at Gettysburg. In the campaign of 1864, Stuart by a wide detour succeeded in interposing himself between the Confederate capital and Sheridan's advancing column. Concentrating all his forces at Yellow Tavern, near Richmond, he was here attacked by his able rival. During the obstinate but ineffectual struggle Gen. Stuart was mortally wounded. D. May 12, 1864, soon after reaching Richmond. See *The Campaigns of Stuart's Cavalry*, by H. B. McClellan (Boston, 1885).

Revised by JAMES MERCUR.

Stuart, JAMES FRANCIS EDWARD: See JAMES FRANCIS EDWARD STUART.

Stuart, JOHN, Earl of Bute: See BUTE.

Stuart, MOSES: biblical scholar and educator; b. at Wilton, Conn., Mar. 26, 1780; graduated at Yale College 1799; studied law, and was admitted to the bar in 1802, and for two years was tutor in Yale College; afterward studied theology with President Dwight, and in 1806 was ordained pastor of the First church (Congregational) in New Haven. In 1809 he became Professor of Sacred Literature in the Theological Seminary at Andover, Mass., and occupied the chair until 1848. By his stimulating influence as a teacher and author, he made an epoch in the study of biblical literature in the U. S. He was the teacher of more than 1,500 ministers. He held his professorship for thirty-eight years. He published several Hebrew and Greek grammars, commentaries on various books of the Bible, of which his works on the epistles to the Romans and the Hebrews are among the most prominent, and *Elements of Interpretation* from the Latin of Ernesti (1822); *The Sabellian and Athanasian Modes of Representing the Doctrine of the Trinity*, from the German of Schleiermacher (1835); *Philological View of Modern Doctrines of Geology* (1836); *Hints on the Prophecies* (1842); *Critical History and Defense of the Old Testament Canon* (1845); *Conscience and the Constitution* (Boston, 1850); and other works. D. at Andover, Mass., Jan. 4, 1852.

Revised by G. P. FISHER.

Stub, stoob, AMBROSIVS: poet; b. on the island of Fünen, Denmark, May, 1705. The greater part of his life was spent in poverty, his genius failing to win recognition till long after his death. After serving as private tutor at various estates he finally established a private school in Ribe, where he spent the latter part of his life. He was the only great lyric poet of his time, and may be regarded as a worthy predecessor of Ewald and Wessel. All but one of his poems were published posthumously (1771). He is the original of the hero of C. K. F. Molbech's romantic drama *Ambrosius*. D. at Ribe, July 15, 1758. His collected poems were edited by Fr. Barfod (Copenhagen, 5th ed. 1879).

D. K. DODGE.

Stubbs, WILLIAM, D. D., Bishop of Oxford: historian; b. at Knaresborough, England, June 21, 1825; was educated at the grammar school at Ripon and at Christ Church, Oxford, where he took a first class in the classics and a third class in mathematics, and was elected to a fellowship in Trinity College; took holy orders in 1848; became vicar of Navestock in 1852; librarian to the Archbishop of Canterbury at Lambeth in 1862, and was school inspector in the diocese of Rochester 1860-66, when he received the appointment of Regius Professor of Modern History at Oxford.

In 1869 he became curator of the Bodleian Library; was chosen as a member of the hebdomadal council in 1872, and in 1875 received the presentation of the rectory of Cholderton, Wiltshire. He was appointed canon residentiary of St. Paul's in 1879, consecrated Bishop of Chester in 1884, and became Bishop of Oxford in 1889. He has published *Hymnale secundum Usum Sarum* (1850); *Registrum Sacrum Anglicanum* (1858); *The Foundation of Waltham Abbey* (1861); *Chronicles and Memorials of Richard I.* (1864); the *Chronicle of Roger de Hoveden* (1868); *Select Charters, etc., of English Constitutional History* (1870); *Memorial of Walter of Coventry* (1872); *Memorials of St. Dunstan* (1874); *The Constitutional History of England* 3 vols., 1874, 1875, and 1878; and (with Haddam) *Councils and Ecclesiastical Documents relating to Great Britain and Ireland* (1869-78). His *Constitutional History of England* is one of the ablest and most authoritative works on the period of which it treats.

F. M. COLBY.

Stucco [= Ital.: Fr. *stuc*, from O. H. Germ. *stucchi*, piece > Mod. Germ. *stück*]: plastic, adhesive composition applied to walls both internally and externally in order to give them a smooth and even surface, either decorative or plain in color or form. The cementing medium of the composition for inside work is common lime or calcined gypsum, or a combination of the two, generally mixed with a certain proportion of sand, depending on the special object to be secured. The word *stucco* technically applies to a mixture of lime-pulver and white sand or powdered marble, and to a coating produced with this compound. The rudest example of the plasterer's art is the application of a single coat of mortar composed of lime-paste and common sand laid on the surface of a wall with the trowel, while the highest consists in imitating fine marbles and other beautiful building-stones by using pure calcined gypsum, mixed with gum, isinglass, and suitable coloring-matter, laid on in a variety of decorative forms in order to produce panels, pilasters, mouldings, cornices, etc. The implements used by the plasterer are of the simplest kind and few in number. They comprise a lathing-hammer, the hawk, the plastering or laying-on trowel, the float, a brush, and straight-edges and moulds of various kinds, together with a screen, shovel, rake, and bud for his attending laborer. The hawk is used by the plasterer for holding the mortar in his left hand while he applies it with the trowel held in his right hand. It is simply a piece of board about 10 to 11 inches square, held by a stout handle fixed on the under side in the center of the board and at right angles to it. The laying-on trowel is a thin plate of hardened steel or iron about 3 inches wide and 9 to 10 inches long, rounded slightly at the front end, square at the other end, and a little convex on the face. It is provided with a handle on the back parallel to the blade. The hand-float is of wood, shaped something like the laying-on trowel. It is used to rub down finished work and give it a hard, smooth, and even face. A cork float is sometimes used upon surfaces which are to receive a high degree of polish. A derby is a long, two-handed float, used principally in forming the floated coat of lime and hair. Jointing-trowels are of steel, the plate being triangular, with an acute angle at the front end, the handle being attached to the heel or base of the tool. They are used about cornices and mouldings in forming the miters where fine workmanship is desired. A corner-trowel is like a small laying-on trowel with its face bent lengthwise to a right angle; it is used at the intersections of walls and ceiling, etc. Moulds are pieces of hard wood cut to the form of the cornices or mouldings that are to be formed, to assist the workman in securing accuracy and uniformity in his work. They are sometimes made of copper plates inserted in a wooden stock. The plasterer's brush is broad and thin, and is used for keeping the material wet and plastic until it is finished to the required form. The plasterer's materials are lath-nails, laths, lime, calcined gypsum or plaster, hydraulic cement, and sand, together with various pigments for giving the requisite colors.

The mortars used for inside plastering are "coarse stuff," "fine stuff," "gauge stuff," called also "hard finish," and "bastard stucco." Coarse stuff is simply common lime-mortar, of the quality suitable for brick masonry, mixed with well-switched bullock's hair free from all animal and vegetable matter. Fine stuff is prepared by slaking pure lump-lime with a small quantity of water, and afterward adding water until the paste is diluted to the consistency of cream. It is then allowed to stiffen by evaporation to the proper

composition for use. It is then sometimes called putty. It is used for the finishing coat, but always with some fine sand or sifted plaster, except for what is known as a slipped coat, and even for slipped work fine sand may be added in small quantities. Franco stuff is composed of putty or fine sand and strained gypsum, in the proportion of 3 or 4 of the former to 1 of the latter. The mixture called stucco is prepared with lime-putty and white sand, and is used only for a finishing coat.

After coat of plastering on laths is said to be *laid*, and the coat is called a *laying-coat*; and work in two coats is said to be *laid and set*, and the mortar is styled a *laying coat* and a *set coat*. In three-coat work on laths the first is called the *prepared* coat, the *scratch* coat, the second is the *float* coat, and the third the *set* coat. In masonry, plastering in one coat is styled *rendering*; two-coat work is said to be *rendered and set*; and three-coat work *rendered, floated, and set*. In good two-coat work upon laths, and also upon masonry, the first coat should be a *scratch coat*—that is, laid in screeds and "filling out." The screeds are strips or bands of coarse stuff, 6 or 8 inches in width, applied at the angles of the room, and also in parallel strips 3 or 4 feet apart all over the walls and ceiling. They are carefully worked out, so that all those on the same wall or ceiling shall be accurately in the same plane, as determined by the frequent application of the straight-edge in all possible directions. When the screeds have become somewhat firm, the spaces between are filled in flush with the surfaces already established, so as to produce a continuous straight and even surface. In three-coat work the second is the *scratch coat*. One-coat work on either laths or masonry—that is, either *laid or rendered*—although an inferior quality of work for walls and ceilings, is in common use for attics, kitchens, cellars, vaults, and places of like character. After the first coat of two-coat work has become partially dry, so that it will not break up under the trowel in the work which follows, it is in readiness for the coat or finishing coat, which may be in *slipped work, stucco, sand and siccato, or hard finish*.

Hard finish is applied with a trowel to the depth of an eighth of an inch, and may be polished with the water-lime and trowel, but not hand-floated. Hard finish requires the best labor, and is extensively practiced in the U. S. In three-coat work on laths, the first coat—the *prepared* coat, the *scratch*, or *brown coat*—is applied in the same way as *laying*, with the exception that inasmuch as it is designed to form merely a good foundation for the *scratch coat*, its thickness does not usually exceed one-quarter to three-eighths of an inch. After it has become partially dry, but while still soft, the mortar is *scratched* over nearly to its entire depth with a stick cut on the end into pointed teeth. The scratching is done in two sets of parallel strokes at right angles to each other, each running diagonally across the surface. The lines are about 2 inches apart, and are designed to assist the adhesion of the *scratch coat* which follows. The second and finishing coats are applied as already described for a *scratch coat* and *set*.

For exterior plastering a mortar composed of common lime and sand is not the most suitable, although frequently used upon the walls of common buildings well protected by projecting eaves. A cheap and useful surfacing of this kind is made by first cleaning off and roughing up the surface and making out the joints to the depth of half an inch, and then rendering it with a not very thick coat of lime-paste and hair. When this has set, another coat of the same mixture is laid on evenly with the trowel without floating; and as soon as a few square yards are executed a semi-fluid and thoroughly incorporated mixture of strong lime and fine clean gravel is freely applied. This is at once, while soft, troweled to any desired color with an ochreous mixture put on with a brush. The whole dries and hardens into a compact mass.

Common lime forms the basis of some very good outside stuccoes, which, when properly applied, are very durable. Water holding coarse brown sugar or molasses in solution may be used for mixing the mortar, with beneficial effects on subsequent induration. One lb. of sugar to 5 gal. of water will answer for all except the surface coat, which should contain four times this proportion of sugar. Powdered slaked lime, mixed with the scales from a smith's forge and tempered with bullock's blood, produces a moderately hydraulic and durable mortar, frequently used for exterior stuccoes. The wall should be previously coated over with melted oil. In the U. S. hydraulic cement and clean, sharp sand, mixed up with fresh water to the consistency of plasterer's mortar, is now commonly used for the exterior

rendering of walls, more especially of brick walls. The mortar is usually applied in two coats in one operation; that is, the second coat is put on while the first is yet soft and plastic, so that the two become one. The workman never scores more than 2 or 3 superficial feet at one time, finishing it off with the second coat as he goes along. The aggregate thickness of both coats should be about half an inch. It should be protected from the direct rays of the sun for some days, and kept moist by sprinkling with a hose or brush. Sometimes the first coat is replaced by a wash of thin cream of pure cement, put on while a brush just in advance of the mortar. Faithful workmanship is most essential in this kind of plastering. The mortar must be put on under a firm pressure with the trowel, in order to secure intimate contact with the wall, and the surface must not be too dry. Deficient adhesion will result from neglect of these precautions. When a cement is too dark to give an agreeable shade of color, a judicious use of white sand, common lime, and ochre, singly or in combination, may generally be depended upon to greatly lessen if not entirely remove the objection.

Certain precautions are indispensable to the durability of stucco upon the exterior faces of walls. In the first place, the sand used must be perfectly clean, and should therefore be washed, repeatedly if necessary, until it will no longer discolor clean water. The most destructive agent to be guarded against is frost, when accompanied by the penetration of moisture between the stucco and the wall, which will inevitably result in throwing off the mortar. In well-troweled and hand-floated work all the vertical surfaces will shed the water with sufficient promptness to prevent that degree of saturation which would be likely to result from frost. The points to be especially looked to are at the eaves and gables, the projecting portions of a wall, and the joints of windows and doors. A projecting roof will afford sufficient protection to the upper edge of the stuccoed surface. Where the stucco abuts against a projection, like a sill or a lintel, the joint should be closed out to the depth of at least three-fourths of an inch, and the mortar firmly troweled into it. At the points of openings extra care should be taken to secure close adhesion throughout, followed by a careful inspection by sounding and the removal of all spots where the stucco has failed in union with the wall.

Revised by RUSSELL STURGEON.

Stadtke: See **ANALYST.**

Stuhlweissenburg, steel-*shayn-berch* (town), in the county of Fehér, Hungary; on a marshy plain 16 miles S. E. of Lake Balaton (see map of Austria-Hungary, ref. 6-6). It has several fine buildings, a gymnasium, a military academy, a Magyar theater, manufactures of potash, leather, linen, and woollen fabrics, and an extensive trade in oil, wine, grain, cattle, and wool. In its magnificent cathedral the Kings of Hungary were crowned and buried from 1037 to 1527. Pop. (1890) 28,942.

Stumpf, CARL, Ph. D.; psychologist; b. in Wiesentheid, Bavaria, Apr. 21, 1848; educated at Würzburg and Göttingen Universities; became Professor of Philosophy at Würzburg in 1879, at Prague in 1879, at Munich in 1899, and at Berlin 1894; member of the Prussian Academy of Sciences 1895. His principal works are *Über den psychologischen Ursprung der Raumvorstellung* (1873) and *Lehrpsychologie* (2 vols., 1883-99).

J. M. H.

Stupor [= Lat. deriv. of *stupere*, to be struck senseless, whence (by deriv.) *stupefactus*, *stupidus*, dazed, stupidly] that condition in which, when fully developed, the functions of the brain, so far as the mind is concerned, are almost entirely suspended, the individual lying in an unconscious state, though he may still be aroused by vigorous shaking or shaking. When there is complete loss of consciousness the condition is properly spoken of as **COMA** (q. v.). It may be induced by poisons upon the brain, as from a depressed phlegm of bone of the skull or the entrance of some foreign body, as a bullet, by a blow or fall, causing evulsion of the brain or compression from extravasated blood; by the rupture of a blood-vessel, causing cerebral hemorrhage; by the circulation of poisoned blood through the cerebral vessels, as occurs, for instance, when an overdose of opium or alcohol has been taken. Stupor and coma are to be distinguished from sleep by the fact that it is easy to awake a person from sleep, while it is difficult to arouse him from stupor and impossible in coma. In sleep the mind may be active; in stupor it is, as it were, dead. Stupor is a symptom of serious importance in various injuries and diseases

to which the brain is liable. It may exist in all degrees of severity. There is a form of stupor, met with in certain diseases of the brain, in which the individual, though unconscious, is nevertheless not altogether deprived of the power to think and to move the limbs. There is, in fact, a marked degree of restlessness, though the movements are, as it were, automatic, and the speech is incoherent. This condition is known as "coma vigil." It generally only occurs in cases of great gravity, and it indicates a fatal termination.

Revised by W. PEPPER.

Sturgeon [from Fr. *esturgeon*: Ital. *storione*: Span. *esturión* from Teuton. *sturjo*, appearing in O. H. Germ. *sturjo*, *sturo* > Germ. *stör*: O. Eng. *styrja*]: any ganoid fishes of the family *Acipenseridae*. All the species have the body elongated and subcylindrical, or slightly compressed and tapering backward into a rather slender caudal peduncle; the skin is generally armed with minute bony plates, as well as five rows of larger keeled bucklers, one dorsal, one pair lateral, and one pair on the sides of the abdomen; there is no well-defined lateral line; the head is produced into a projecting snout, which is provided below with four barbels in a transverse row; the operculum proper well developed; the mouth is small, inferior, transverse, protractile, with fleshy lips; teeth entirely wanting in the adult; the dorsal fin far behind, and short; the anal still nearer the tail than the dorsal; the caudal with the upper lobe prolonged; ventral behind the center of gravity. The skeleton is cartilaginous. The stomach is not caecal; the pyloric appendages are numerous; the rectum has a spiral valve; the air-bladder is large and simple, and communicates with the oesophagus; two accessory gills occur. Species are found in all the temperate portions of the northern hemisphere. All breed in the fresh water, but some are residents of the sea part of the year, while others are permanent denizens of the lakes and rivers. They nearly agree, in fact, in distribution with the salmonids, save that they are less generally found in streams, on account of their larger size. There are two primary types—(1) *Acipenser*, which embraces several subordinate subgenera or genera; and (2) *Scaphirhynchus*, of which only two species are known, one (*S. platyrhynchus*) confined to the Mississippi river and its tributaries, and another from Central Asia. The number of species of *Acipenser* is about twenty. The most common American species are *A. brevirostris*, or short-nosed sturgeon, and *A. oxyrinchus*, or sharp-nosed sturgeon, which ascend the rivers of the Atlantic slope, and the fresh-water *A. rubicundus* of the Great Lakes and their tributary rivers. Their flesh is reddish, and is by some highly esteemed. Their eggs are often made into caviare; their air-bladders can yield a kind of isinglass. They are the largest of fresh-water fishes, the huso (*A. huso*) of the Caspian and Black Seas and Sea of Azov sometimes exceeding the length of 15 feet and the weight of 2,000 lb. See also FISHERIES and STERLET. For illustration, see FISHES.

Revised by J. S. KINGSLEY.

Sturgeon Bay: city; capital of Door co., Wis.; on Sturgeon Bay, about midway between Green Bay and Lake Michigan, and on the ship-canal connecting those bodies of water (for location, see map of Wisconsin, ref. 4-F). The bay is 8 miles long by 2 miles wide, and affords an excellent harbor for the largest vessels. The city is in an agricultural and lumbering region, has large shipping interests, and contains a State bank with capital of \$25,000, a private bank, and a monthly and two weekly periodicals. Pop. (1880) 1,199; (1890) 2,195.

Sturges, OCTAVIUS: physician; b. in London, England, 1833; educated at Addiscombe as a cadet in the service of the East India Company; served in India as a lieutenant in the Bombay Artillery; returned to England and entered Emmanuel College, Cambridge, taking the degrees A. B. and A. M. in 1862; entered St. George's Hospital, London; in 1862 became a member and in 1870 a fellow of the Royal College of Physicians; M. D., Cambridge, 1867; lecturer on forensic medicine 1868-71, on materia medica 1871-74, on medicine 1874-93 in Westminster Hospital. He was the author of *An Introduction to the Study of Clinical Medicine* (London, 1873); *The Natural History and Relations of Pneumonia* (London, 1876); *On Chorea and other Allied Movements* (London, 1881). D. Nov. 3, 1894. S. T. A.

Sturgis: village; St. Joseph co., Mich.; on the Gr. Rapids and Ind. and the Lake Sh. and Mich. S. railroads; 31 miles E. by N. of Elkhart, and 36 miles S. by E. of Kalamazoo (for location, see map of Michigan, ref. 8-II). It is in an agricultural region, and contains 9 churches, public, central, and

ward schools, water-works, electric lights, fair-grounds, mile race-track, several large manufactories, a national bank (capital \$65,000), a State bank (capital \$50,000), and a monthly and 3 weekly papers. Pop. (1880) 2,060; (1890) 2,489; (1900) 3,144. State census, 2,834.

EDITOR OF "JOURNAL."

Sturgis, RUSSELL: architect and writer on art; b. in Baltimore, Md., Oct. 16, 1836; studied architecture in New York architect's office and in Europe, and practiced from 1865 to 1878. He then retired on account of feeble health and has since occupied himself with archaeology and fine art, and the work of societies devoted to fine art in New York and elsewhere. Among the buildings designed by him are Battell Chapel, Farnam Hall, Durfee Hall, and Lawrence Hall of Yale College, the Homœopathic Medical College and Flower Hospital in New York, the Mechanics' and Farmers' Bank at Albany, and churches, business buildings and residences in New York, Albany, Aurora, Tarrytown, Watertown, N. Y., New Haven, Farmington, and Littlefield, Conn., Minneapolis, and Louisville. He was editor for decorative art and mediæval archaeology of *The Century Dictionary*, for fine art in general of *Webster's International Dictionary*, and for archaeology and art of *Johnson's Universal Cyclopædia*; otherwise his published writings have been limited to periodicals.

Sturlason, SNORRE: See SNORRI STURLUSON.

Sturm, störm, JOHANNES, von: educator; b. at Schleiden, Germany, Oct. 1, 1507; founded (1537) the gymnasium at Strassburg, which attained, under him, worldwide celebrity. He was generally regarded as the greatest educator connected with the Reformed Church, and received the title *Præceptor Germaniæ*. His work gave a great impulse to the establishment of classical schools. To read, write, and speak Ciceronian Latin was the great object of his instruction, and to this end a course of twenty-one years—six at home, ten at school, five at college or university—was thought about sufficient. D. at Strassburg, Mar. 3, 1589. See Joseph Payne, *Lectures on the History of Education*. C. H. T.

Sturt, Sir CHARLES: explorer; b. in England early in the nineteenth century; entered the army at an early age. In 1828 he was the leader of an expedition organized to explore the interior of Australia, during which he discovered the Macquarie, Castlereagh, and Darling rivers, and soon after led another expedition which explored the course of the Murrumbidgee river, and in June, 1830, discovered the great Murray river, which he followed to its mouth in Lake Alexandrina, returning early in 1831. In 1844 he penetrated to the great stony desert nearly in the center of the continent. He was made registrar-general and subsequently colonial secretary of South Australia. In consequence of his exposure in these expeditions he became totally blind, and returned to England, where he was knighted a short time before his death. He published *Two Expeditions into the Interior of Southern Australia in 1828-31* (1833) and *Narrative of an Expedition into Central Australia in 1844-45* (1849). D. at Cheltenham, England, June 16, 1869.

Revised by M. W. HARRINGTON.

Sturzenbecker, stoorts'en-bek-ker, OSKAR PATRICK (*Oskar Odd*): writer; b. in Stockholm, Sweden, 1811. He was from the first one of the warmest advocates of the union of Scandinavian countries, on behalf of which he began to write in 1830. His greatest success was achieved in the light feuilleton style imitated from the French, in which he has never been equaled in Sweden. His best sketches are collected in *Grupper och Personager från igår* (Groups and Persons from Yesterday). He was also the author of lyrics that display patriotic warmth and a deep sympathy for human progress. D. near Helsingborg, Feb., 1869. Selected works were published at Stockholm in 1878.

D. K. DODGE.

Stuttering: See STAMMERING.

Stuttgart, stöot'gäart: capital of the kingdom of Württemberg, Germany; on the Nesenbach, an affluent of the Neckar; 38 miles E. S. E. of Carlsruhe (see map of German Empire, ref. 7-D). It lies in a charming valley among hills covered with forests and gardens, and is regularly and beautifully built. The Altstadt, occupying nearly the center, and grouped around the market-place, contains several small and narrow streets, but the new parts of the city, mostly erected during the nineteenth century, have broad and beautiful streets and symmetrical squares. The most prominent part is the palace square, ornamented with gardens and fountains containing the jubilee column, over 50 feet high, and surrounded by magnificent buildings. Among these the new

palace is the most remarkable—a very handsome structure, with two projecting wings, the central building containing 164 rooms rich in works of art by Danneberg, Gengenbach, Thorwaldsen, and others. To the right of this edifice stands the old palace, built 1573-79, a gloomy castle with towers and pinnacles, but containing a beautifully painted chapel and large hall, the curious Reichensteine, a spiral horse-path giving access to the third floor, and in the court the equestrian statue of Knecht, the first Duke of Württemberg. In the left wing of the new palace is the royal theater, finished in 1846, and opposite the palace is the Königsplatz, a beautiful structure with an Indian colonnade, built 1855-59, and containing numerous shops, elegant *cafés*, a concert-hall, and other assembly-rooms. In the rear of the old palace is the Schiller Square, containing the statue of the poet, the enormous building of the palace of the prince, and the park church, erected 1490-99, and restored in 1847. One of the most beautiful and most important streets is the Neckarstrasse, running from the palace square in a northwestern direction, and containing the museum of natural science with a rich collection of mammals; the national library, comprising 400,000 volumes, 5,000 manuscripts, 2,300 incunabula, and a collection of 8,700 Bibles in eighty-nine different languages; the museum of art, containing an art school and collections of paintings and statues, etc. Nearly parallel with the Neckarstrasse runs the Königstrasse, traversing the palace square and dividing the city into two parts, a southwestern and northwestern; on this are the royal stables and the royal central hall for commerce and industry, with a good library and important collections. Other remarkable buildings are the museum for Württembergian antiquities, the polytechnic school, the new market-hall; and among the churches, the Landhard's church, Johann's church, a Roman Catholic church, an English church, and the magnificent synagogue. The finest promenade is the palace garden, a park with lakes, fountains, statues, etc., stretching from the palace for the distance of about 2 miles. In the vicinity are the royal summer palaces, Solitude, Villa Rosenstein, Wilhelms, and the Villa, and the charming town of Cannstadt-on-the-Neckar, with 12,000 inhabitants, much frequented as a bathing-place, connected with the city by a railway. The industry in woolen manufactures is important; a wholesale cattle-fair is annually held in August. The manufactures of games, carriages, chocolate, sugar, and machinery are also considerable. The commerce of the city is extensive; the bank and art trade is especially important. Pop. (1890) 125,212. The name *Stuttgart* first occurs in history in 1229, though the exact date of its foundation is not known. It became the residence of the Count of Württemberg in 1329, and the capital of the country in 1482. The city was held by Austria from 1519 to 1594, and occupied by Alba in 1546 on the Smalkalde war. In the period from 1624 to 1638 one-half (5,519) of the inhabitants died from the plague. In the wars of Louis XIV. it was taken by the enemy three times; also several times during the wars of Napoleon.

Revised by M. W. HARRINGTON.

Stuyvesant, st'v'e-sant, Peter: director-general of New Netherlands; b. in Holland in 1602; served in the West Indies; was director of the colony of Caracas; lost a leg in an attack upon the Spanish island of St. Martin; returned to Holland in 1644, and in 1647 was sent to the New Netherlands as director-general. Upon his arrival at New Amsterdam (now the city of New York) in May, 1647, he made peace with the Indians, and a few years later arranged the boundary-line between the Dutch and the English possessions in North America. In 1651 the Dutch built a fort on the site of the present Newcastle, Delaware river, which the Swedish governor Rising captured in 1654. In 1655 Stuyvesant sailed for the Delaware with seven vessels conveying 600 or 700 men, recaptured the fort, and took possession of the entire colony of New Sweden. In the meanwhile discontent had sprung up against the arbitrary administration of the Dutch West India Company, and in 1655 a convention of two delegates from each settlement in the colony assembled and demanded that obscure and obsolete laws should not be revived, and that no officer should be appointed except with the approbation of the people. Stuyvesant replied that the magistrates derived their authority from God and the Dutch West India Company, and not from a few ignorant subjects, and ordered the convention to disperse under pain of condign punishment. The discontent, however, still continued. The English colonies in New England, in spite of the repeated remonstrances of the

governor, began to encroach upon the boundaries of New Netherlands. In 1664 Charles II. of England issued a charter to his brother, the Duke of York, afterward James II., bestowing upon him all the country between the Hudson and the Delaware, including New Netherlands as well as some territory which had previously been granted to the New England provinces. In August of that year, although England and Holland were at peace, Col. Nicolls with an English fleet, appeared in the bay and demanded the surrender of New Amsterdam. Stuyvesant at first refused, but the municipal officers, seeing little hope of successful resistance, and having no very warm attachment to their Dutch masters, insisted that he should yield, and the town was surrendered Sept. 8, 1664, and its name changed to New York—a designation soon extended to the whole province of New Netherlands. Stuyvesant went to Holland the next year, but returned soon after, and passed the remaining eighteen years of his life at the farm, called the *Flower*, which has given its name to the street called the Flower. D. in Aug., 1682.

Revised by J. M. GARDNER.

Sty, or **Harde'olum** [sty = G. *hag*, *stymed*, swelling; *adjuv*, *adjuv*, etc.]: a small leaf which occurs on the edge of the eyelid. It should be treated with a warm-water dressing or light wet poultice; after the discharge of a little pus and a scab, it usually goes well at once. If there be a long succession of these, as sometimes happens, iron and quinine, with occasional mild laxatives, will be useful.

Style, or **Stylus**: See **Pen**.

Style, Old and New: See **CALENDAR**.

Styllis: See **PELAGIC SAINTS**.

Styllis, St. Klement: See **ROMAN SYLLATES**.

Stylopide: See **STREPTOMETER**.

Styptic: See **BLEEDING**.

Styrac'cea (named from the typical genus *Styrax*, from Lat. *styrax* = Gr. *styrax*, storax, or the tree yielding it): a family of exogenous, gamopetalous trees and shrubs, with the stamens commonly monadelphous or polyadelphous, and adnate to the base of the corolla; the calyx more or less adnate, and the seeds few and large with a bony coat; the leaves alternate entire, serrate, membranous, or coriaceous feather-veined. There are about 200 species distributed among seven genera, the most important of which are *Dalson* and *Styrax*. The former is the **SHOEWEE-TREE** (q. v.). *Styrax* contains over sixty species, restricted to the warmer parts of Asia, Europe, and America. Many of the species yield valuable gums, such as *Styrax* (q. v.) and storax. The latter is a solid resin resembling vanilla in color, obtained from *N. officinalis*, a small tree of Asia Minor and Syria. Liquid storax is a balsam obtained from the inner bark of *Liquidambar orientalis*. It is used in making incense and perfumery. Its chief market is in the East.

Sty'ria (in Germ. *Steiermark*): province of Austria; bounded N. by Upper and Lower Austria, E. by Hungary, S. by Carniola and Croatia, and W. by Carinthia and Salzburg. Area, 8,679 sq. miles. In the southern part, on some of the plains, and in the valleys are raised wheat, maize, tobacco, flax, hemp, wine, and fruit; elsewhere the province is mountainous, and cattle-rearing, dairy-farming, mining, and manufactures of metallic wares are the principal branches of industry. The Scler Alps cover the surface between the Enns and the Mur; the Styrian Alps, between the Mur and the Drave; and the Carnic Alps, between the Drave and the Save. These mountains rise to a height of between 7,000 and 8,000 feet, and are rich in iron, copper, salt, alum, marble, and coal. Pop. (1890) 1,282,708, of whom over 710,000 are of German and the rest of Slovenian descent. Capital, Gratz.

Revised by M. W. HARRINGTON.

Styrian Literature: See **SCOTICAN LITERATURE**.

Styx (Gr. *Στύξ*, the hateful): in Greek mythology, a river of Hades which flowed from the tenth source of Oceanus. At the entrance to Hades was the abode of the nymph or goddess Styx, by whom the most solemn oaths of the gods were sworn, thus dedicating themselves to death in case of perjury.—*STYX* was also the name of the highest waterfall (not, as Herodotus says, a fountain) in Greece, near Nemea in Arcadia. The ancients, like the modern residents of the vicinity, considered its waters fearfully poisonous, and it was believed that no vessel could hold any of it unless made of the hoof of an ass or horse. The ancients associated this waterfall with the mysterious *Styx* of the lower world.

Revised by J. H. B. STRECHER.

Suabia: See **SWABIA**.

Suakim, swaa-keem', or **Sawakin**: fortified town of Nubia and best port on the Red Sea; on an island a few hundred feet from shore; lat. 19° 7' N. (see map of Africa, ref. 3-G). It has been in the possession of the British since 1882. Formerly the head of the caravan routes into the interior, it lost much of its importance as a result of the Mahdist rebellion, and this is not yet recovered, because of the insecurity of the interior. The influence of the British hardly extends beyond the reach of their cannon. Opposite Suakim on the mainland is the suburb of El-Kef, also fortified, connected with the city by a low bridge and short railway. The latter is all that was made of a railway projected to Berbera on the Nile in 1884, but prevented at that time by the Mahdists. Suakim is considered of great strategical and commercial importance, and is the most suitable terminus for a railway into Egyptian Sudan. The chief exports are gum arabic, silver, ivory, senna, and skins.

MARK W. HARRINGTON.

Subcarboniferous Series: in American geology, the lowest group of Carboniferous strata. It occupies the interval between the Devonian system and the coal-measures. Earlier designations of the same division are mountain limestone, Carboniferous limestone, and Lower Carboniferous, and a later proposed title, Mississippian series, has much to commend it. In the Mississippi valley it consists principally of limestones and shales, and includes, in an ascending order, the Kinderhook, Burlington, Keokuk, Warsaw, St. Louis, and Chester formations or groups. In Pennsylvania the equivalent series consists principally of sandstone and shale, having a maximum thickness of 5,000 feet. The series has also been recognized in Nova Scotia and New Brunswick, and has a great development in the Rocky Mountain region. The fossils are principally marine invertebrates, some of which, especially the brachiopods, are of worldwide distribution. Remains of fishes and of reptiles also occur. Rocks corresponding to the Mississippian series in time have a wide distribution in other countries, and especially in Europe. See **CARBONIFEROUS PERIOD** and **DEVONIAN PERIOD**.

ISRAEL C. RUSSELL.

Subconscious States: states of mind which belong to us and which we can pay attention to, but which we may not be actually thinking of; such as our sense of the furniture in the room about us. Such states or elements are very common in our mental history, and are called subconscious as long as there is evidence that they have not sunk entirely out of the whole of our present state of mind. On the other hand, things which we may merely remember on occasion, and are in no sense conscious of at a particular moment, are then "unconscious." See **UNCONSCIOUS STATE**. J. M. B.

Suberic Acid [*suberic* is from Lat. *sub'er*, cork-tree, cork]: a homologue of oxalic and succinic acids. Its general characters are those of that family of dibasic acids, and its empirical formula is $C_8H_{10}O_4$. The name was originally due to the fact that this acid was first obtained by the action of nitric acid on cork. Fats generally, however, yield it by the same treatment, and it is by no means a characteristic product of cork. To obtain suberic acid free from the other acids produced by the action of nitric acid on fats, the mixed product is treated with cold ether, in which this acid is almost insoluble. It is necessary, however, to purify it further by recrystallization. It may be obtained in large needles, which sublime like oxalic acid. It is sparingly soluble in cold, but easily in boiling water, and soluble in alcohol.

Revised by IRA REMSEN.

Suberine: See **CORK**.

Subiaco, sôo-bêe-aa'kô (anc. *Sublaqueum*): town; in the province of Rome, Italy; on the right bank of the Tevere; 42 miles E. N. E. of the city of Rome (see map of Italy, ref. 6-E). It derived its name from its situation below a villa belonging to Nero, in the grounds of which were three lakes. In the monastery of Santa Scolastica, founded in the fifth and restored in the tenth century, the printing-press was first used in Italy, a Lactantius (1465) being the first issue. The monastery of St. Benedict, the first founded by the saint himself, was rebuilt in 817. Pop. 6,503.

Subinfeudation: See **LANDLORD AND TENANT**.

Sublimation [from Lat. *sublimare*, raise, deriv. of *sublimis*, lifted up, on high]: a chemical process of separation and purification, applicable only occasionally in cases in which a volatile substance condenses or crystallizes from the condition of vapor directly to the solid condition, and

not to the usual liquid form. In such cases this method of obtaining bodies in pure and crystallized form is highly convenient and valuable. Among the more important substances to which this method is applicable are sulphur, iodine, vermilion, corrosive sublimate, calomel, salts of ammonia, arsenious oxide, oxalic, benzoic, succinic, and pyrogallic acids, camphor, caffeine, etc. As those substances which volatilize at low temperatures will readily pass through porous diaphragms like paper when in a vaporous state, it is often convenient to cover the lower vessel, containing the substance to be volatilized, with paper, which will prevent the crystals that condense in the head or upper inverted vessel from falling back and causing waste of time. In cases of bodies requiring high temperatures wire-gauze screens may be employed in the same way. Revised by IRA REMSEN.

Sublime [from Lat. *sublimis*, lifted up, lofty, sublimis]: Contradistinguished from the beautiful, which charms and attracts us, the sublime awes us, moves us with a feeling of pleasure mixed with fear. The sublime in nature is usually found in the boundless expanse of the ocean, in the resistless might of its waves when moved by a storm, or more frequently in the thunder-storm with its threatening look, its vivid and destructive lightnings, and its deafening crashes of thunder. Still more adequate is the manifestation of the sublime in instances of moral heroism—in deeds of daring and self-denial; the sublime in art has most frequently made use of this phase. Kant, in his *Critique of the Judgment* (§ 23-53), has given the first thorough and systematic treatment of the sublime. According to him, "while the beautiful in nature appertains to the form of an object—hence to its circumscribed limits—the sublime, on the contrary, is to be found also in formless objects; a want of limitation attaches to it. It is, however, represented as a whole, and not as something merely fragmentary. The beautiful may therefore be regarded as the portrayal of an idea of the understanding (not a mere concept), but the sublime is rather the portrayal of an idea of the reason, which, from its nature, can not be adequately represented by material things." "The pleasure of the beautiful appertains to the quality of an object, while the sublime is manifested chiefly in the quantitative aspect of it." "To the charm of the beautiful there is frequently joined a sportiveness, but the sublime is always earnest." "The sublime, in its proper form, is not presented in a sensuous manner, but concerns only ideas of the reason, whose very incommensurability with sensuous forms, being exhibited, stirs the heart." "The beautiful pleases us immediately, but in its presence we feel disinterested; the sublime pleases us, but through its hostility to our sensuous interests." Cousin (*On the True, Beautiful, and Good*, lecture vii.) says: "A beautiful object is something completed, circumscribed, limited, which all our faculties easily embrace, because the different parts are on a somewhat narrow scale. A sublime object is that which, by forming not in themselves disproportional, but less definite and more difficult to seize, awakens in us the sentiment of the infinite." Hegel (*Æsthetics*, 2d part, div. i., chap. iii.) makes the sublime a province of symbolic art, whose chief function is to portray the purification of spirit and its separation from the world of sense and all visible existence. "The highest principle is regarded as existing apart by itself, and as incapable from its very nature of finding adequate expression in the finite appearances of the real world." "The sublime arises in an attempt to express the infinite without finding in the domain of visible phenomena an object capable of representing it. The infinite elevates itself above particular existences, considered either in themselves or in their totality; they are as nothing before it; and the positive relation which sensuous objects have to the beautiful, in the sublime changes to a negative relation which is more in conformity to the divine nature. God is thus represented as purified of all contact and participation of visible appearance." "In the Orient, in India, the One, or Substance, is conceived as immanent in contingent existences created by it; they are portrayed as mere instruments of the divine power, or as mere ornaments for the display of the glory of the Absolute." In the *Bhagavad Gita* (ch. xi.) the vision of the Universal Form of Vishnu furnishes us the highest example of this phase of the sublime. The speech of the *Erdgeist* in Goethe's *Faust* is an example quite similar in form and content. In Hebrew poetry Hegel finds the highest realization of the sublime: "Jehovah is not 'immanent' in nature, but 'transcendent'."

—lord over the universe—and in his presence the entire creation is devoid of power and sinks into nothingness. The grandeur of the Lord is revealed by the fact that the real world, with all its splendor, pomp, and magnificence, is a mere accident, an instrument, an ephemeral appearance in comparison with the eternal and immutable Being. In the 104th Psalm God is represented as covering himself with light as with a garment, and as stretching out the heavens like a tent. 'He layeth the beams of his chambers in the waters; he maketh the clouds his chariot; he walketh upon the wings of the wind: he looketh on the earth, and it trembleth; he toucheth the hills, and they smoke. He laid the foundations of the earth, that it should not be removed forever.' In the psalm of Moses (Ps. xc.) the finitude of man furnishes the contrast which makes the portrayal of the omnipotence of God sublime." For other but less adequate treatises on this subject, the reader is referred to the writings of Burke, Dugald Stewart, and Addison. The famous treatise of Longinus (*Περὶ Τρύφους*) should not be omitted.

WILLIAM T. HARRIS.

Sublime Porte: See PORTE.

Subluxation: See SPRAIN.

Submarine Navigation [*submarine* is from Lat. *sub*, under + *marine*, from Lat. *marinus*, deriv. of *ma're*, sea]: the art of navigating a submerged vessel. In submarine navigation it is requisite that an operator should be able to move freely in any direction and at any depth, and with no communication with the surface except at long intervals. The accounts of early attempts to accomplish these results are exceedingly meager. William Bourne, of London, is mentioned as proposing a plan in 1578, and Cornelius Drebbel, in 1624, is said to have constructed a submarine boat to carry twelve rowers, besides passengers, and also to have discovered a liquid which had the property of restoring air when it became impure by breathing; but he died before his plans were perfected, and his secret died with him. Papin and Borelli are mentioned in 1672, and Stapleton in 1693; but little was apparently accomplished till 1771, when David Bushnell first suggested the idea of attacking a vessel underneath the water, and constructed a submarine boat capable of accomplishing the desired object. There is no drawing extant of this remarkable invention, but the accompanying figure corresponds with the descriptions, which are quite accurate, and will serve to illustrate an invention which, for the purpose for which it was designed, was the most perfect thing of its kind that has ever been invented. The boat was shaped like a turtle, and floated in the water with the tail down. It contained air enough to support life for half an hour, and air could be renewed at the end of that time through small ventilators by rising to the surface. The operator was seated in the middle, the seat forming a brace between the two sides, and in this position he had his eyes opposite one of the numerous glass plates in the cover or top of the boat. In front of him was the handle of a screw, by which the boat was propelled; another, by which it was raised or lowered; a compass marked with phosphorus; a water-gauge, to show the depth, marked with oil and phosphorus; and near him the handles or treadles of various small pumps and levers, by which water and foul air were expelled, the rudder moved, ballast let go, etc. The torpedo—or submarine magazine, as Bushnell called it—consisted of a block of oak containing a charge of about 150 lb. of powder. This block was on the upper after

underneath the bottom, fasten the torpedo by means of the screw. The torpedo and screw were then detached from the

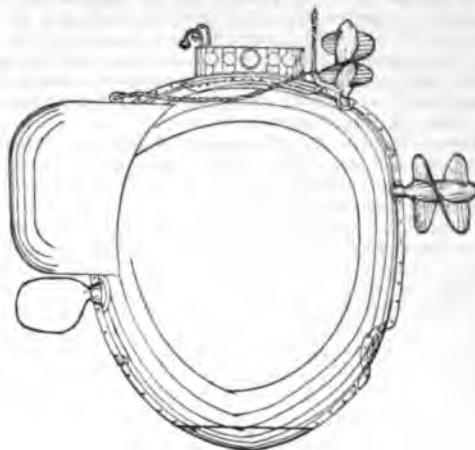


FIG. 2.—Bushnell's submarine boat: elevation.

operator's boat, a clock-work mechanism inside the torpedo being set going at the same time. This clock-work could be set for six, eight, or twelve hours' run, thus allowing the operator ample time to make his escape. See TORPEDOES.

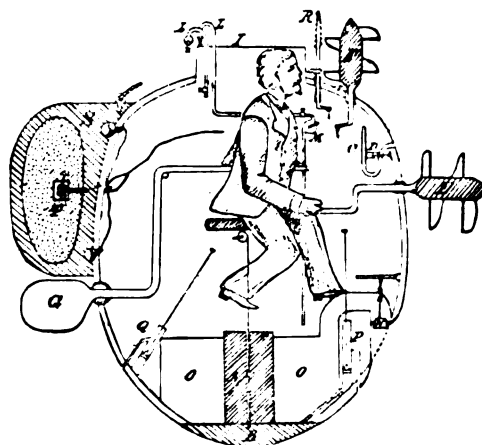


FIG. 3.—Bushnell's submarine boat: vertical longitudinal section.

- | | |
|-----------------------|----------------------------|
| A. permanent ballast. | M. ventilator. |
| B. movable ballast. | r. r. valves in L. L. |
| C. water-gauge. | N. valve to admit water. |
| D. compass. | O. O. water-tank. |
| E. screw. | P. pump for discharging O. |
| F. screw. | Q. bilge-pump. |
| G. rudder. | R. wood screw. |
| I. entrance. | S. magazine. |
| L. L. air-pipes. | T. percussion clock-work. |

In 1845 a shoemaker of Michigan City, Ind., named Phillips, devised a submarine boat in which he made frequent descents, sometimes taking his family. In 1864 occurred the only successful use of a submarine boat in warfare, when the U. S. S. *Housatonic* was sunk by a spar-torpedo carried by a Confederate "David," a cigar-shaped boat built of boiler-iron and having a crew of nine men, eight of whom worked the propeller. This boat is, however, supposed to have been only partially submerged when the attack was made. She was sunk with her entire crew by the explosion of her own torpedo. About the same time the French Government tried a boat called the *Plongeur*, designed by Admiral Bourgeois and M. Brun. This vessel was of about 200 tons displacement and propelled by 80 horse-power compressed-air engines. Her depth of immersion was to be regulated by the admission or expulsion of water, but horizontal rudders of large area were found a better means of attaining this end, and a vertical

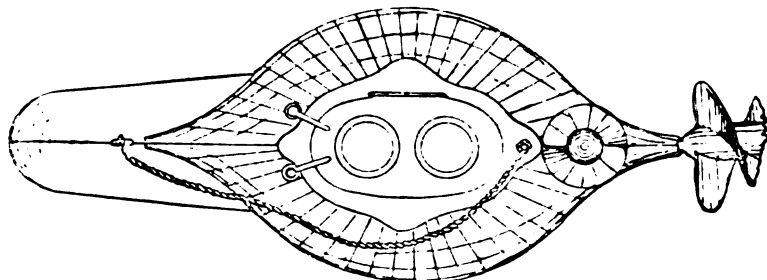


FIG. 1.—Bushnell's submarine boat: plan.

part of the boat and connected by means of a rope to a wood screw, the handle of which was directly in front of the operator. The mode of operation was to move slowly along the surface, with the top just awash, till within a short distance of a vessel at anchor, then to sink, and, coming up

screw worked by hand was afterward added to assist in the depth regulation. Although since Bushnell's time many inventors, including Fulton, have turned their attention to submarine navigation, little real progress was made for over a century. The principal naval powers, however, have conducted experiments looking to the adoption of submarine boats for war purposes, and it has been shown that submarine navigation is feasible, though opinions differ greatly as to its value for actual service.

In Great Britain the Nordenfolt boats have attracted widespread attention. Their principal features are steam-propulsion on the surface, the use of the reserve heat stored in the water and superheated steam for propulsion under water, and submergence by vertical screws. The first boat, built in 1883 and sold to Greece, had a surface speed of 9 knots. The second and third boats were of 160 tons displacement, with 12 knots surface speed, and were built for the Turkish Government. The fourth boat embodies numerous improvements over her forerunners. Her displacement is 250 tons submerged and 160 tons when running on the surface. Engines of 1,000 horse-power give a speed of 15 knots on the surface, and the heat stored in her boilers, which contain 27 tons of hot water, furnishes power for a submerged run of about 20 knots at 5-knot speed. Submergence is effected by vertical screws, working in wells, one at each end of the boat, and actuated by separate engines, the boat being first brought awash by filling certain compartments with water. The reserve buoyancy is never less than half a ton, and can be increased by expelling the water by powerful pumps. In the conning-tower are placed the necessary connections for controlling the machinery for driving and steering the vessel, sinking or rising, and for discharging the Whitehead torpedoes with which she is equipped.

In France, where perhaps the greatest advance in the art of submarine navigation has been made, the Goubet boats, a number of which are said to have been bought by Russia, succeeded the Plongeur. These are very small boats and originally were driven by hand-power, though in the

Holland, of New York, have been tried. The essential feature of the Baker boat is the use of two screws on a transverse shaft through the center of gravity of the boat, these screws being susceptible of movement so that the thrust developed by their rotation can be directed at will in any plane at right angles to the shaft. The motive power is electricity from storage-batteries, and submergence is effected and maintained by giving the screws a sufficient angle to overcome the buoyancy by the vertical thrust and at the same time propel her by the horizontal component. This plan renders it less important to preserve horizontality of the boat's axis than in a boat whose motive power is at the stern, but it has the disadvantages of being wasteful of power and of placing the screws in a greatly exposed position. The Holland boat, which has been, perhaps, as successful as any yet built, is shown in the drawing. She was 31 feet long by 6 feet in diameter, circular in cross-section, and weighed 18 tons when submerged. The motive power was obtained from a petroleum-engine which gave a surface speed of 8 knots and a submerged speed of about 6 knots. Reservoirs containing 240 cubic feet of air at 340 lb. per square inch supplied the air necessary for breathing purposes, for the engine, for the propelling charge of a gun fixed in the bow, and for expelling water from the water-ballast tanks if it became necessary to ascend quickly to the surface. The engine-compressor, drawing its air directly from the living space, gave sufficient ventilation. The essential feature of this boat was the use of diving-rudders on a horizontal shaft at the stern, to produce and maintain submergence, the boat being steered in a vertical direction just as an ordinary boat is in the horizontal plane. The practicability of this method was proved by numerous dives in water of various depths, and it was found possible to maintain a nearly constant depth either by hand-steering or by an automatic device similar to the depth-regulator of a Whitehead torpedo. A camera-lucida projecting above the water gave a clear view while the boat was running several feet below the surface.

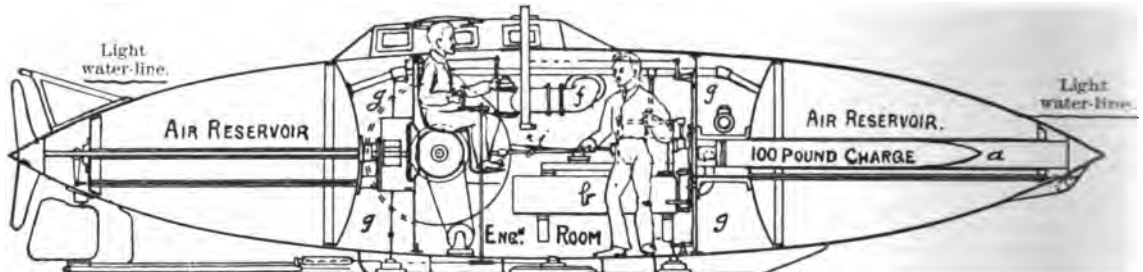


FIG. 4.—Vertical longitudinal section of Holland's submarine boat: a, submarine gun and projectile; b, firing-charge chamber; f, automatic air-pressure regulator; gg, water-ballast tanks; j, camera-lucida.

later ones an electric motor working from accumulators is used. The submerged displacement is 2 tons and the speed 5 knots. Trim is preserved by water-tanks at each end connected by a pump which transfers water from one to the other on being started by the automatic action of a pendulum. The crew of two men are provided with sufficient air, from a reservoir at 50 atmospheres pressure, for ten hours. The screw is fitted with a universal joint so that the propelling power can be applied to changing the course in any direction. The armament consists of a torpedo carried outside the boat and intended to be released at the proper moment so as to rise under the enemy's bottom and there be exploded by a wire leading to the boat after she has withdrawn to a safe distance. The utter impracticability of this method of attack is evident. A later French production is the Gymnote, of 30 tons displacement, spindle-shaped, and 56 feet long by 6 feet maximum diameter. This boat was so successful that a larger boat of the same general design, and named after the inventor, Gustave Zédé, was also ordered. The Gymnote is propelled by a 55 horse-power electric motor worked by accumulators, submergence being effected by filling water-compartments until she has only a slight buoyancy and then causing her to dive by means of horizontal rudders. She has a speed of 10 knots and is worked by a crew of three men. An electric gyroscope indicates angular movements in the horizontal plane, and enables her to maintain a fixed course beneath the surface.

In the U. S. two improved types of submarine boat, invented respectively by George C. Baker, of Detroit, and J. P.

In 1892 an appropriation of \$200,000 was made to enable the Navy Department to build and test a submarine boat, and Mr. Holland's plans for a boat of about 150 tons displacement were adopted. This boat differs from that above described in having a 70 horse-power electric motor, worked from storage-batteries, for under-water propulsion. Her surface speed was designed to be 15 knots, with 1,000 horse-power steam-engines actuating twin screws, and her submerged speed 8 knots for six hours. An automatic device controlling the vertical rudders enables a straight course to be held under water. The armament adopted consists of Whitehead torpedoes expelled from a pair of bow tubes. In addition to the diving-rudders this boat has a vertical screw at each end actuated by an 8 horse-power electric motor to maintain submergence when not moving. An important feature is an automatic safety device by means of which, when a dangerous depth is reached, air is admitted into a bow compartment, expelling a large quantity of water, and, by raising the bow, changing the course upward.

General requirements for submarine boats for war purposes—and this is their only practical use—stated in the order of their importance, are safety, facility of maneuver, speed, endurance, and offensive power. For safety the boat must have strength to resist the crushing force of the greatest depth to which she will descend, and must possess a reserve buoyancy, overcome during submergence by mechanical means but never destroyed. She must have stability enough to prevent capsizing or considerable change of trim

under service conditions and must carry an ample supply of air for the crew. Modern steel construction enables the necessary strength for a submergence of 150 feet, which is ample, to be obtained with a weight of hull of about one-half the displacement. Reserve buoyancy is a feature of all modern submarine boats, and additional safety is given by various devices whereby the pressure due to any stated depth will automatically impel the boat upward, either by expelling water from the tanks or by moving the horizontal rudders. Stability on the surface is obtained as in ordinary vessels, and below the surface by simply placing the center of gravity below the center of buoyancy. Compressed air in tanks gives a ready means of ventilation, but in a boat of ordinary size there is enough air to last the crew several hours, especially as the storage-batteries generally in use for propulsion under water give off a certain quantity of oxygen.



FIG. 1. Vertical cross-section of a submarine boat. A, coning-chamber; B, reserve buoyancy; C, reserve buoyancy; D, reserve buoyancy. E, reserve buoyancy; F, reserve buoyancy; G, reserve buoyancy; H, reserve buoyancy; I, reserve buoyancy; J, reserve buoyancy; K, reserve buoyancy; L, reserve buoyancy; M, reserve buoyancy; N, reserve buoyancy; O, reserve buoyancy; P, reserve buoyancy; Q, reserve buoyancy; R, reserve buoyancy; S, reserve buoyancy; T, reserve buoyancy; U, reserve buoyancy; V, reserve buoyancy; W, reserve buoyancy; X, reserve buoyancy; Y, reserve buoyancy; Z, reserve buoyancy; AA, reserve buoyancy; AB, reserve buoyancy; AC, reserve buoyancy; AD, reserve buoyancy; AE, reserve buoyancy; AF, reserve buoyancy; AG, reserve buoyancy; AH, reserve buoyancy; AI, reserve buoyancy; AJ, reserve buoyancy; AK, reserve buoyancy; AL, reserve buoyancy; AM, reserve buoyancy; AN, reserve buoyancy; AO, reserve buoyancy; AP, reserve buoyancy; AQ, reserve buoyancy; AR, reserve buoyancy; AS, reserve buoyancy; AT, reserve buoyancy; AU, reserve buoyancy; AV, reserve buoyancy; AW, reserve buoyancy; AX, reserve buoyancy; AY, reserve buoyancy; 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CT, reserve buoyancy; CU, reserve buoyancy; CV, reserve buoyancy; CW, reserve buoyancy; CX, reserve buoyancy; CY, reserve buoyancy; CZ, reserve buoyancy; DA, reserve buoyancy; DB, reserve buoyancy; DC, reserve buoyancy; DD, reserve buoyancy; DE, reserve buoyancy; DF, reserve buoyancy; DG, reserve buoyancy; DH, reserve buoyancy; DI, reserve buoyancy; DJ, reserve buoyancy; DK, reserve buoyancy; DL, reserve buoyancy; DM, reserve buoyancy; DN, reserve buoyancy; DO, reserve buoyancy; DP, reserve buoyancy; DQ, reserve buoyancy; DR, reserve buoyancy; DS, reserve buoyancy; DT, reserve buoyancy; DU, reserve buoyancy; DV, reserve buoyancy; DW, reserve buoyancy; DX, reserve buoyancy; DY, reserve buoyancy; DZ, reserve buoyancy; EA, reserve buoyancy; EB, reserve buoyancy; EC, reserve buoyancy; ED, reserve buoyancy; EE, reserve buoyancy; EF, reserve buoyancy; EG, reserve buoyancy; EH, reserve buoyancy; EI, reserve buoyancy; EJ, reserve buoyancy; EK, reserve buoyancy; EL, reserve buoyancy; EM, reserve buoyancy; 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UL, reserve buoyancy; UM, reserve buoyancy; UN, reserve buoyancy; UO, reserve buoyancy; UP, reserve buoyancy; UQ, reserve buoyancy; UR, reserve buoyancy; US, reserve buoyancy; UT, reserve buoyancy; UU, reserve buoyancy; UV, reserve buoyancy; UW, reserve buoyancy; UX, reserve buoyancy; UY, reserve buoyancy; UZ, reserve buoyancy; VA, reserve buoyancy; VB, reserve buoyancy; VC, reserve buoyancy; VD, reserve buoyancy; VE, reserve buoyancy; VF, reserve buoyancy; VG, reserve buoyancy; VH, reserve buoyancy; VI, reserve buoyancy; VJ, reserve buoyancy; VK, reserve buoyancy; VL, reserve buoyancy; VM, reserve buoyancy; VN, reserve buoyancy; VO, reserve buoyancy; VP, reserve buoyancy; VQ, reserve buoyancy; VR, reserve buoyancy; VS, reserve buoyancy; VT, reserve buoyancy; VU, reserve buoyancy; VV, reserve buoyancy; VW, reserve buoyancy; VX, reserve buoyancy; VY, reserve buoyancy; VZ, reserve buoyancy; WA, reserve buoyancy; WB, reserve buoyancy; WC, reserve buoyancy; WD, reserve buoyancy; WE, reserve buoyancy; WF, reserve buoyancy; WG, reserve buoyancy; WH, reserve buoyancy; WI, reserve buoyancy; WJ, reserve buoyancy; WK, reserve buoyancy; WL, reserve buoyancy; WM, reserve buoyancy; WN, reserve buoyancy; WO, reserve buoyancy; WP, reserve buoyancy; WQ, reserve buoyancy; WR, reserve buoyancy; WS, reserve buoyancy; WT, reserve buoyancy; WU, reserve buoyancy; WV, reserve buoyancy; WW, reserve buoyancy; WX, reserve buoyancy; WY, reserve buoyancy; WZ, reserve buoyancy; XA, reserve buoyancy; XB, reserve buoyancy; XC, reserve buoyancy; XD, reserve buoyancy; XE, reserve buoyancy; XF, reserve buoyancy; XG, reserve buoyancy; XH, reserve buoyancy; XI, reserve buoyancy; XJ, reserve buoyancy; XK, reserve buoyancy; XL, reserve buoyancy; XM, reserve buoyancy; XN, reserve buoyancy; XO, reserve buoyancy; XP, reserve buoyancy; XQ, reserve buoyancy; XR, reserve buoyancy; XS, reserve buoyancy; XT, reserve buoyancy; XU, reserve buoyancy; XV, reserve buoyancy; XW, reserve buoyancy; XX, reserve buoyancy; XY, reserve buoyancy; 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ZT, reserve buoyancy; ZU, reserve buoyancy; ZV, reserve buoyancy; ZW, reserve buoyancy; ZX, reserve buoyancy; ZY, reserve buoyancy; ZZ, reserve buoyancy.

Complicated means for purifying the air are found to be practically not necessary. Facility of movement in the vertical plane can probably be best obtained by diving-rudders, for with these a boat can most quickly come to the surface and again disappear. Any simple form of pressure-gauge will indicate the depth of submergence, and the variations of the water-pressure are easily made to control the diving-rudders automatically, the replacement of fuel, torpedoes, or other stores expended by an equal weight of water keeping the buoyancy and trim unchanged. Motion in the horizontal plane is controlled by ordinary rudders and twin screws add to the turning power. Surface speed is of great importance, since approach to an enemy must be on the surface, and escape may depend upon it. Steam propulsion is still the best for surface use, means being provided for rapidly housing the smoke-stack and sealing the furnace-doors preparatory to diving. Endurance depends only on the weight which can be allotted to fuel or other sources of power. Fuel for a run of 1,000 miles on the surface and electric power for a run of 50 miles under water can easily be carried in a boat of 150 tons. For purposes of offense the automobile torpedo is probably most effective, though the submarine gun, using either powder or compressed air as a propelling charge, promises well. Speed under water is best obtained by the use of the electric motor and storage-batteries, the feature of unchanging weights having manifest advantages. With a vessel of good form there should be no difficulty in attaining as great or greater speed than on the surface, but there is no probability that high speeds will ever be used in submarine navigation, the impossibility of seeing anything and the uncertainty of position and direction rendering it necessary to move slowly.

PHILIP R. ALLEN.

Subpoena [Lat. *sub*, under + *poena*, penalty]: in law, a writ or process by which either parties or witnesses are compelled to appear in court or before a judicial officer and answer or testify, as the case may be, under a penalty for their disobedience. There are several different kinds of this writ. In the courts of chancery it was for a long time the ordinary process, issued upon filing a bill of complaint, for the purpose of procuring the defendants to appear and answer. This use, however, was abolished in England some time before the consolidation of the law and equity courts and procedure (see *Courts*), and the defendant in a chancery suit was simply served with a copy of the bill, and with a notice or summons to answer thereon or acknowledging the same. The common species of subpoena now used in all the courts, civil and criminal, is the *subpoena ad testificandum*, for the purpose of ordering witnesses to attend upon a trial or other judicial examination, and to give their evidence thereon. It generally purports to be issued by the court, to be signed by its clerk, and sealed with its seal; but in the loose procedure prevailing in many States of the U. S. it is issued by the attorney. It commands the person in whom it is addressed to lay aside all excuses and pretenses, and to appear before the court or officer at the time and place mentioned, and testify on behalf of the party issuing it, under a penalty in case of a neglect to comply with the order. A variety of

this species is termed the *subpoena duces tecum*, and contains an additional clause directing the witness to bring with him into court certain books, papers, etc., in his possession which may be useful as evidence, and which must be designated with sufficient particularity to apprise the witness of the exact papers to be produced. Both these forms are compulsory; the witness must obey the mandate, and it is for the court alone to decide whether his evidence or the documents he is ordered to produce are material and proper. If the witness violates the command, an action for damages may be maintained against him by the party who is materially injured by his default. The subpoena is served by exhibiting the original to the witness and delivering to him a copy thereof, and paying him his lawful fees for travel and for attendance. Both the subpoena of *testificandum* and the *subpoena duces tecum* may be used by committees of legislatures and other quasi-judicial bodies lawfully constituted for the purpose of carrying on investigations, as well as by courts and magistrates. Revised by F. STOKES ALLEN.

Subrogation [from Lat. *sub*, under + *rogare*, ask]: an equitable doctrine by which a person paying in proper circumstances a debt which is between himself and another should have been paid by the latter is given the rights and remedies of the original creditor. It may be stated as a general principle that whenever a person *voluntarily* liable for a debt pays the same, the demand is not regarded in equity as discharged, but he at once and by operation of the equitable doctrine succeeds or becomes subrogated to all the rights, remedies, and securities which the creditor held against the debtor primarily liable, and may enforce the same as a creditor against such debtor in order to reimburse himself for the outlay which he has made on behalf of that party. The following are some of the most common and important instances which result from an application of this general principle to different facts and circumstances: (1) When a junior mortgagee pays the debt due to a prior mortgagee of the same land he becomes entitled to the prior mortgage, is regarded as its equitable assignee, and can compel its actual assignment to himself. The rule applies to all cases where a junior creditor pays the demand of a prior creditor; he succeeds to the latter's claim and is entitled to all the securities held for its enforcement. (2) When one of several joint debtors pays the entire demand he is entitled to a contribution from the others for their respective shares, and acquires the rights and securities of the creditor against them. (See *Governments*.) (3) The principle is most frequently applied in the case of the surety who pays the demand primarily owing by his principal debtor. He is entitled to recover their contributory shares from his co-sureties, if any, and the entire amount which he has advanced from his principal. To aid him in enforcing these rights he is entitled to hold and use all the collateral securities given by the principal debtor to the creditor. For example, if as such surety he pays off a mortgage debt he is an equitable assignee of the mortgage itself. If the creditor has recovered a judgment against the principal and surety, or against the principal alone, and the surety pays the demand, he is not only entitled to hold this judgment, but he is permitted to enforce it by execution against the principal.

Revised by WILLIAM A. KEEVEL.

Subsidies [from Lat. *subsidius*, reserve-troops, support, relief; deriv. of *subsistere*, settle down, lie in wait]: (1) in English constitutional history, special taxes assessed upon persons and not directly upon property; (2) in the political history of Europe, payments to an ally, to aid in carrying on a war; (3) the usual application of the term since 1840, grants of money by the state in aid of individual enterprises. The most important subsidies of this kind have been granted in aid of transportation companies.

Railway Subsidies.—In Great Britain the Government granted no subsidies whatever except in Ireland. France defrayed about half the original cost of her railways, and left them to the companies to operate. This policy was followed in most of the other states of Southwestern Europe, as well as by Austria, Russia, and British India. (For the history of direct ownership of railways by the state, see *Transportation*.) In the U. S. the subsidy system has been much more complicated. Railways have been assisted by State and municipal subscriptions in their stock and their bonds, even on an unwisely large scale. National aid to railways, with one important exception, has been in the form of grants of public land. From an early period there had been

important grants of this kind in favor of roads and canals. In 1850 large grants of public land were made to the Illinois Central and the Mobile and Ohio railroads, through the medium of the States of Illinois, Alabama, and Mississippi, Congress for form's sake delivering the land to the States, to be in turn by them delivered to the railway companies. The example was rapidly followed in other parts of the U. S., the system being extended to Missouri in 1852, to Arkansas in 1853, and in 1856 to Michigan, Wisconsin, Iowa, Florida, and Louisiana, besides additional grants to Alabama and Mississippi. It was a game of sectional interests, each part of the republic being anxious to secure its share of the spoil. Some 27,000,000 acres were given to corporations in this way before the crisis of 1857 put a temporary stop to all schemes of the kind.

The civil war, though it stopped railway building, gave a new impulse to the policy of subsidies. California was at that time so far out of communication with the rest of the republic that its adherence to the Union was a matter of sentiment rather than of direct connection. To strengthen this sentiment on the one hand, and to secure the means of communication by land when it was no longer safe by sea, public attention was directed to the project of a Pacific railway, which seemed to be a political necessity, to be obtained at almost any price. The Pacific Railroad Bill, carried by Thaddeus Stevens in 1862, gave to the Union and the Central Pacific railroads a money subsidy amounting to over \$25,000 a mile, and more than 30,000,000 acres of land in addition. The money subsidy took the form of a loan, but it was not expected that it would be repaid. It seemed for a time doubtful whether the road would be built at all; but the work proved unexpectedly easy, and the Cr dit Mobilier, a construction company formed for the purpose of building the road, realized enormous profits, involving a public scandal, since many Congressmen were found to hold the stock of this construction company without having furnished any consideration therefor. The unexpected success of this enterprise made the company profitable, and it might have paid interest on the moneys advanced by the U. S., but, taking advantage of a technical defect in the remedies by which the lien of the U. S. could be enforced, the company evaded this obligation. The Thurman Act of 1878 attempted to settle the matter by providing for the payment to the U. S. of a portion of the earnings of the company, to form a sinking fund which should meet the amount of the debt at maturity; but these earnings proved much less than had been expected.

The Northern Pacific road did not succeed in getting a cash subsidy, like that of the Union Pacific, but its promoters secured a double grant of land per mile, amounting to about 47,000,000 acres in all. The two southern routes secured about 70,000,000 acres, so that there have been granted in aid of railways something like 160,000,000 acres of territorial land. In addition to this, Congress, in the years immediately following the war, renewed the policy of State land grants, renewing those which had been forfeited and adding new ones to the amount of some 30,000,000 acres. Besides these grants of U. S. land, certain swamp and timber lands, which under general laws had been made the property of the States themselves, were also devoted to the aid of railway construction. The nominal amount of land thus granted in aid of railways under various acts exceeds 200,000,000 acres, but only a little more than a fourth of this has been actually patented.

The method adopted in the granting of the lands was ingenious. The whole country being divided into quarter sections of 160 acres each, the U. S. reserved the alternate squares or quarter sections, like the black squares on a checker-board, and granted to the railways only the intermediate parts. On the lands thus reserved by the U. S. the price was at once doubled, so that the treasury was as well off as before, and even better off, since its land came into market more rapidly, owing to the construction of the roads. Meantime, it was ingeniously argued that a settler, so far from being burdened by the change, was better off than before, for he could better afford to pay \$2.50 an acre for land that was near a railway than \$1.25 an acre for land which was wholly out of reach. Thus it was thought that the help might be rendered to the railways without sacrifice of any other interests. Unfortunately, it proved that the system stimulated unsound railway schemes and caused railway building to be misdirected; that the provisions intended to protect the Government interests were disregarded; that the settler was induced to move too far West, where he was, for

the time being, at the mercy of the railway; and that the real gainer by these schemes was usually either the land speculator or the financial operator of the worst sort. The best practical proof of these mistakes is seen in the reaction against land grants which made itself suddenly felt at the time of the granger movement. Since 1872 the policy has been abandoned, though it has been impossible always to enforce forfeitures, even in cases where such a procedure would be clearly just. The whole history of the land grant system, as well as that of municipal subscriptions to railway stock and bonds, gives force to the views of those who disbelieve in Government interference. It appears that business men, as a rule, can judge better than Congressmen of the necessities of the various sections of the U. S., and that the attempts to stimulate enterprise in particular directions, though well meant, have been apt to do harm rather than good. It is probable that the subsidy to the Union Pacific was justified by the result, and perhaps that to the Illinois Central also, but the number of mistakes is largely out of proportion to the number of successes.

A most important system of subsidies has been that of the Dominion Government to the Canadian Pacific Railway. The reasons in this case were a good deal like those for the Union Pacific route in the U. S., and the success of the enterprise seems to have justified the policy of its promoters.

Steamship Subsidies.—Ocean steam-navigation was proved possible as early as 1818, but it was not until many years afterward that the commercial success of any such enterprise was assured. The marine engines of that period were not economical in their construction, and sails furnished cheaper, though less sure, motive power. It was a political necessity, however, for Great Britain to have steamships sooner than any other nation, even if such steamships were for the time being unprofitable. Her colonial possessions were so scattered that every argument in favor of the Union Pacific Railway subsidy in the U. S. applied with vastly greater force to steamship subsidies for Great Britain. In 1838 proposals were asked for a line of Atlantic steamers, and in 1840 the contract was awarded to Samuel Cunard. In 1840 four ships were put on, with an annual subsidy of £81,000. The contract was gradually extended until 1858. It was not until about 1870 that it was gradually reduced. About the time of the establishment of the Cunard subsidy a contract was made with the Peninsular and Oriental Steamship Company for the carriage of the mails to Gibraltar, and this contract was afterward extended so as to secure the carriage of the mails by the same company to Alexandria, Calcutta, Bombay, and finally to Australia. In 1840 a contract was also made with the Royal Steam Packet Company for the carriage of mails to the West Indies, and afterward to South America. At the time when the subsidy system was most largely developed, the British Government was spending in round numbers £1,000,000 annually for the conveyance of the mails—a sum which has been reduced to about £700,000 annually.

To the Cunard Company and to the Royal Mail Company these contracts were unquestionably of great value. In the case of both these companies the price paid was sometimes much more than the service was commercially worth. If proof were needed, this is shown by the fact that the Inman line, established in 1850, has worked successfully without the aid of subsidies. Other unsubsidized companies of the same sort soon followed, and ultimately public sentiment forced the Government to reduce the payments to the Cunard line. The Peninsular and Oriental Company was not quite so liberally dealt with as the two other great subsidized lines. In many cases it would appear that the special requirements as to construction, sailing ports, and penalties for delay almost offset the advantage of a subsidy. Great Britain was paying not for mail contracts but for military strength, and she got what she paid for, and on the whole she got it cheaply. In one instance, at least, that of the Galway and the Anchor line, a subsidized line failed in the competition with an unsubsidized one.

The admiralty subsidies in Great Britain are at present £33,847 annually. Besides this, the payments for carrying the mails in the fiscal year 1893-94 were £710,585, which is about £450,000 in excess of the receipts for sea-postage.

The U. S. did not want Great Britain to get the start in ocean steam-navigation. In 1841, two years after the first Cunard contract, there was an agitation in favor of similar action on the part of the U. S. In 1845 the Postmaster-General was authorized to make contracts for the conveyance of foreign mails in steamships sailing under the U. S.

flag. A line to Bremen was established under this act in 1847. In the same year an act was passed requiring the Secretary of the Navy to arrange for U. S. steamships to carry the mail from New York to Liverpool, to the West Indies and Gulf ports, and from Panama up the Pacific coast. From these contracts arose the Collins line and the Pacific Mail Steamship Company, besides others less important. By act of 1851 provision was made for the Panama Railroad, and in 1852 the Collins line subsidy, originally \$250,000, was increased to \$350,000 annually. In 1853 the payments for U. S. foreign mail service amounted to about \$9,000,000. The Collins line was the most important enterprise, and for the time being the most successful. It had the fastest and best steamships of their period, built of oak, and relying on paddle-wheels as their motive power. The subsidy was \$25,000 a voyage, or \$4.70 per mile run. The average speed attained was nearly half a day better than that of the Clippers. In 1854 the Arctic was sunk in a collision, and the Pacific disappeared in 1856. Such was the effect of these accidents that, in spite of the subsidy, it was no longer possible to run the Collins line, and the field was left to the British steamers. At the outbreak of the civil war the U. S. lines to Europe were withdrawn. In 1864 arrangements were made for subsidizing a line to Cuba and Brazil. In 1865 the Pacific Mail Company was offered large inducements to extend its lines to China and Japan; \$150,000 annually was spent for the Brazil line; \$500,000 for the China and Japan lines. In 1869 an attempt was made to establish a European line with a subsidy of from \$400,000 to \$600,000 a year, but it failed because the mail service provided under this act would have been inadequate. In 1872 an attempt was made to increase the subsidies in the Pacific Mail and Brazil companies. But the reaction was close at hand. An investigation into the history of the means by which these appropriations were secured brought such scandalous corruptions to light that no Congressman dared to vote for the continuance of a policy of this kind. Meantime the Pacific Mail Company had been unfortunate in every way. Prior to 1865 it had been a sound concern. When the subsidy was increased it fell into the hands of speculators. The stock fell from par to below 40. The money under the supplementary contract of 1872 was not earned by the company, owing to its failure to construct the vessels at the appointed time. In 1875 the Brazilian and Pacific mail subsidies expired, and hardly a voice was heard in favor of their renewal. In the year 1879 a strong effort was made to secure renewed subsidies for a Brazilian steamship line, but without success. It was not until 1891 that the efforts to secure profitable mail contracts for American lines met with anything like success. By an act of Mar. 3 of that year the Postmaster-General was directed to make arrangements with U. S. steamship companies, whose vessels were so constructed that they could serve as naval auxiliaries in case of war, to carry the U. S. mails at a rate not to exceed \$4 a mile run with first-class vessels—i. e. vessels of not less than 8,000 tons register and 20 knots an hour ordinary sea speed. Vessels of lower classes in tonnage and speed were limited to \$2, \$1, and \$0.60 per mile for successive classes. Mail contracts for service between the U. S. and Great Britain were only to be made with vessels of the first class. A number of lines to South American ports took advantage of these contracts, and the Pacific Mail and Oceanic companies arranged for a considerable Pacific service on this basis; but it was not until the autumn of 1893 that the International Navigation Company made an arrangement for first-class European service (in connection with the admission of the Paris and New York to the U. S. register).

To U. S. steamships carrying mails without special contract an advantage is given by paying them \$1.50 a pound for letters and post-cards and 5 cents a pound for other articles, instead of 44 cents and 4½ respectively, which are the rates paid foreign vessels. The total ocean mail payments of the U. S. in the year 1893-94 were as follows:

ARTICLE	U. S. vessels	Foreign vessels
Transatlantic service	\$196,732	\$425,170
Transpacific service	240,735	11,600
Other transoceanic service	281,965	25,000
Total	\$719,432	\$461,770

The Dominion of Canada voted a subsidy of \$150,000 to the Canadian Pacific Railway for its service to China and Japan, and a few years later (1893) it voted \$150,000 for a transatlantic steamship line.

Germany has paid subsidies to mail-steamers amounting in 1902 to 1,000,000 marks, or \$1,540,000—averaging about \$1.25 per mile run—besides regular payments at low rates for mail passages on ordinary routes.

France has adopted a much more comprehensive system of shipping bounties. It includes payments both for construction and navigation of steam-vessels, whether they carry mails or not. By the act of 1890 the construction bounties are as follows:

Iron and steel vessels	As France lost steam ton.
Wooden vessels	Over 150 tons 40 "
	Under 150 tons 30 "
Engines and boilers	15 francs per 100 h.p.

In addition to this there are navigation bounties for vessels engaged in foreign trade. For those engaged in the "distant" trade (beyond Gibraltar or the Suez Canal) these bounties are as follows: per 1,000 nautical miles run:

VESSELS	First year francs per ton	Maximum for each successive year
Steel or iron, steam	1.40	0.4
Wooden, steam	1.10	0.3
Steel or iron, sail	1.70	0.5
Wooden, sail	1.50	0.3

In order to earn this bounty these boats must be built in France and almost entirely manned by French sailors. The act of 1891 allowed one-half the regular rate of navigation bounty to foreign-built ships run under the French flag, but this was withdrawn by the act of 1901. Vessels in the short-distance foreign trade earn two-thirds of the amount above given. The average annual payments under the act of 1891 were: Construction bounties, \$570,000; navigation bounties, \$1,540,000. The act of 1901 was more successful in encouraging navigation than in encouraging construction.

Italy has a combined system of construction and navigation bounties. The construction bounties are nominally in the form of a tariff rebate on materials used; but as this rebate is purposely made larger than the tariff, it operates as a premium. The navigation bounties are at the rate of .35 lire (about 12½ cents) per net ton per 1,000 miles on all long distance voyages. The total amount paid averages about 4,000,000 lire a year. Most of the long mail routes are maintained under special contract rather than under the general act.

Austria has a combined system of mail contracts with navigation bounties. Norway and Sweden have no direct subsidies, and their postal contracts are trifling in amount.

A. T. HAMLEY.

Substance [from Lat. *substantia* (noun, under a story, stand), constructed first as translation of Gr. *ὑπόστασις*, support, real essence, substance; *ὑπό*, under + *ὑστάναι*, stand; in philosophy, a term which appears first in Aristotle, who uses it in two senses, between which it has wavered ever since. Logically, it is the first of the categories as opposed to the other nine, which are its accidents (*κατηγορηματά*). There are first and second essences, the first always designating singular—e. g. a man, a horse; the second being general terms, as man, horse (Categ. V.). It is also used in the sense of *esse* or constituting essence, in which acceptance it is sometimes rendered into Latin by *essentia* (Metaph. IV. 8). The logical *substantia* is the first of induction (*ἐπίστασις*); the metaphysical *substantia*, the first of deduction (*ἐπίστασις*). None of the post-Aristotelian philosophical schools had profoundly enough to require the category of substance until the rise of the Neo-Platonists, who re-established it. Plotinus criticizes Aristotle rather severely for not distinguishing between material and spiritual substance (*Εἰσαγωγή*, bk. vi.), as he himself did. Porphyry and Simplicius accepted the Aristotelian doctrine. In the Middle Ages the metaphysical view prevailed, and substance was identified variously with God, person, etc. The same is true of modern times, dating from Descartes. He regarded substance as that which can exist independently of anything else, and Spinoza (*Ethics*, i. def. (iii)) as "that which is in itself and is conceived by itself"—a definition which, of course, identifies it with God. Leibnitz identified with substance the monads. Locke looked upon substance as a mere imagined substratum, holding attributes together, but did not altogether deny its validity, as did Hume (*Human Nature*, pt. I, § 6). Kant classed substance in his Transcendental Table of the Concepts of the Understanding along with Cause and Community under the head of Relation, and

defined its scheme as the "permanence of the real in time" (*Critique of Pure Reason*, p. iii., Meiklejohn's translation). Hegel defines substance as the "absolute, as relation to itself" (*Logik*, pt. 2, p. 185, ed. 1834), and as "the unconditioned essence (*Wesen*) existing in and for itself as being immediate existence" (*Propädeutik*, p. 105). Mill and the English school mostly follow Locke. In the orthodox doctrine of the Trinity, substance is used of the essential unity of the Divine Being as distinct from the tripersonality.

THOMAS DAVIDSON.

Substitutions, Theory of: a recondite but most attractive branch of modern mathematics, which has placed the theory of algebraic equations on a new basis. A substitution is an operation which is conceived to interchange quantities or symbols among themselves, putting one in place of another, but taking none away, and adding no new ones. If we have an algebraic expression containing several symbols, say the roots of an algebraic equation, some substitutions may change the value of the expression and others may not. For example, in the expression $x + y - z$, an interchange of x and y makes no change of value, because $x + y = y + x$; but interchanging either of these quantities with z changes the value. An excellent treatise on the subject is that of Netto, of which an English translation from the German original has been made by Prof. Cole, of the University of Michigan, and published at Ann Arbor. The most exhaustive treatise is that of Jordan, of Paris, published in 1870.

S. NEWCOMB.

Succession [from Lat. *successio*, deriv. of *succedere*, *successum*, go under, follow after; *sub*, under + *cedere*, go]: in European law, a term which covers all cases where rights or obligations previously established are acquired or assumed by new parties. Where one acquires a right previously held by another, the jurist speaks of an active succession; where one takes the place of a debtor, they speak of the succession as passive. The ordinary transactions of life give rise only to special or "singular" successions. In case of death, however, the Roman law, and the majority of modern legislations provide that some person or persons shall step into the place of the deceased, acquiring, in principle, all his rights, and becoming answerable for all his obligations. These persons are the "heirs" (see *HÆRES*), and their succession is termed universal.

The heir or heirs may have been designated by the deceased. At Roman law this could be done only by testament. (See *WILL*.) Teutonic custom, however, permitted rights of inheritance to be created by contract also, and most of the modern German codes retain the Teutonic rule (so the Prussian and Saxon codes, the German draft code, and, with limitations, the Austrian code). In the French law, rights of inheritance can be created by antenuptial contracts, but by such contracts only.

In the absence of heirs designated by the deceased, the succession is determined by the law. Succession *ab intestato* may be based upon the family organization or upon consanguinity. The first principle would wholly exclude illegitimate children. The second would exclude succession between husband and wife, and between adoptive parents and children. The Roman law, in its latest development, represents a compromise between the two principles. The same is true of all modern European legislations. Illegitimate children have some rights of inheritance, not only from the mother and her relatives, but also (if "recognized") from the father. Husband and wife also have reciprocal rights of succession, but the exact position assigned to the surviving spouse differs in different legislations. The law of intestate succession is often modified in this point by the rules of matrimonial property. See *MARRIED WOMEN*.

In general, succession is determined by the degree of kinship, nearer relatives excluding the more remote. (For the different methods of reckoning degrees, see *CONSANGUINITY*.) It should be noted, however, that the degree of consanguinity is never wholly decisive. In every legal system direct descendants, though of remoter degree, are preferred to ascendants and collaterals; and even among collaterals the remoter relative may be preferred—e. g. a brother's grandchild will always take precedence of an uncle, although by either the Roman or the canonical computation the latter is one degree nearer. In other words, every legal system regards the *kind* of relationship as well as the degree, and divides the relatives into classes, so that any member of a prior class excludes all members of a posterior class. Such a classification becomes perfectly logical only when succession

is avowedly based on the preference of the nearer *parentela*. This term designates the descendants of one ancestor. The *parentela* system divides all the relations of a deceased person into a series of such ancestral groups. The direct descendants of the deceased constitute the first *parentela*. His parents and their other descendants (i. e. his brothers, sisters, nephews, nieces, etc.) make up the second *parentela*. His grandparents and their descendants (not already included in the first or second group) are of the third *parentela*, and so on. As long as any member of a nearer *parentela* is in existence, all members of other *parentela* are shut out. This is claimed to be the Teutonic principle of succession. It lies at the basis of the English law of succession to real property. It is logically carried out in the Austrian code and in the codes of several Swiss cantons. It is adopted in the German draft code.

Whenever, under any system of succession, there are several heirs of the same class, those nearer in degree are preferred. This principle is modified, however, by the right of "representation," by which more remote relatives may be put into the place of their ancestor, and take the share to which he would be entitled if he had survived the intestate. In such a case succession within the class is said to be *per stirpes*, by lines. (See *DESCENT*.) In all modern legislation direct descendants take *per stirpes*; and the same system obtains, to some extent at least, among collaterals. Among remoter collaterals, however, the right of representation is frequently refused, because it tends to an undesirable subdivision of property.

Teutonic law never developed a "universal succession." It always recognized distinct succession to realty and to personality. It often drew further distinctions. It exhibited, in particular, a tendency to consider the channel through which property had come to the deceased; to prefer the paternal relatives when the property had been inherited from the father, the maternal when it had come from the mother. Modern European codes generally reject this distinction.

Special variations in the law of succession, which have existed in past times and still exist sporadically, are the exclusion of females or of the descendants of females (older Roman law), or a preference of the male line (classical Roman law). Similar tendencies reveal themselves in the older Teutonic law of real property; and under the influence of feudalism the preference of males was associated with the preference of the eldest son. (See *PRIMOGENITURE*.) In the succession to German peasant estates, also, the system of primogeniture generally obtained through the Middle Ages, and still obtains in some territories. Sporadically, a preference of the youngest son has also existed.

At Roman law the estate of a deceased person did not devolve *ipso jure* upon the heir unless he was a child or slave of the deceased. All others had to "enter," and could refuse to enter. The Teutonic principle, on the contrary, is that death vests seizin (at least as regards real property)—i. e. the legal heir acquires *ipso jure*. This rule is recognized in the French code and in the German draft code (in the latter for testamentary as well as intestate heirs); but the heir may divest himself of the inheritance by an express renunciation.

Since the acquisition of an inheritance makes the heir personally liable for the debts of the deceased, the Roman law established the rule, first for the children and then for other heirs, that they might take with the "benefit of inventory," in which case their liability was limited to the amount of the assets. This rule obtains generally in modern Europe. Conversely, when the heir is insolvent, the creditors of the estate may demand a separation.

See Demolombe, *Des Successions* (Paris, 1880); Koeppen, *Erbrecht* (Würzburg, 1888), and *Motive zum deutschen bürgerlichen Gesetzbuch* (vol. v., Berlin, 1888).

MUNROE SMITH.

SUCCESSION, in the common-law system, is employed in a more limited sense than in the civil law. In England and the U. S. the term is used only to describe the transmission of property (a) from a person or group of persons composing a corporation to his or their successors; or (b) upon the death of a person to his heir, devisee, or next of kin. Technically, it is only in the former sense—as describing the persistence of the rights of a corporation through all changes in its membership—that the term has any footing in the common law. The power of perpetual succession is one of the peculiar properties of a corporation, and the term successor, applied to a person in his corporate capacity, is the legal

equivalent of the term heir, applied to a person in his natural capacity.

In the other sense mentioned, however, the term *succession* is sometimes, by analogy with its signification in the civil law, employed to describe the acquisition of property rights upon and in consequence of the death of the former owner. Thus used it may comprehend the transmission of property by will or by descent, and it is under the description of these terms respectively that the devolution of property upon the death of the owner is treated by the common law. The subject of succession by testament is considered under the title WILL. "Descent," in its more general acceptation, includes the devolution, in case of intestacy, of personal as well as of real property. As only the latter is considered under that head, however (see DESCENT), the transmission of personal estate under those circumstances is considered here.

There was no such thing as a universal succession at the common law. This familiar principle of the civil law is not to be found in the early Teutonic customary law, nor did it ever find a place in the English system. The functions of the Roman *heredes* were from an early period divided up between the "heir," who took the real property, and the person or persons to whom the personal property descended; and it is not the English heir, but the personal representative—the executor or administrator—of a decedent, whose position bears the closest analogy to that of the Roman heir.

Although the right to dispose of personal property by will has always existed at common law, it was in the early history of English law much restricted by considerations of public policy, and of what were regarded as the rightful claims of the surviving members of the family. A rule of "reasonable partition," as it was called, prevailed, which provided that if a man left a wife and children surviving, one-third of his personal estate should go to the wife and one-third to the children, leaving only one-third of the whole to be disposed of by the will of the decedent. If the testator left a wife, but no children, or if he died a widower, but leaving children, he was entitled to dispose of one half of the estate, the other half to go to the surviving wife or children, as the case might be. Long before the time of Blackstone, however, this compulsory feature of the law of descent of personal property had disappeared, and the law was confined in its operation to cases where the owner of the estate died wholly or partially intestate.

There being no absolute right of succession to personal property recognized by the common law, except as above described, the title to all such property as a decedent might have disposed of by will, but which he failed so to dispose of, vested in the crown. By a series of early statutes this right of the crown was speedily reduced to a right of *ADMINISTRATION* (q. v.); the property being "distributed very justly to the wife and children and relations, to every one according to the degree that belongs to him" (Stat. Caserte, cap. 71). So a statute of William the Conqueror (cap. 84) provided that if a man died without a will, his children should divide the inheritance equally. In the course of time this right of administration became vested in the Church, and it continued to be exercised by the ecclesiastical tribunals in England from before the reign of Edward I. (A. D. 1272) down to the year 1857. It seems, from the authorities, to be clear that by an abuse of this right of administration the clergy claimed, and for a considerable period exercised the right to appropriate the personal property which thus came into their hands in case of intestacy to "charitable and pious uses," but when they were constrained by statute (31 Edw. III., Stat. I., cap. 11) to grant administration to the next of kin of the intestate (the just distribution to the nearest relations which the law contemplated was again made possible).

The distribution of intestate estates which now prevails dates back directly to a statute enacted in the year 1670 (29 and 30 Car. II., cap. 10) by which the respective rights of wife, children, and next of kin were fairly and, as the event has proved, permanently adjusted. By that statute one-third of the personal estate undisposed of by will, and remaining after the payment of debts and funeral expenses, was to go to the widow, and the residue to the children, to be equally divided among them. If there was no widow, the children took the whole of the surplus; if there was a widow but no children, the widow took one half and the next of kin (parents, brothers and sisters, grandparents, etc.), every one according to the degree that belongs to him, took the other half. If the intestate left no widow or children, the next of kin were entitled to the whole sur-

plus. In case a person entitled was dead, his legal representative would take his share. There was no discrimination (as there was in the rules regulating the descent of real property) against kin of the half-blood nor against female kin, but all of the same class or grade of kinship inherited equally. The rights of the husband in the personal estate of his wife were not altered by this statute, but remained as at common law. As a married woman could own no personal property during her life, she could of course leave none at her death, save only such claims against others (*choses in action*) as her husband had not previously reduced to possession. As in those, he was solely entitled to administration for the purpose of collecting them in and converting them to his own use. See MAXWELL WHEAT (Property Rights).

The statutes of distribution now in force in Great Britain and the U. S. are substantially only re-enactments of the act of Charles II. above described. (See, for example, New York Revised Statutes, II., 90, § 75, and Laws 1845, chap. 280.) In those States in which the common-law disabilities of the married woman have been removed and she has been rendered capable of holding property free from her husband's control, the rights of the latter with respect to the property left by the wife *as intestate* have also generally been somewhat modified. Thus it is provided by statute in New York that the husband of a deceased married woman who leaves descendants her surviving, shall be entitled only to such distributive share in the personal estate of his wife as a widow is entitled to in the estate of her husband. (Laws 1867, chap. 782, § 11.) This statute does not, of course, affect the rights of her husband in case the wife dies leaving no descendants. He is not required to share the estate with her next of kin, but takes the whole surplus as at common law.

The meaning of the expression "next of kin" and the relative rank of such persons, and the order of their succession, are defined with precision in the several statutes of distribution to which reference has been made. The test usually applied is nearness in degree of blood, and the method employed to ascertain the degree is usually that of the civil law. (See COGNATIVITY.) Persons born out of lawful wedlock have no part in the distribution of personal estate, whether they claim as children of the intestate or as next of kin. A bastard is *nobilis filius* by the common law, and is wholly outside the pale of consanguinity. In some of the States, however, an illegitimate child has by statute been rendered capable of inheriting from his mother. Of course, if such a person marries, he or she thereby becomes capable of taking property by descent from the wife or husband, the capacity in that case being wholly independent of any relationship of blood.

See the articles on DESCENT and HEIR. Consult also Stephen's *Commentaries*; Kent's *Commentaries*; *The American and English Encyclopedia of Law*, title *Intestate Laws*; Williams on *Executors*; Wharton on *The American Law of Administration*; and the statutes of the several States.

GEORGE W. KIRCHWAY.

Succession Wars: in general, wars resulting from conflicting claims to the throne. The term is especially applied to the four wars of the eighteenth century that arose from the disputed succession to (1) the throne of Spain (1701-14); (2) that of Poland (1733-35); (3) that of Austria (1741-45); and (4) that of Bavaria (1778-79)—of which only the first and third are of sufficient importance to be treated within the limits of the present article.

War of the Spanish Succession.—The weak and ineffectual King of Spain, Charles II. (1665-1700), had no children, and the succession accordingly devolved upon the collateral heirs. In the lifetime of Charles there were three principal claimants, first, Louis XIV., in right of his wife, Maria Theresa, daughter of Philip IV., who, however, had expressly renounced her right in the Treaty of the Pyrenees; second, Leopold I., Emperor of Germany, by virtue of his descent from Philip III. of Spain; and third, Joseph Ferdinand, the electoral Prince of Bavaria, grandson of Leopold and Margaret Theresa, the younger daughter of Philip IV. Neither Louis nor Leopold ventured to claim the throne for himself, but only for a member of his family, the former supporting the candidacy of his grandson, Philip, Duke of Anjou, the latter that of his second son, the Archduke Charles. Nevertheless, so great an accession of power to either the Bourbon or the Hapsburg dynasty was thought to endanger the independence of other nations, and it was finally agreed that the electoral prince should succeed to the Spanish throne

His death, however, in 1699, reopened the question, now further complicated by the fact that there was no third candidate on whom all could agree. In the intrigues which ensued Louis was successful, and Charles II., just before his death in Nov., 1700, made a will bequeathing all his possessions to Philip of Anjou. The latter was well received in Spain, and his title was generally recognized throughout Europe, but Louis took a course that was at once aggressive and impolitic. He alienated the other nations by declaring that Philip's succession to the Spanish throne had in no wise affected his right to the throne of France, and he angered England by pronouncing the Pretender the lawful heir to the English throne. In the winter of 1701-02 the Grand Alliance was concluded between England, the emperor, the Dutch, the King of Prussia, and the Grand Duke of Hesse, with the object of breaking the power of the Franco-Spanish monarchy. For ten years the war was actively carried on, the chief campaigns being in Spain, in Italy, in the Rhine countries, and in the Spanish Netherlands. In Spain the French were generally successful, and, first under Berwick and afterward under Vendôme, expelled the invaders and maintained Philip on the throne. In Northern Italy the Austrians, under Prince Eugene, conquered Milan and Mantua, and finally, after a victory at Turin, forced the French to withdraw altogether from Italy. In the meanwhile Marlborough and Prince Eugene had won the important victory of *BLENHENIM* (*q. v.*) in 1704. Marlborough's victory at Ramillies, two years later, drove the French out of the Netherlands, and their attempts to regain their lost footing were foiled by Marlborough and Prince Eugene at Oudenarde (1708) and Malplaquet (1709). Louis now sued for peace, but the terms imposed by the allies were so humiliating that he preferred to continue the war. Circumstances soon came to the rescue of France: the death of Leopold I. and of his son and successor, Joseph I., brought the Archduke Charles to the throne. To unite the thrones of Spain and the German empire seemed even more menacing to the balance of power than to maintain the Bourbon king in Spain. In England the Tories, who had supplanted the Whigs, desired peace, and in 1713 was signed the Treaty of Utrecht, stipulating that the two lines of the Bourbon house should renounce all claims of inheriting from each other, and the two crowns should never be held by the same person. In the following year the treaties of Rastadt and Baden settled the particular questions at issue between Austria and France.

The War of the Austrian Succession.—As the Emperor Charles VI. had no male heirs, he tried to obtain the accession of all the powers concerned to the Pragmatic Sanction, by which it was stipulated that after his death all the Austrian possessions should be transmitted undivided to his eldest daughter, Maria Theresa. The nearest claimant to the Austrian inheritance, the Elector of Bavaria, Charles Albert, never gave his consent to the Pragmatic Sanction, and when Charles VI. died (Oct. 20, 1740) a general desire was manifested among the other European powers to break up the Austrian state and divide its dominions. Claims were advanced by Spain, Augustus III. of Poland and Saxony, the King of Sardinia, and Frederick the Great of Prussia, to whom France was added by her traditional hatred of the Hapsburgs. Great Britain alone went to the aid of Austria. The Elector of Bavaria took possession of Bohemia in 1741, and in the following year was crowned emperor. Frederick the Great had in the meanwhile seized Silesia. Stripped of her provinces and threatened with an advance of the Bavarian and French troops upon her capital, Maria Theresa appealed to her Hungarian subjects for aid. It was granted, and a large army was soon in the field. A period of Austrian success followed, due in part to the purchase of Prussian neutrality by the surrender of Silesia to Frederick the Great; but the latter, alarmed by the continued success of the Austrians, again took the field in support of the emperor (1744). At the same time a reverse took place in the Austrian fortunes at other points of the contest. In Upper Italy a French army joined the Spanish, and fought with great success, and in the Netherlands Marshal Saxe began his brilliant campaign with the victory at Fontenoy May 11, 1745. Soon, however, events occurred which gradually prepared people's minds for peace. On Jan. 20, 1745, the emperor, Charles VII., died, and in September, Joseph, the husband of Maria Theresa, was elected Emperor of Germany under the name of Francis I. Frederick the Great had become thoroughly disgusted with his allies, the French, and in the death of Charles VII. he found an opportunity of retiring from the

coalition; peace was concluded between Prussia and Austria on Dec. 25, 1745. The war with France continued. Marshal Saxe gained brilliant victories in the Netherlands (at *Raucoux* Oct. 11, 1746; at *Laufeldt* July 2, 1747) and penetrated into Holland, where he took *Bergen-op-Zoom* and *Maestricht*. The British, however, had nearly destroyed the French shipping and conquered many French colonies, and when Russia, in June, 1747, joined Austria and sent an auxiliary army to Germany, France was willing to make peace. Peace was concluded at *Aix-la-Chapelle* in Oct., 1748. Austria gave up Parma, Guastalla, and Piacenza to Don Philip, of the Spanish Bourbon line, several districts of Milan to Sardinia, and confirmed Frederick II. in the possession of Silesia.

F. M. COLBY.

Succinic Acid [*succinic* is from Lat. *succinum*, *succinum*, amber, deriv. of *sucus*, *sucus*, juice]: one of the series of acids of which oxalic acid is the first member. Its composition is $C_4H_4O_4$. Succinic acid was known to the ancients as volatile salt of amber, from which it is obtainable by distillation. It is found ready formed in several plants, and even in animal bodies. It has been identified in the urine of dogs and rabbits. It is formed, with *SUBERIC ACID* (*q. v.*) and others of this homologous series, by the action of nitric acid on fatty substances. Pasteur found that it is an invariable product of the alcoholic fermentation of saccharine liquids. Many other organic transformations engender it. It is found in the watery part of the products of the distillation of amber, in solution, and crystallizes out by cooling. Warming with nitric acid will destroy the impurities, and enable pure succinic acid to be obtained by recrystallization. It is, however, obtainable much more cheaply from crude calcic malate, prepared from mountain-ash berries. This is fermented with yeast or rotten cheese, and the calcic succinate formed decomposed by sulphuric acid. Succinic acid crystallizes well, and is soluble in five parts of cold water. It melts at $356^\circ F.$, and boils at $455^\circ F.$, and is decomposed with formation of water and succinic anhydride, $C_4H_2O_3$.

Revised by IRA REMSEN.

Succory: See *CHICORY*.

Suc'coth (tents or booths): the Hebrew name of the second station in the Exodus itinerary (Ex. xii. 37, xiii. 20; Num. xxxiii. 5, 6). Excavations made by Naville in 1883, at Tell el-Maskhuta near the eastern end of the Wadi Tûmilât in the eastern Delta region of Egypt, and just westerly of the middle of the Isthmus of Suez, resulted in the discovery of a place which bore the civil or political name *Theku-t* (Succoth), the religious or sacred name *Pi-Tum* (PITHOM, *q. v.*), the Greek name *HEROÏPOLIS* (*q. v.*), and the Latin name *Ero-Castra*. The importance of the discovery was in the confirmation of the record of the building of Pithom as one of the "store cities" (Ex. i. 11) constructed for Ramses II., the Pharaoh of the oppression (thus approximately fixing the date of the Exodus), and in the determination of the starting-point and of the route followed by the Israelites when they left Egypt. See also *MIGDOL*. C. R. G.

Suchet, sū'chā', Louis GABRIEL, Duke of Albufera: soldier; b. in Lyons, France, Mar. 2, 1770. Entering the army in 1792, he served under Bonaparte, Brune, Masséna, Jourdan, and Moreau in the campaigns in Italy and Switzerland, passing through the grades from *chef de bataillon* (major) to that of lieutenant-general before the age of thirty. Subsequently he distinguished himself at Ulm, Jena, and Austerlitz. Under orders of Lannes he served with the Fifth Corps at the siege of Saragossa, and was designated by him to Napoleon on his departure for the command in Aragon. A series of battles and sieges (of Lérida, Mequinenza, Tortosa, Tarragona) gained for him the marshal's baton (July 8, 1811), and after the battle of Albufera and the siege and capture of Valencia he was created Duc d'Albufera (Jan. 24, 1812). He immediately joined Napoleon on his return from Elba. Under the Restoration he lived for several years in retirement, but was again invited to the court in 1819. The *Mémoires du Maréchal Suchet sur ses Campagnes en Espagne* forms one of the classics of military literature. D. in Marseilles, Jan. 3, 1826.

Suchow, or **Soo-chow-foo**: a city of China, capital of a department of the same name, and of the province of Kiangsu; situated on the Grand Canal, 80 miles W. of Shanghai (see map of China, ref. 6-K). The city is rectangular in plan, with walls 30 feet high and 12 miles in circuit. Outside five of the six gates by which the walls are pierced are large suburbs. The original plan, engraved in stone,

have been preserved since 1847 in the temple dedicated to Kwan-yin. In 1861 the Taipings reduced the city almost to a heap of ruins, the only buildings which escaped destruction being the temples 600 in number and pagodas, of which there are seven, one of them, the Great Pagoda, being the highest in China. Suchow is a great commercial and manufacturing city, thousands of looms turning out many varieties of silk and satin, and there are numerous workers in wood, iron, brass, tin, stone, silver, and gold. Its streets—7 or 8 feet wide—are too narrow for much traffic, but a great network of canals extends throughout the city and surrounding region, and along these all the heavy traffic passes. Though devoid of Western improvements, Suchow lies, from an Eastern standpoint, many marks of culture and refinement, and the quiet and elegance of life and manners enable it to be called the Paris of China. With Hangchow (q. v.) it shares the distinction of being likened by the natives to an earthly paradise. Pop. 500,000. A history of Suchow in 100 vols. was written 1,000 years ago. See six articles, by Rev. A. P. Parker, in vol. six of *The Chinese Recorder*.

THOMAS A. HAYES.

Sucker: any one of several fishes which have no resemblance to each other except that they "suck" in some way. 1. The *Catostomus* (q. v.). 2. The *Forsteryi* (q. v.). 3. Representatives of the families *Cyprinodontidae*, *Lipariidae*, and *Gobiinidae*. These have ventral fins peculiarly modified and adapted for adhering to rocks and other bodies. The species are numerous, and each family is represented on the coast of the U. S. Revised by F. A. Lucas.

Suckling, Sir John: poet; b. at Whitton, Middlesex, England, in 1699; educated at Trinity College, Cambridge. In 1717-18 he served as a volunteer under Gustavus Adolphus, King of Sweden, who was waging war against the Emperor of Germany. Returning to England, he was attached to the court of Charles I., and in 1680 equipped a troop of horse for the royal service against the Scotch. In 1640 he was elected to the Long Parliament, but was obliged to flee to France in consequence of his complicity in a plot to rescue the Earl of Strafford from the Tower. His works, most of them first published after his death, include four plays, some letters, *An Account of Religion by Reason*, and a number of songs, of which *A Ballad upon a Wedding* and *Way to Pile and Wan, Good Lover*, are still popular, and are admirable specimens of the gay and graceful poetry of the Cavaliers. A complete edition of his poems, plays, and romances was published in 1874. D. in Paris about 1642.

Revised by H. A. BEYER.

Sucre, see *krö*, more commonly called *Chuquisaca*, chook-suck-ka, and formerly *La Plata*: the official capital of Bolivia and capital of the department of Chuquisaca; on a terrace of the Eastern Cordillera of the Andes, overlooking the valley of the upper Pilcomayo, and in the midst of magnificent mountain scenery, 8,840 feet above the sea (see map of South America, ref. 6-D). It was founded by order of Pizarro in 1539, on the site of the Indian village of Chuquisaca (golden bridge), and during the colonial period was renowned for its riches, derived from the silver mines of the vicinity. Later, the Potosí mines attracted part of the population; but La Plata, as it was then called, remained the metropolis of the district. From 1559 it was the seat of the *audiencia* of Charcas, and hence the capital of Upper Peru, now Bolivia. After independence was won, in 1825, the name was changed to Sucre, in honor of the first president. It remained the official capital, but during the civil wars it became customary for congress to meet at La Paz, which is now virtually the capital of Bolivia. Remains of its former grandeur are seen in the fine cathedral and other public buildings. It has a university, the oldest in the republic, and is still the metropolis of the mining region and of a rich agricultural district. A railway to Oruro is projected. Pop. about 35,000. HERBERT H. SMITH.

Sucre, Antonio José, de: general; b. at Canana, Venezuela, Feb. 3, 1795. He joined the revolutionary army in 1817, served with distinction under Miranda and Piar, was on the staff of Bolívar's army, and rose to be general of division. He commanded the advance in the movement on Guayaquil, and his victory at Pichincha, May 24, 1822, finally drove the Spaniards from Quito or Ecuador. In the Peruvian campaign he took a leading part. After the battle of Junco, Bolívar left him in command of the army; and the decisive and brilliant victory of Ayacucho, Dec. 9, 1824, gradually ended the South American war for independence. In honor of this event he was created grand-marshal

of Ayacucho. In 1825 he was elected first president of Bolivia, and he governed with wisdom and success; but in 1828 the faction opposed to Bolívar, having obtained power in Peru, demanded Sucre's removal. To prevent a civil war he resigned and went to Colombia, where Bolívar placed him in command of the army acting against Peru. He defeated the Peruvians at the battle of Giron, near Quenya, Feb. 26, 1828, and forced them to sue for peace. The same year he was president of the congress of Colombia. While returning to his home at Quito he was assassinated near Pasto, June 4, 1830. HERBERT H. SMITH.

Sudeto-ria: a group of *Protium*. See *Protium*.

Sudan', **Soudan**, or **Soudan** (Arabic, *Sūdān*, *al-sūdān*, or country of the blacks; geographic name for that part of Africa lying S. of and adjacent to the Sahara, and extending, roughly, from 5° N. lat. to 15° N. and from 10° W. lon. eastward to the Nile. This region is occupied by many peoples and many different states, and embraces the basins of the Niger, Lake Chad, and the Bahrel-Ghazal branch of the Nile, representing, respectively, Western, Central, and Eastern or Egyptian Sudan. The upper part of the basin of the Senegal is sometimes distinguished as the French Sudan. This, with the Kong country on the upper Niger, is mountainous, with elevated plateaus. Central Sudan is less elevated and generally level, but contains some high mountains (as Athabaka, 8,500 feet). French, Western, and Central Sudan are generally well wooded and watered, and of great agricultural capacity. The Egyptian Sudan is generally arid. The races occupying the Sudan are very varied, mostly Negroes, but also including Fulas, Turcoms, Arabs, and in the east Shams. See *SENEGAMBIA*, *NIGER*, *SAHARA*, *CHAD*, *DAHOMY*, *BAHREL-GHAZAL*, *NILE*, *SAHARA*, etc. See also the *Travels of Mungo Park*, *Vogel*, *Baikin*, *Barth*, *Bodilly*, *Schweinfurth*, *Nachtigal*, and *Leuz*. MAX W. HANSENSTADT.

Sudbury: town of Nipissing district, Ontario, Canada, junction of the Canadian Pacific Railway with its Sault Ste. Marie branch; 125 miles W. of Mattawa and 182 miles E. of the Sault (see map of Ontario, ref. 1-1). It is in the center of a rich copper and nickel mineral district. Branch lines of railway run out short distances to the more important mines. Pop. 500. M. W. H.

Su'dermann, Herman: dramatist and novelist; b. at Matzlen, East Prussia, Sept. 30, 1857; was a private teacher and journalist until he suddenly became famous by his drama *Die Ehe* (1890), which, on account of the clever and sentimental treatment of the social question, achieved a remarkable success, and which has since been translated into several European languages. His subsequent plays, *Sadomas Eude* (1891), *Die Heimat* (1893), and *Die Schmutzlinge* (1894), were less successful, and established the fact that their author had been greatly overestimated. He also wrote a number of novels and short stories, of which *Der Antikrist* (1890) is the best. JULIUS GORDL.

Sudeten-Gebirge, see *lät-ten-gē-ber-ge*: a range of mountains which separates Silesia from Moravia, and connects the Riesengebirge with the Carpathian Mountains. They are 2,000 or 3,000 feet high, covered with pine forests, rich in coal and metals, and form plateaus with single peaks, rather than continuous chasms.

Sue, st. MARIE JOSEPH ECHUÏ: novelist; b. in Paris, Dec. 10, 1804; studied medicine, and held a position as surgeon, first in the army, then in the navy, until 1829, when, having inherited a considerable fortune, he retired and devoted himself to literature. His first novels, *Kernuel le Pirate*, *Pick et Pock*, *Atar-Gull*, *La Salamandre*, *La Chasse au chat*, *La Vigne de Kout-Yen*, which appeared between 1831 and 1835, were inspired by Cooper, and inaugurated in France the novel of naval adventures. In *Chéri*, *Arthor*, *Le Marquis de Lefortière*, *Jean Cavalier* (4 vols.), *Thérèse Danvers*, *Lutèce*, *Le Capitaine*, from 1835 to 1838, he wrote the historic, melodramatic, and romantic vein. After 1840 he became frankly socialist, and celebrated the proletariat in his most famous and exceedingly popular novels, *Malkilda* (4 vols., 1841); *Les Mystères de Paris* (10 vols., 1842-43); *Le Juif Errant* (10 vols., 1844-45); *Martin* (12 vols., 1847); *Les Sept Nègres captifs* (16 vols., 1847-48); *Les Mystères du Peuple* (16 vols., 1849-50). Elected to the Legislative Assembly in 1850, he took his seat among the most extreme radicals. After the coup d'état he left France and settled at Annecy, in Savoy, where he died Aug. 3, 1867. He wrote about fifty volumes of novels not mentioned here.

Revised by A. G. CARRIAGE.

Suetonius (swē-tō-ni-ūs) **Tranquillus**, GAIUS: author; b. probably about the beginning of the reign of Vespasian, and employed for some time by the Emperor Hadrian as his *magister epistolarum*. The date of his death is unknown, perhaps about 160. His principal work, *Duodecim Caesarum Vitae*, has been preserved entire and in authentic form. It contains biographies of the first twelve Roman emperors, beginning with C. Julius Caesar and ending with Domitian. The best editions are by Baumgarten-Crusius (Leipzig, 1816), C. B. Hase (Paris, 1828), and Roth (Leipzig, 1858). The other writings are best given by Reifferscheid (Leipzig, 1860). English translations of the *Vitae*, by John Clark (London, 1732), and by Thomson and Forrester in Bohn's Classical Library (1855). Revised by M. WARREN.

Suevi, swē-vi: originally a collective name, comprising several individual Germanic tribes which formed a kind of union. It is thus used by Caesar and Tacitus. In the fourth century the name was applied to a single tribe, one branch of which settled in the regions along the Neckar, afterward called Suabia, while another branch broke into Gaul, and in 409 crossed the Pyrenees and penetrated into Spain, where they embraced Christianity, conquered Galicia, and formed a kingdom, which in 585 was united with the Visigothic empire.

Suez, soo-ēz': town of Egypt; at the head of the Gulf of Suez, an inlet of the Red Sea, in lat. 29° 59' N. and lon. 32° 31' E., and 2 miles from the southern end of the Suez Canal (see map of Africa, ref. 2-G). The surrounding region is a desert, and provisions and water must be brought to the town from a distance. Since the opening of the railway from Cairo to Suez, and the opening of the Suez Canal, the city has grown rapidly. Pop. (1882) 10,918; estimated (1895) 12,500. Revised by M. W. HARRINGTON.

Suez Canal: See SHIP-CANALS.

Suez, Gulf of: the western and larger of the branches into which the Red Sea divides lying between Egypt and the peninsula of Sinai. Its extreme length is about 180 miles; its average breadth 20 miles. It was known to the ancients as the Gulf of Heroöpolis, and the generally received scene of the passage of the Red Sea by the Israelites is near the present head of the gulf.

Suez, Isthmus of: a neck of land connecting the continents of Asia and Africa, and separating the Mediterranean from the Red Sea. Its extreme breadth from the Gulf of Suez to that of Pelusium is about 72 miles in a straight line, but following the course of the canal the distance is 100 miles. The surface is low and sandy, having an average elevation of not more than 6 or 8 feet above the sea, but in places reaching to 50 or 60 feet. In general, the isthmus is almost a desert; where irrigation has been practiced, however, it is quite fertile. It is probable that the whole isthmus was once covered by the waters of the Mediterranean and Red Seas, which were then connected.

Suffix: See STEM and ROOT.

Suffocation: See ASPHYXIA.

Suffolk: county of England; bounded N. by the Ouse, S. by the Stour, and E. by the North Sea; area, 1,475 sq. miles. The surface is flat, and the soil for the most part productive and excellently cultivated. Wheat, barley, beans, oats, and hemp are raised, dairy-farming is extensively carried on, and butter is one of the principal products of the county. Five members are returned to the House of Commons. Pop. (1891) 369,351. Capital, Bury St. Edmunds.

Suffolk: town; capital of Nansemond co., Va.; on the Nansemond river, and the Atl. and Danv., the Norf. and Car., the Norf. and W., the Seaboard Air Line, and the Suf. and Car. railways; 18 miles S. W. of Norfolk (for location, see map of Virginia, ref. 7-I). It is in an agricultural region; is engaged in lumbering, oyster-packing, and the manufacture of iron, lime, and woolen goods; and contains a State bank with capital of \$20,000, and a daily, a monthly, and 2 weekly newspapers. Pop. (1880) 1,963; (1890) 3,354.

Suffragan [from O. Fr. *suffragan* < Lat. *suffragans*, pres. partic. of *suffragari*, vote for, assist; cf. also Late Lat. *suffraganeus*, suffragan]: a bishop of a single diocese in an ecclesiastical province subject to the ecclesiastical authority of the metropolitan of that province. A coadjutor is sometimes said to be suffragan to his superior bishop. A bishop of a limited part of a diocese is a suffragan to the bishop of the diocese. For instance, the Bishop of Dover is a suffragan of the Archbishop of Canterbury, while all

bishops of the province of Canterbury are suffragans of the same metropolitan in a different sense. In the Protestant Episcopal Church in the U. S. suffragan bishops are not allowed, the canons forbidding their creation. All attempts to remove this prohibition have failed.

Revised by W. S. PERRY.

Suffrage: See CITIZEN and PRIVILEGE.

Sufis, or **Soofees**: the mystics of Islam, deriving their name from a coarse woolen cloak, their principal garment. Rabi'a, a Mussulman woman who lived not long after the prophet Mohammed, taught as her central doctrine divine love, and is reckoned by them their founder. Abu Saïd, one of Abul Khafr, in the ninth century, advanced further, and urged abandonment of the world and consecration to a contemplative life. The various doctrines developed by his adherents and followers embrace every possible phase of mysticism. Many are pantheists, and declare that God is all, but that all is not God. Some claim direct communication with the Deity, and a mysterious union or identification with him. They are numerous in Persia, and have furnished noted scholars and poets. See DERVISHES. E. A. GROSVENOR.

Sugar [M. Eng. *sugre*, from O. Fr. *sucre*, Ital. *zucchero*, from Arab. *sokkar*, from Sanskr. *ṣarkarā*, whence Gr. *σάκχαρος*, whence Lat. *saccharon*, whence Eng. *saccharine*]: any compound of a carbohydrate nature which is soluble in water. In the common acceptance of the word, it is any such compound having a sweet taste, but the term usually includes only cane-sugar (sucrose, or saccharose), and possibly also sugars made from starch, known as glucose or grape-sugar, and consisting chiefly of dextrose, dextrin, and maltose.

The sugar of commerce is derived almost exclusively from sugar-beets and sugar-cane, the former supplying a little less than two-thirds and the latter a little more than one-third of the world's consumption; sugar from either of these sources is usually called cane-sugar, although the more correct term is sucrose. The other sources of sugar, such as maple, palm, sorghum, and starch, while of importance for special purposes and in limited localities, do not supply sufficient quantities to affect sensibly the commerce of the world.

Occurrence.—Sugar is a normal product of almost every kind of vegetable growth. It is the first and principal result of the biochemical activity of all green plants, and is an important component of many plants devoid of chlorophyll, such as the mushroom. Its formation is the result of the condensation in the living plant-cells of its elements pre-existing in the air. These elements are carbon dioxide and water. The sugar thus formed furnishes the principal food-supply for the growth of all the other tissues of the plant. From it are formed directly the wood-fiber, the digestible fiber, the pentosans and the starches, all of which have essentially the same centesimal chemical composition. Indirectly, it enters into the formation of the fats and oils and of the nitrogenous constituents of the plant organism.

In many plants almost all the sugar produced is consumed in their further growth and development. In others the amount of sugar produced is far in excess of the demands of nutrition, and it is then stored as a waste or excess product in some part of the plant itself. In the sugar-cane, sorghum, and green Indian corn it is found in the stalks. In root-crops, such as beets and turnips, it is found in the fleshy roots. In trees, such as the maple and sugar-palm, it is dissolved by the first flowing sap of the spring. It exists in nearly all seeds, and of many, such as the coffee-bean, the peanut, and the cottonseed, it forms an important constituent. Sugar is also formed as a normal product of the functional activity of certain animal organs, such as the liver, and is an abnormal product of these in certain forms of disease, as diabetes mellitus. Many kinds of sugar have also been formed synthetically in the chemist's laboratory.

History.—(1) It is quite certain that the nations of remote antiquity were not acquainted with sugar as such, but honey was known to them all. The bees must be regarded as the first manufacturers of sugar. The sugar which is found in HONEY (*q. v.*) is derived chiefly from the nectar of flowers, and this nectar consists of mixtures of cane-sugar and a sugar made by the inversion thereof, known as invert sugar or fruit-sugar. The sugar of the nectar of flowers in its fresh state consists largely of pure cane-sugar, but this, in passing through the organism of the bee, becomes inverted probably by some indirect biochemical action or under the influence of the formic acid which the bee secretes. The result is that the honey which is stored by bees, and which they

soluble from the nectar of flowers, consists almost exclusively of invert sugar and water. The percentage of water varies largely, but the mean may be taken to be about 15 or 20.

The chief supply of sugar for consumption, for medicinal uses and as an article of luxury, was furnished by bees until probably the beginning of the fifteenth century.

(2) Sugar-cane, *Saccharum officinarum*, doubtless had its origin in India, and, from the best information which can be obtained, the original varieties contained only a very small quantity of sugar, probably not more than from 2 to 4 per cent. Its constant cultivation and selection the content of sugar in the sugar-cane has been increased until it averages from 10 to 12 per cent. in Louisiana, 15 per cent. in Cuba, and 16 per cent. in the Hawaiian Islands. It is believed that the original form no longer exists.

Cultivated sugar-cane will not return to the wild state, and is uniformly diseased when deprived of the care of man. From the earlier travelers Cook (1775) and Forster (1777), found in the Hawaiian Islands and other South Sea Islands only the cultivated cane. The statements which have been made regarding the existence of the wild varieties in Africa have not been positively negatived, but it is more than likely that these were some of the varieties of sorghum which grow wild in all these localities and resemble in many respects the sugar-cane, as were those described by Humboldt on the Indus, the Rappahannock, and the Persian Gulf. Henshaw, in 1860, declared that the banks of the mouth of the Mississippi were thickly covered with sugar-cane, which, under the heat of the sun, exuded sugar that dropped from the stalks like gum. This growth was doubtless the wild cane *Arundo donax* or *Arundinaria gigantea*, which, though also a grass, is very different from the sugar-cane.

While the cultivated cane will not revert to a wild state, yet with proper care, in favorable climates, it will continue to grow from the same stubble for fifteen or twenty years. In some cases it has been known to grow for forty years.

The sugar-cane does not appear to have been known outside of Bengal at the time of the writing of the Rig-Veda (about the fourteenth century a. c.). In other Vedas the sugar-cane is mentioned, especially in the Atharva-Veda; but even at the time of Buddha the sugar-cane was not generally known in that part of India. At that period the stalk was either used directly or the expressed juice drunk without further preparation. The first use of bry for concentrating sugar-juices was doubtless also due to the inhabitants of India; about 600 or 700 years a. c. From there

this art was spread among all nations of antiquity. Humboldt asserts that the Aztecs in Mexico were accustomed to make sugar from the stalks of maize before the Spanish invasion. At first only syrup or molasses was made, and after that the art of sugar-making was learned. Probably solid sugar was first made and used in India about the sixth century of the Christian era.

The existence of the sugar-cane was not known to the Greek nations before the Christian era. Pliny (23-79 a. d.) says sugar came from Arabia, but the Indian product was preferable. It was a honey collected from canes, white like gum, breaking easily between the teeth, and was used only as a medicine. It was not until about 500 a. d. that the knowledge of the art of growing and refining sugar began to spread westward. In their wars of conquest toward the East the Mohammedans first learned of the manufacture of sugar. At the time of Harun-al-Raschid the tribute of some of the conquered provinces was paid partly in sugar. It was valued as a luxury and as a medicine.

In the eighth century the culture of the sugar-cane had spread over the greater part of the Nile delta. The sugar-



Sugar-cane.

cane grew so well in Egypt that it soon became an article of export from that country to the Mohammedan Asiatic provinces. Because it could not well be transported by water, it was always sent overland and many of these cargoes fell into the hands of the Christians during the crusades, and in this way the knowledge of sugar was diffused throughout Europe. When Sicily was conquered by the Arabs the culture of sugar was introduced into that island from Egypt, and thence also to Spain at the time of the Moorish conquest in the eighth century. Sugar-cane is still cultivated in the valleys along the southern Mediterranean shore of Spain. In the ninth and tenth centuries the culture of sugar-cane in Spain was carried on in all of the provinces of Andalusia. In the beginning of the fifteenth century the Spanish production amounted annually to over 2,000,000 cwt., and there were fifteen sugar-factories at the village of Novell, near Granada.

At the time of Marco Polo, about 1290, the sugar-cane industry had assumed considerable importance in China, whence it spread to Siam, Ceylon, and Japan. The first introduction into Western Europe was made by the returning crusaders, by whom it was used only as a medicine. The sugar brought from Syria soon came into use as a delicacy, and in Paris of France as early as the twelfth century sugar became a regular article of commerce, being used for making cakes and preserving fruits. From France the use of sugar spread into Holland, Italy, and Germany. Venice, in the Middle Ages, became the headquarters of the industry, receiving the crude materials from the East, refining them, and delivering the products to the North and West.

Sugar is not mentioned in the oldest German literature, and it is first spoken of by the poets of the twelfth and thirteenth centuries. Later it became an article of commerce with the Venetian dealers and the German merchants at Constantinople. It was used in cakes and preserves and eaten only by the wealthy.

A considerable part of the sugar used in Europe in the fourteenth and fifteenth centuries came from Cyprus, where the culture of sugar-cane had been introduced by the Arabs in the seventh century. Perhaps the greatest quantity of sugar from any country among those mentioned was sent to Europe from Egypt.

The refining of sugar was probably first practiced at Venice; at least that is where the industry first assumed importance. In a directory of that city, published in 1475, refiners of sugar are mentioned. The art of refining, as at first practiced, consisted simply in melting the sugar in water and recrystallizing it by evaporation over an open fire. This was often repeated two or three times.

Columbus took sugar-cane from the Canary Islands to San Domingo at the time of his second voyage, and his report to the Spanish king told of the wonderful growth of the cane in the New World. A new lot was sent in 1506. From San Domingo the culture of sugar-cane spread to Cuba and the neighboring islands and also to Mexico. As early as 1553 Mexico exported sugar to Spain. In 1592 sugar-cane was introduced into Brazil from Madeira. Within 100 years after the first introduction of sugar-cane into the New World the production of sugar therein was so great as to turn the dealers of Europe toward the West for their supply of this commodity.

In 1597 a sugar-refinery was erected in Dresden, and soon afterward Antwerp became a center for the sugar-trade. In the seventeenth and eighteenth centuries the production of sugar rapidly increased in the New World, especially in the British and French colonies in the tropics, San Domingo leading with a production of 20,000 tons annually. The revolution of 1791 in that island, however, almost destroyed the industry.

The processes of manufacture in all these countries were of the most primitive kind. The canes were crushed in crude mills driven by men, wind, or water; clay and lime were largely used in purifying the juices, the clay acting chiefly in a mechanical way in removing impurities. The boiling was accomplished in iron or copper kettles over the open fire. The raw brown sugar thus made was refined by melting and recrystallizing, the white product obtained in this way being known as "king's sugar." Europe continued to be the only market for American sugars, and in the competition thus produced the sugar industries of Sicily, Egypt, and Spain were ruined and practically ceased to exist. The desolation wrought by the Thirty Years' war in Germany put a stop to the consumption of sugar in that country, and the commercial downfall of Spain and Venice threw the trade

of the world into the hands of Great Britain, France, and Holland. In Great Britain the consumption of sugar increased rapidly. In 1700 it was 10,000, in 1750 80,000, and in 1800 150,000 tons annually.

The first sugar made in Louisiana was in 1791 by Don Antonio Mendez, associated with a farmer named Solis. Étienne de Boré, about 1794, was the first to make sugar-culture a commercial success, and his first crop amounted to nearly 100,000 lb., for which he received about \$12,000. His plantation is now a part of the city of New Orleans. In 1818 Joseph Coyron erected the first steam-engine ever used to grind sugar-cane in Louisiana. The variety of cane in cultivation at first was known as creole, and was a very tender plant, easily injured by frost. In 1820 the red-ribbon cane, a much hardier variety, was introduced from Georgia. The yield of sugar gradually increased in Louisiana until 1853, after which it slightly decreased until 1861, when the largest crop ever made in the State up to that time was secured, viz., 230,000 tons. The civil war almost paralyzed the sugar industry in Louisiana, and for three years no data of yields are recorded. In 1864 the crop amounted to only 5,000 tons. From this time on the production of sugar in Louisiana increased, but not with regularity on account of disasters from flood and frost, until the season of 1893-94, when it amounted to 320,000 tons.

Sugar-cane is also cultivated to a considerable extent in Texas and Florida, and in a smaller way in Georgia, Alabama, and Mississippi.

3. The sugar-beet, *Beta vulgaris*, originally came from the lowlands of Burgundy, and was carried by the Mennonite exiles into the Palatinate. From this locality it gradually spread to all parts of Germany, and was grown as cattle-food. In 1747 Marggraf (1709-82) discovered that sugar could be obtained from the common beet. Achard (1753-1821), in Kaulsdorf, near Berlin, was the first who undertook a systematic culture of the beet, and he largely increased its content of sugar. In France the sugar-beet appeared soon after its introduction into Germany and Holland, and was cultivated by Vilmorin in 1775, but its first systematic culture there was undertaken by Abbé Rozier in 1782. In 1786 it was introduced into England by Perkins and in 1830 into the U. S. by Vaughn and Ronaldson. In 1798 Achard, in Berlin, succeeded in preparing crystallized sugar from beets in considerable quantities, and as much as 16 cwt. was used in 1800 in the bakeries of Berlin.

The first real beet-sugar factory was erected by Achard, with royal aid, at Kunern, in Silesia, and put in operation in Mar., 1802. Many attempts were made to manufacture beet-sugar in Germany during the decade beginning in 1800, but in spite of the fact that the competition with cane-sugar was practically removed by the Napoleonic embargoes these attempts were generally unsuccessful. In France the Emperor Napoleon appointed a commission to investigate Achard's work, and as a result an imperial decree, in the early part of his reign, established the beet-sugar industry in France, and a considerable subvention from the imperial treasury was accorded it. Two factories were built at St-Ouen and Chelles, but for lack of scientific supervision they failed of their purpose.

In 1808 Delessert undertook the culture of the sugar-beet at Passy, and by means of clarification with lime, sulphuric acid, and charcoal, succeeded in making a good merchantable sugar. In 1812 the Emperor Napoleon, as a result of a personal inspection at Passy, ordered that ten new factories be immediately constructed, and committed the work of construction to Delessert. In Great Britain, on account of her tropical colonies, the introduction of the beet-sugar industry was vigorously opposed, and its further development on the Continent discouraged.

In the U. S. attempts were made as early as 1830 by a Philadelphia company, of which John Vaughn and James Ronaldson were successively presidents, to introduce the culture of the sugar-beet. By reason of the absence of practical information little was accomplished. In 1839 a beet-sugar company was formed at Northampton, Mass., by David L. Child, and 1,300 lb. of sugar was made and the enterprise was then abandoned. The next company of which there is any account formed for the purpose of promoting the culture of the sugar-beet was in 1863, in Livingston co., Ill., but no practical results were obtained. In 1864 the Gennert Brothers established a beet-sugar factory at Chatsworth, Ill., but failed for lack of capital. The establishment was subsequently bought by a German company and removed to Freeport, Ill. All these attempts,

however, ended in failure. The next beet-sugar factory in the U. S. was established in 1866 at Fond du Lac, Wis., and for two or three years a considerable quantity of sugar was made at that point. In 1870 the proprietors removed to California and organized the Alvarado Sugar Company, which, after various vicissitudes, finally succeeded in establishing itself on a firm basis, and is still in operation. Companies were also organized for the manufacture of sugar from the sugar-beet at Sacramento, San José, and Soquel, but none of them except the Alvarado company was finally successful. In 1878 a large factory built on modern principles was established at Portland, Me., and in the following year factories were also established at Wilmington, Del., and Franklin, Mass., and large sums of money were invested therein. After unsuccessful attempts at profitable manufacture all of these establishments were abandoned. For many years no further attempts were made to manufacture beet-sugar in the U. S., except at Alvarado, Cal. In 1888 a factory was built at Watsonville, Cal., and in rapid succession factories were established at Grand Island and Norfolk, Neb., Chino, Cal., and Lehi, Utah. At present (1895) there are six fully established beet-sugar factories in the U. S. The total quantity of sugar manufactured at these localities during the season of 1893-94 amounted to 45,191,296 lb.

Palm-tree Sugar.—An old and, at one time, important sugar of commerce is the product of certain of the varieties of the palm-tree. It has been and is produced principally in India, where it is known as jaggery, a word which is of the same origin as the word sugar. The palms used for sugar-making are planted in rows in high and dry land, and can be used from five to thirty years. The trees are tapped in the same manner as the maple, but usually a small triangular hole is cut into the tree for the purpose of collecting the sap, which is removed by boring a hole into this receptacle from below and inserting therein a small bamboo cane, which conducts the sap into an earthenware receptacle. The sap flows principally during the night, and should be removed the following morning before the sun becomes very hot. After tapping, the tree will continue to afford a supply of sap for about three days, and must then be allowed a period of rest. The sugar season begins in November and lasts until the middle of February. The cooler and calmer the weather the better the harvest. The juice, with the addition of a little lime, is evaporated over the naked fire to a thick sirup. Part of it is sometimes further dried in the sun to a hard mass. This thick sirup is sometimes called date-tree honey, and was known as an article of commerce at the time of Herodotus and probably for many years before. The sugar of the palm as it comes from the tree is nearly pure sucrose, or cane-sugar, but much of it becomes inverted in the crude process of manufacture. Good palm-trees yield from 30 to 40 lb. of sugar in a season. The varieties cultivated are chiefly *Phoenix sylvestris*, *Cocos nucifera*, *Borassus flabelliformis*, *Caryota urens*, and *Arenga saccharifera*. A grove of from 600 to 800 palms is considered a valuable possession. The annual production in India is estimated at 1,000,000 metric centners (100,000 tons of 2,204½ lb.).

Maple-sugar.—The maple-tree is the sugar-palm of temperate climates. Of the several varieties of this tree, only the *Acer barbatum* (also called *A. saccharinum*) is used to any extent for sugar-making. The principal centers of the maple-sugar industry are in Vermont, New York, and Ohio, but almost everywhere in the northeastern parts of the U. S., and also in parts of Canada, some sugar and molasses are made. Only the old trees are used for sugar-making, and, until within a few years, the natural forests. Within the past few decades there has been some planting of maple-trees for sugar-producing purposes, although a grove is not profitable for use until it is thirty or forty years old. The best groves for sugar-making are those in which the underbrush and small trees have been cut away, allowing the larger trees an opportunity to increase their leaf and twig growth. As a rule, the shorter trees with dense spreading overgrowth are better for sugar-production, both in the sweetness and quantity of sap. Woodpeckers are quick to discover the sweeter trees, which they fill with holes in the springtime for the purpose of drinking the sap. The excess of sap flowing over the bark darkens it, and the sweeter trees thus often have almost a black exterior.

The sugar season begins after the breaking up of the winter. In the more southern latitudes the sap will flow freely after the first thaw in winter, often in January. In

Southern Indiana and Ohio the manufacturing season usually begins in February and lasts until the end of March; in Vermont in March, lasting until the end of April. A cold, steady winter is favorable to a good season, because it prevents the flow of sap until the sugar season fairly opens. The trees are tapped by boring with an auger, three-quarters of an inch in diameter, on the south-west exposure of the tree. The holes are bored at a distance of from 2 to 4 feet from the ground. Spiles made of chert-tubes or of metal are fitted into the sugar-holes, water-tight, so as to cause all the sap to flow out through the central orifices, where it is collected in appropriate vessels. Where little regard is had for the welfare of the tree a notch is cut in it as described for the date-palm. This is, however, very injurious, and trees thus treated during a series of years lose their vitality. From one boring the sap will continue to flow for a considerable time—usually for one season. Sometimes, however, a second boring is practiced to increase the flow. Usually two spiles are put into each tree; in small trees, sometimes only one; in very large ones, three or four. The flow of sap is most free during a warm, still day. It is checked by a frost at night and by high winds. In case of a thaw it will flow for twenty-four or even for forty-eight hours. It will then cease and begin again after another freeze. When the buds begin to swell later in the spring the flow ceases, and if started again by a subsequent freeze the sap is found to be less sweet and to have undergone a viscous fermentation which unfit it for sugar-making. The sap is nearly pure sugar and water, containing, however, certain organic aromatic compounds, which give the "maple flavor," and make both sugar and molasses so highly prized that they command double the price of similar sweets made from cane or other sources. The maple-sap also contains notable quantities of malic acid combined with lime. This is especially the case toward the end of the manufacturing season. In evaporating the sap the malic acid is precipitated, and forms a scale or sandy deposit in the bottom of the pans which is known as sugar-sand. The sap of the maple contains varying quantities of sugar, depending on the year, the time of collection, and the position and peculiarities of the trees.

In the analysis of the sap from twelve trees from a maple-bush in Northwestern Indiana, taken on Mar. 21, the average content of sucrose was found to be 2.98 per cent. The highest content in any one tree was found to be 3.43 per cent.; the lowest, 1.95 per cent. At the same time the sap from a tree in Southern Indiana showed 4.90 per cent. The average content of sugar in the sap of fifteen trees near Lumberton, Vt., examined daily from Apr. 7 to Apr. 28, was found to be 3.33, 3.72, 3.01, 3.66, 3.42, 3.13, 3.74, 2.98, 3.73, 3.33, 3.55, 3.69, 4.06, and 3.18 per cent. respectively.

From a comparison of all the analyses made it is apparent that the average percentage of sugar in the sap is about 3.5. In one instance determined in Vermont in the mixed sap of 3,350 trees, taken at intervals from Apr. 9 to 22 inclusive, the average percentage of sucrose was found to be 3.25. The average yield of sugar from a tree is difficult to determine, inasmuch as the sap of the trees is mixed and no attempt made to keep the samples separate. In some few instances it is stated that trees have yielded as high as 40 lb., and yields of 20 lb. per tree are not uncommon. The average quantity of sap required to make a pound is 16 quarts. It is probable that the average yield of all the trees during one season and from one season to another is about 3 lb.

In the best orchards metallic spouts are used strong enough to hold a pail. The pails are preferred to wooden ones, the latter often imparting a bad taste to the sap. The sap is collected from the pails as often as possible, and when drawn to the small factory it should be strained before being placed in the storage-tanks. For boiling, the best sugar-makers use pans made of Roosts iron, about 5 feet long, 2-3 feet wide, and 8 inches deep. They are set on arches of brick 20 inches in depth and provided with grate bars and other appliances to make the use of fuel economical. Open kettles are also often employed, but not by the best makers. In many factories the juice before entering the evaporator is passed through a heater, a copper box provided with tubes, through which the waste heat from the furnace passes. Many of the makers also use the continuous evaporating pans so largely employed in the manufacture of sorghum molasses. The fuel usually consists of the waste wood from the grove itself or adjoining forests. From 1 to 125 cords of wood are required for each 100 lb. of sugar produced. Sometimes the white of eggs is used for clarifying the sap, but as a rule this

is not necessary. The scums which form during the boiling and which are usually of a very dark color, should be carefully removed. They contain large quantities of albuminous matters which if left in the sugar or syrup impair their keeping qualities. The sugar is either poured while hot into moulds, or, if a granular variety is desired, is vigorously stirred while cooling. This process is termed "sugaring off." The granular sugar thus made, especially while fresh, has a most delicious flavor and is highly prized. The retaining of maple-sugar would deprive it of its characteristic flavor and thus reduce it to value to the level of ordinary sugar. It is therefore never practiced.

The quantity of maple-sugar made in the U. S. is not easily ascertained. Much of it goes into domestic use, while other large quantities which are placed on the market are adulterated. The total quantity varies probably between 15,000 and 20,000 tons per year. There is little evidence of either an increase or a decrease in the amount, but inasmuch as the maple-tree tends to grow naturally in rich soils, there is a disposition on the part of the farmers to clear the land and thus to diminish the output of sugar. The maple forests which are best preserved therefore are those which are found growing on places too hilly or rough for easy tillage.

Attempts were once made to introduce the growth of the maple-tree and the manufacture of sugar therefrom into Europe, but without any encouraging results. Maple-sap was sent to Berlin from the U. S. in 1797 at the instance of a member of the Prussian cabinet, and encouragement was given to use also the sap of the silver maple, already growing in that country, for sugar-making purposes. Some little sugar was made in this way during the decade and a half beginning with the nineteenth century. The reopening of the West Indies to European commerce, however, which attended the downfall of Napoleon, caused all these efforts to cease, and the production of maple-sugar became confined to North America.

Maize-stalks.—The stalks of maize, *Zea Mays*, at the time of the formation of the starch in the grain are filled with a sap very rich both in sucrose and reducing sugars (sugars which reduce an alkaline copper solution with the formation of suboxide of copper). Humboldt reported in the account of his visit to Mexico that, before the arrival of the Europeans, the Mexicans as well as the Peruvians pressed out the sap of the maize-stalks, and by concentration thereof prepared sugar, and Cortés reported to Charles V. that the Mexicans had for sale honey, wax, sirup, and sugar from the maize-stalks, which were as sweet as sugar-cane. The maize used was doubtless sweet corn, the juice of which will sometimes yield as much as 16 per cent. of sucrose. From maize grown in Germany in 1760 Just obtained a fairly good sugar, and in Italy, in 1784, Jaspoin and Marabelli erected a mill for pressing the maize-stalks, and succeeded in making sugar therefrom.

Numerous analyses of the juice of maize-stalks were made in the U. S. Department of Agriculture from 1878 to 1882, and attempts were made on a small scale in the manufacture of sugar. Previous to this, in 1870, F. L. Stewart had announced in *The Public Ledger of Philadelphia* the result of some of his experiments in manufacturing sugar from maize-stalks. According to his analyses the juice of the maize-stalks contained 10.8 per cent. of sugar. In 1876, in the Department of Agriculture, samples of maize juices were analyzed showing 5.6 and 6.7 per cent. respectively of sucrose in the juices. In 1881 analyses of a large number of samples of maize juices showed a percentage of cane-sugar varying from 9 to 15, and in 1880 nearly 800 analyses were made showing a variation of cane-sugar in the juices from 9 to 15. The percentage of reducing sugars in the juices was also determined, showing a wide range in total numbers of from 1 to 4 per cent.

The attempts at making sugar, however, from these juices were attended with very little success, the syrups resulting from concentrating them crystallizing with great difficulty. Nevertheless a committee of the National Academy of Sciences reported that the experiments had shown that in successive years there was obtained from the stalks of common maize, after the ripened grain had been plucked, sugar at the rate of 900 lb. per acre.

Although the stalks of maize at the time the starch is in a milky state in the grains contain large quantities of sugar, there is no reason whatever to believe that maize can ever enter into competition with the sugar-cane and the sugar-beet as a source of commercial sugar. In a small way and for domestic consumption a fairly good sirup may be made

therefrom, but all enthusiastic promoters of enterprises for making sugar from maize-stalks should be reminded that economically the task is a hopeless one so long as cheaper and better sources of raw material are available in practically inexhaustible supplies.

Sorghum Sugar.—The history and method of making sugar from sorghum are described in the article *SORGHUM* (q. v.).

Culture of Sugar-cane.—Since the sugar-cane and sugar-beet are practically the sources of all commercial sugar, a description of the methods of cultivation will be confined to these two plants. Sugar-cane is propagated by cuttings, and in rare instances from the seed. All parts of the cane having well-formed joints may be used for planting. In some localities it is customary to cut off the top, which is less rich in sugar, and use it for planting, while the rest is employed for sugar-making. The more common practice, however, is to use the whole cane, with the exception of that portion of the top devoid of well-formed joints. In the U. S. the time of planting extends from October to March. As a rule, autumnal planting is to be preferred. The soil is prepared by plowing and reducing with harrows and cultivators to a good tilth. Furrows are then opened by a double mould-board plow, at distances varying from 5 to 8 feet. The canes, cut into sections of about 2 feet in length, are laid in the bottom of the furrow and the soil thrown over them either by a hand-hoe or by a plow. Some planters prefer not to cut the canes unless they are crooked. When the seed is good, two canes alongside are enough to make a good stand. A third cutting is, however, often laid at the points of union of the canes, making, in the language of the planter, "two canes and a lap" in a row. The total quantity of seed required varies from 4 to 6 tons an acre. After planting it is best to either roll the top of the soil or to smooth the space over the furrows with a hand-hoe, removing all clods which might interfere with the exit of the young canes from the soil. The young canes grow from eyes held on the joints of the parent cane. When spring planting is practiced, the eyes of the cane are preserved from the injurious effects of frost by being preserved between the rows, the top of one cane being spread over the stalk of the one previously cut. This process is called *windrowing*. A light covering of earth, which can be thrown over the canes by running a plow on either side, is sufficient to protect the seed from all ordinary frosts and to prevent it from becoming too dry. If a better protection be desired the seed is preserved in mats, piles of cane carefully laid down and covered with cane-tops and earth. The preservation in windrows is usually preferred to that in mats, unless very cold weather be expected. Cane preserved for seed is subject to disasters due to drying up, frost, insects, and fungous diseases. For this reason the seed preserved for spring planting is often of poor quality, requiring a larger weight per acre.

Young canes are not seriously hurt by frost unless it comes very late in the spring. In the cane-growing districts of the U. S. frosts are not often experienced after Mar. 1. In fields which have long been under cultivation sugar-cane requires generous fertilizing. Superphosphates, potash salts, and cottonseed-meal are the fertilizing materials usually employed. The highest tonnage per acre has been obtained by using 350 lb. of cottonseed-meal, 430 lb. of acid phosphate, and 100 lb. of sulphate of potash.

The sugar lands of Louisiana consist almost wholly of alluvial deposits embracing two types, a light and a dark soil. The cultivation of the growing cane consists in keeping the ground well plowed and free from weeds. As the cultivation goes on it is the general custom to throw the soil toward the row, so that at the time of "laying by" the field is left in ridges, the canes growing on the summits. The cultivation usually lasts until the latter part of June. After the first crop of canes is harvested the stubbles will produce in the succeeding years a second crop and often a third or fourth. In the U. S. the replanting of the fields, however, usually takes place every second or third year, while in tropical countries the fields may run from ten to fifteen, and even a greater number of years, without replanting. The first crop from the fields is known as plant-cane, and subsequent crops as first and second year stubble, etc. The beginning of the cultivation of stubble-cane consists in barring off, that is, in throwing the soil from the stubble by means of a single mould-board plow. In addition to this the stubble is often shaved, that is, cut off smoothly just beneath the surface. At this time it is also customary

to apply the fertilizers. After a few days the soil is thrown to the stubble and the middles broken out and reduced to good tilth, and the subsequent cultivation is the same as that for plant-cane already mentioned. The stubble crops from year to year become harder and contain more woody matter, but the juices are, as a rule, richer in sugar, so that the total amount of sugar per ton is about the same in both plant and stubble crops. In harvesting the canes are cut as near the surface of the soil or as little thereunder as may be with a broad steel knife furnished with a hook on the back, by means of which the laborer by a skillful stroke on either side of the cane relieves it of its leaves, after which the top is cut at the first immature joint and the canes thrown in a pile for subsequent removal to the factory by cart or portable railway. A good laborer will cut from 3 to 5 tons of cane per day.

Culture of the Sugar-beet.—Sugar-beets are grown to the best advantage for sugar-making purposes in northern temperate regions. In going southward, as a general rule, the beet becomes less sweet and more pithy and tends to grow to a larger size. A mean temperature of 70° F. is well suited to the growth of beets of high sugar content. The soil in which beets are planted should be plowed to the depth of about 10 inches and loosened by a subsoil plow to an additional depth of 6 inches. The plowing is often accomplished in the late autumn. In all cases before planting the surface should be reduced to perfect tilth. Any soil suited to the growth of good crops will produce beets, but they do not grow well in a stiff clay. The seeds are planted in rows about 18 inches apart, and covered to the depth of about 1 inch. Deep planting should be avoided, inasmuch as the tender shoots of the young plants are not able to emerge from a very deep covering of earth. From 12 to 20 lb. of seed are planted per acre. When the plants are grown until they show four well-developed leaves, the thinning process is commenced, leaving one vigorous shoot at about every 9 inches in the row. The number of plants per acre is determined in a large measure by the fertility of the soil and the degree of fertilization practiced; but in all cases they should be numerous enough to limit the average weight at harvest-time to a little more than 1 lb. The culture of the beet consists in keeping the soil well stirred and free of weeds. Deep culture is not admissible on account of the danger of disturbing the young plants in their position and of covering up the tops. At the time of laying by, which is about the middle of July, the surface of the soil should be left as smooth and level as possible. The planting in the chief beet-sugar countries extends from the last day of April till the end of May. In California, where are found exceptional climatic conditions, the planting begins as early as January and extends to June. As a rule, the earlier plantings produce the better crops. In Germany and France the harvest begins about Sept. 15, and is concluded by the middle or end of November. In California the harvest begins as early as August and continues until the end of the manufacturing season. The beets can be left without much danger until January, or until there is danger of second growth from the winter rains. In harvesting, the beets are loosened by a digger which passes under them, and are then removed from the soil by their tops and thrown into heaps. The tops with a portion of the neck of the beet are then removed by means of a large sharp knife, and the beets are then ready for preserving in silos or delivering to the factory. In siloing the beets they should be covered as lightly as possible, to preserve them from danger of freezing. If the temperature of the silo becomes too high the beets are apt to be injured.

The manufacturing season begins in California in August, and in other countries in September. The average duration of the manufacturing season is about three months, but in exceptional cases it lasts for four or five months. With the approach of spring, however, the beets rapidly deteriorate, and for this reason manufacturers try to close the season by the end of January.

The production of a beet rich in sugar has become a separate branch of the sugar industry. From an original content of from 4 to 6 per cent. of sugar, the development of the beet has continued until it now shows from 13 to 15 per cent., and in exceptional cases from 15 to 19 per cent.

At the time of harvest certain beets of typical shape and size and of apparently perfect nature are selected and preserved in silos over the winter without having their necks removed. In the following spring the silos are opened and each beet examined separately by taking out a core cut

diagonally through it by an appropriate machine. The juice is expressed from this core and the content of sugar determined thereon. The beets thus examined are classified according to their sugar content. The following table shows the number of beets of each variety placed in each class, as determined by analyses made at the experiment station of the Department of Agriculture in Schuyler, N. Y., in 1893:

VARIETY	No. 1, grade 1 sugar 15 per cent. and upward	No. 2, grade 2 sugar 12 to 14 per cent.	No. 3, grade 3 sugar 10 to 12 per cent.
Original Kleinwanzlebener	25	425	448
Dippel's Kleinwanzlebener	5	263	1,176
Vidua's improved	9	600	784
Deutsche	—	—	476
Jaeger's	—	—	105
Elite Kleinwanzlebener	7	210	224
Totals	57	1,508	3,056

The beets are not materially injured by this boring, and after the examination is made they are carefully protected until all danger of frost is passed, when they are transplanted into a field devoted to this purpose and placed in rows at distances of about 8 feet. Each class is planted by itself, and thus three grades of seed are produced. The first grade is kept especially for the production of special beets of high content of sugar, while the second and third grades are used for the production of beets, which in their turn are planted in large quantities in furnish seed for commercial purposes. It is by the persistent application of this principle of self-selective selection that the sugar-beet has been raised to its present high content of sugar, enabling it to compete successfully with sugar-cane, and even to exclude sugar made from the sugar-cane from the markets of Europe.

Manufacture of Cane-sugar.—The process of making sugar from sugar-cane is very simple. In its most primitive form it consists of crushing the canes between appropriate rollers, and evaporating the juice thus obtained to the crystallizing-point in open vessels. Commercially the process is as follows: The canes, harvested as previously described, are sent from the field to the factory, where they are crushed between powerful iron rollers. In many factories before entering the rolls the canes are passed through a shredder, which tears them into small pieces and thus puts them in a condition to be more evenly fed to the mill and to yield with a given pressure a higher percentage of juice. In the best factories the mills are erected in series of two or three. The first mill usually has three large rolls and the emerging canes, now called bagasse, are conducted by a carrier to a second mill, consisting usually of two rolls, but larger and heavier than those of the first mill. While in transit between the mills the bagasse is generally moistened with steam or hot water, whereby a better extraction of the saccharine matter is obtained, although the resulting juice is more dilute. Occasionally a third mill, similar in construction and operation to the second, is found. To avoid danger of breaking, the rolls are made adjustable to feeds of different magnitudes by means of rubber pads or springs or hydraulic regulators. With careful control, and with canes not too woody, from 75 to 85 per cent. of the saccharine matter contained in the canes may be obtained by milling. Taking into consideration all kinds of milling practiced in sugar-cane countries the world over, it may be said that only about two-thirds of the sugar produced in the canes is obtained by the crushing process.

The bagasse from good milling is conducted at once to a specially constructed furnace, and by its combustion renders the use of any other fuel in the factory unnecessary.

To a limited extent the diffusion process is used in the extraction of sugar-cane. This is described in the section on the manufacture of sugar from sugar-beets. The cutters used for canes to prepare them for the diffusion process are, however, different from those employed for beets. The canes are either run into thin slices by being fed obliquely through hoppers against a revolving horizontal disk carrying radial knives, or else are torn into fine pieces by means of revolving, staggered, circular saws. From 90 to 95 per cent. of the saccharine matters in the cane are obtained by the diffusion process, but the juices are more dilute and the bagasse is left in a condition unsuited for fuel.

The juices obtained from the sugar-cane are treated with excess of lime to neutralize the free organic acids therein contained, heated to the boiling-point, and the blanket of

scum thus produced removed. After standing for some time the sedimentary matters separate and the clarified juice is drawn off and sent to the evaporators. The scum and sediment are passed through a filter-press and the clear juice obtained thereby added to that secured as described above. The evaporation of the juice and its subsequent concentration into crystallized sugar are accomplished as in the sugar manufacture.

Treatment of Sugar-beets.—After the removal of the tops, together with a portion of the neck or collar, the beets are ready for the factory. The upper portion of the beet contains an excess of mineral matter, the introduction of which into the factory would prove injurious to the yield of sugar by preventing its crystallization. The beets are thrown into a trough and moved by a series of screw-paddles against a strong current of water. Adhering soil and sand, the presence of which would render the slicing of the beets difficult by reason of the dulling of the knives are removed by this treatment. After washing, the beets are carried by an inclined water to the slicing apparatus situated above the center of the diffusion battery. In countries where a tax is laid upon the beets they are, after washing, carried onto a weighing-machine, where their weight is noted by an agent of the inland revenue bureau. The beet slicer consists of a revolving, horizontal disk carrying radial knives against which the beets are fed through a hopper. These knives are arranged in such a way as to produce an irregular cutting, usually of a V-shape. The best cuttings are known in France as *manilles* and in Germany as *Schnittzel*. Their irregular form prevents the too close contact of their surfaces in the diffusion battery, and thus permits a free circulation of the diffusion liquids throughout all parts of the system. The theory of the diffusion process rests upon the well-known principle of osmosis. If a crystallizable body in solution be separated from pure water by means of a porous membrane there will be an interchange of such a nature that at the end of a certain time the crystallizable body will be found equally diffused within and without the membrane. The vegetable membranes which compose the cells of sugar beets and sugar-cane easily permit this diffusion to go on. If, therefore, into a mass of finely sliced cane or beets warm water be introduced, it will soon become impregnated with sugar, and after a certain time, depending upon the temperature and the fineness of the cuttings, will contain the same percentage of sugar as the unbroken cells themselves. In practice the water thus impregnated with sugar is passed into another cell containing fresh cuttings, while fresh water is passed into the first cell, and this process is continued until all the cells of the battery, with two exceptions, are in operation. A diffusion battery usually consists of twelve cells. When in operation two will thus be found under pressure, while one will be filling with the fresh cuttings and one will be emptying of the exhausted cuttings. The process once established goes on continuously.

Treatment of Beet Juices.—The saccharine juices extracted from beets require a more elaborate treatment than those expressed from sugar-cane. This arises from the fact that they contain foreign bodies more refractory to purifying treatment and more difficult to eliminate. The preliminary treatment of the beet juices preparatory to condensation is carried on as follows: The juices as they come from the diffusion battery are treated with lime in considerable excess of the quantity required to neutralize their natural acidity. From 2 to 3 lb. of lime are used for each 100 lb. of juice. Beet juices a few moments after expression or extraction become quite dark, and when in a large mass, as in the juice from a diffusion battery, the color is quite inky. The excess of lime precipitates this coloring-matter, as well as a part of the nitrogenous and other impurities present. To remove the excess of lime after the purification, carbonic acid is blown into the mixture, and the temperature is slowly raised until the boiling-point is reached, a little before the saturation is complete. The carbonic acid is obtained from a lime-kiln, which also furnishes the lime for the preliminary treatment. At the end of the saturation with carbonic acid the lime is found in the form of a carbonate of a fine granular texture, which is a great help in the following filtration, preventing the clogging of the filter-cloth. This treatment is technically called carbonatation or saturation. At the end of the operation the whole mass is passed through a filter-press, and the precipitated carbonate of lime and the other solid impurities are separated as press cakes. The emergent juice is of a bright amber color, transparent and apparently quite pure. In practice,

however, it is found to be profitable to repeat the process just described. In the second saturation the quantity of lime used is much less than in the first, not exceeding from $\frac{1}{2}$ to 1 lb. to 100 lb. of juice. The second saturation is followed by a second filtration, and the bright juices thus obtained are ready for evaporation, although they still contain large quantities of soluble materials other than sugar, chief among which are salts of potassium.

The evaporation, concentration, and crystallization of the purified juices, both from beets and sugar-cane, are carried on in the same manner, and one description of the process is sufficient.

Evaporation and Crystallization.—The two chief points to be kept in view in securing the sugar from the saccharine juices, clarified as above described, are the removal of the water and the prevention of the inversion of the sugar during boiling. Evaporation in open kettles is largely practiced in making sugar in a small way. The heat is applied directly to kettles or pans by means of a fire of wood or bagasse, or indirectly by means of copper coils connected with a steam-boiler. As the concentration proceeds the condensed juices are carried to the finishing kettle or pan, fresh juices being added to the others. When the evaporation has proceeded to the crystallizing-point, which is determined by the temperature or the appearance of the boiling material, portions of the mass may also be removed, cooled, and tested. The sugar, still in a liquid state, is put into vessels, where it crystallizes. When the crystallization is complete, the molasses is removed by transferring the mass to hogsheads with perforated bottoms. Sugar-canes are often pushed into the crystalline mass to open up channels for the liquid portions. The sugar thus formed is of a more or less pronounced yellow color and quite moist. When made from cane it retains the natural aromatic flavoring matters of the original juices, and is highly prized, especially by bakers. The process, however, is not an economical one, both on account of the large amount of fuel required and by reason of the loss of sugar by inversion at the high temperature reached in the end process. Even in Louisiana, where this method was once the leading one, it has almost entirely given way to more modern processes.

All modern sugar-factories of a magnitude to be of any commercial importance conduct the evaporation of sugar juices in a partial vacuum. This not only secures great economy in the use of fuel, but also, by reason of the lower temperature which is maintained, avoids all loss by inversion. To avoid confusion, some of the technical terms in use in sugar-factories should be defined. The word juice or liquor is applied to all saccharine liquids of moderate density in the raw state after extraction from the cane or beets, or in the clarified state with its attendant concentration. The term sirup designates the saccharine liquid after its first evaporation but before it is finally boiled for sugar. The expression massecuite is used to designate the mass as it is finally boiled for sugar, and embraces not only the crystallized but also the liquid contents of the vacuum-pan at the end of the boiling. Molasses is a term applied to the separated portion of the massecuite, whether obtained by drainage or by centrifugal action. Multiple effect is the name given to the series of evaporators joined *en suite*, by means of which the juice is reduced to a sirup. When only two are *en suite* it is called double, and when three a triple or multiple effect. They are arranged in such a way as to require steam to be applied only to the first one. The vapors arising from the first pan become the source of heat for the second, those from the second of the third, and so on. This is accomplished by so arranging them as to have the lowest vacuum in the first of the series and the highest in the last. If three pans be used, the reading of the vacuum-scale on the first one will be, for example, 5 inches, on the middle one 15 inches, and on the last one 25 inches, 30 inches representing practically a perfect vacuum.

In point of fact, by this arrangement there is no economy of speed, four pans not evaporating any more than one would at the highest vacuum and with the same amount of steam. The amount of fuel required, however, for a given volume of evaporation is approximately only one-third that which would be required if only one pan were used plus the amount necessary to operate the vacuum-pump. Inasmuch, however, as the quantity of steam required for the pump is the same whether one or three pans be used, there is saved, approximately, two-thirds of the fuel. In practice it is found that no economy is secured by increasing the number of pans beyond three or four. The saccharine liquor is

gradually transferred during the operation to the third pan, from which the finished sirup is removed from time to time or continuously by means of a pump which will create a higher vacuum than that existing in the pan. The process in a multiple-effect apparatus, when once started, is a continuous one, fresh juice entering the first pan and the finished sirup flowing from the last one.

The strike-pan is a boiling apparatus used with a high vacuum in which the sirup is concentrated to massecuite. Its size corresponds to the capacity of the factory, and for those houses which use from 200 to 400 tons of raw material a day the strike-pan will vary from 6 to 10 feet in diameter and from 10 to 20 feet in height, and with a capacity of from 20,000 to 70,000 lb. of massecuite at each strike. Heat is applied in the strike-pan by means of a series of copper coils, one above the other, beginning near the bottom and extending half way or more to the top. These coils of copper are of large diameter, in order to permit the free circulation of exhaust steam, at low pressure, from the engines and pumps of the factory. Live steam is not used in the pan except when the exhaust steam proves to be insufficient. For the manufacture of raw sugar the vacuum is maintained as high as possible. With a good pump and other apparatus, at sea-level, it can be kept at from 28 to 29 inches. In this vacuum the boiling will take place at a temperature of from 120° to 150° F., according to the density of the mass.

The operation is begun by taking into the pan a quantity of sirup large enough, when concentrated to the crystallizing-point, to cover the first coil. By means of the proof-stick the sugar-boiler determines when the sirup has a proper degree of consistence. At this point a considerable additional quantity of sirup is quickly drawn into the pan, whereby a crystallization is produced in the thickened sirup in the pan. The crystals formed at first are too small to be seen with the naked eye, but when some of the mass is put on a piece of glass it is seen to have a turbid appearance. The art of the sugar-boiler consists in feeding these crystals with fresh quantities of sirup, added in such a way as to avoid, on the one hand, the melting of the crystals already formed, and, on the other, the formation of a new crop of crystals known as false grain. When the operation is properly conducted, the pan is gradually filled with the growing mass of crystals, and coil after coil of the heating apparatus is brought into use until all are in operation. After this the boiling goes on with great activity until the pan is full. At the end the further supply of sirup is cut off, usually after the addition of a considerable quantity of sirup, for the purpose of washing the crystals, and the mass is thickened by further boiling until the minimum quantity of water consistent with the proper handling of the massecuite is secured, viz., from 6 to 10 per cent. The large valve at the bottom of the pan is then opened, after the vacuum has been broken, and the massecuite falls directly into a mixer or into wagons in which it is carried to a mixer. When the sirup is rich and pure the massecuite, as it drops from the pan, is already in appearance a solid body. In the mixer the massecuite is kept in motion by revolving paddles, and thus prevented from setting into solid masses, which would be difficult to break up and dry. From the mixer the massecuite passes directly into the centrifugal machines, where the sugar is separated from the molasses. So quickly is this accomplished that within a few minutes after leaving the strike-pan the dry sugar, still warm, may be found in packages ready for shipment to the consumer or the refiner.

The molasses secured by the above process is still rich in crystallizable sugar, and is reboiled for a second crop of crystals. When very rich it can be boiled to grain, as in the first instance, but if too poor for this it is boiled to string proof to the proper consistence, placed in cars in a warm room, and allowed to remain for a week or ten days. By this time the crystallization is completed, and the contents of the cars are thrown into the mixer, well broken up, and the sugar separated in the centrifugal in the manner already described.

The molasses obtained from this second crystallization is sometimes rich enough to be again reboiled, after which it is placed in wagons or large cisterns, and allowed to remain for several months, yielding a third crop of crystals, which when dried form a low-grade sugar. The residual molasses is finally either sold for culinary use or for mixing with glucose to make table sirups, or is sent to the distiller.

Beet-sugar molasses is unfit for table or culinary use on account of the large quantity of mineral salts which it contains. It is either sent to the distiller or the sugar it contains is recovered by combining it with strontium or lime, whereby an insoluble sucrose of the base used is obtained, which is separated from the soluble salts and other impurities by means of a filter-press. In this case it is the residue in the press cake which forms the valuable product. The sucrose therein contained are beaten to a cream with water, and the lime or strontium precipitated by means of carbonic acid. The carbonate of the base is separated by filtration, and the comparatively pure sugar juices obtained are concentrated and crystallized in the usual way.

The Refining of Sugar.—The sugar which is obtained by the above described processes is not white nor pure, and is prepared for table use by the refiner. In the historical sketch above given it was stated that the early processes of refining consisted at first in simply melting and reboiling the crude sugar. Each successive crystallization obtained in this way showed an improvement in color and purity, but the quantity of fairly white sugar finally obtained was a very small part of the raw material originally taken. The aid of clay, lime, and the white of eggs or blood was found to assist in the refining process, but without adding much to the total yield.

In India the term refined sugar includes sugars which have been purified by charcoal strainers and freed from all admixture of uncrystallized sirup, and also the raw native sugars prepared in the following way: The immediate product of the first boiling of the cane juice is known as gurrh or rab, according as the sugar is boiled down to a hard mass, or allowed to remain in a semi-liquid condition. Both gurrh and rab contain some uncrystallized sirup. Gurrh, as a rule, is intended directly for home consumption, and is comparatively seldom used in the manufacture of refined sugar. Rab, on the other hand, is always intended for refining. In the process of refining the molasses known as shira is partially expressed from the rab by the primitive contrivance of a man standing on a pile of bags filled with rab, and working them backward and forward by the movement of his body. The rab partially refined in this way is called putri, and though it still contains a large percentage of shira it is far more compact, and shows more granulation than before pressing. The putri is thrown into a crate covered with a species of water-weed known as siwar (*Vallisneria spiralis*), and the remaining sirup slowly drains out at the bottom of the crate, and the putri gradually whitens into a mealy looking sugar called pachani, and it is then dried in the sun and broken up by being trampled on for some hours. When dried it is known as shakar.

These crude methods in sugar-refining have led to the modern processes, which are so perfect as to permit of the recovery in a state of purity of almost all the sugar in the crudest articles of commerce.

The process of refining is often carried on in connection with the manufacture of sugar from the raw materials. Various methods are employed. In one process the juices are subjected to the action of sulphur-fumes, whereby they become bleached. In the subsequent boiling the mass is left in a less dense state, so that the crystals are more readily separated from the molasses, and more easily washed. When the crystals are dried in the centrifugals they are washed with a little water, and also with a solution of chloride of tin, which give them a bright appearance. Sugar made in this way, especially from cane-juice, is quite pure, and has a white or delicate yellow tint, and is much prized by some consumers. The yield, however, as can be readily seen, is much less than that obtained by the dense boiling before described.

Instead of sulphur-fumes bone-black is also employed in making a white sugar directly in the factory. The bone-black is generally used on the sirups until they are practically decolorized. Sugar made with the use of bone-black is washed in the centrifugals with a little water, followed by a solution of ultramarine. The bluing thus practiced gives a whiter tint to the crystals.

These refining processes are profitable only where there is a good domestic demand for high-grade sugar, and in localities remote from refineries, where the freights attending the shipment of refined sugar materially increase the price.

From an economical point of view the refining of sugar is entirely distinct from its manufacture from the raw materials. It is carried on in the most economical way in large

establishments kept in operation during the greater part of the year. In the U. S. there are in active operation less than a dozen refineries supplying nearly 2,000,000 tons a year.

Following is a brief description of the process of refining sugar on a large scale:

The raw sugar is dumped into vats, where it is stirred with warm water until melted. In this manner a sirup is obtained containing from 80 to 40 per cent. of sugar. The bags and other packages in which the sugar is shipped are washed, and the wash-water added to the saccharine mixture. The liquor thus formed is filtered through bags or filter-presses, to remove suspended matters. Sometimes the liquor is made thinner, and treated with lime and clarified in the manner described for cane juices. After filtration the limpid liquors are bleached with sulphur-fumes, or by passing over bone-black, which is the more usual way. Bone-black is prepared by subjecting bones to distillation in a retort practically excluded from the air. A large part of the organic matter in the bones is by this process converted into carbon, and left in a finely divided state distributed throughout the molecules of lime phosphate of which the mineral matter of bones is chiefly composed. This combination of animal char and lime phosphate has the property of rapidly oxidizing the coloring-matter of sugar solutions, and thus of bleaching them. The freshly burned char is contained in cylindrical vessels of steel or iron arranged in convenient series. The most highly colored solutions are passed first through those filters which have been in use some time, and thus have lost to a certain extent their decolorizing power. The process is continued in such a way that the less colored solutions are finally brought into contact with some fresh char, whereby they are rendered almost if not quite water-white. The more complete the decoloration the larger the percentage of white sugar which will be obtained. The bone-black, when it has once lost its decolorizing power by use, can have it restored by washing in a dilute acid, followed by water, and then burning in specially constructed retorts. These retorts are continuous in their operation, the spent black being fed in at the top and the revived char being removed at the bottom. After repeated using, however, the char loses its virtue, and is then sold for fertilizing purposes.

The nearly white liquor finally obtained is ready without further preparation for treatment in the strike-pan. The general method of boiling is the same as that already described. The crystals are made large or small to meet the demands of the trade and at the will of the sugar-boiler. If a hard crystal be desired the boiling takes place at a lower vacuum, say 24 to 26 inches, while if a soft crystal be demanded the vacuum is made as high as possible, from 28 to 29 inches. After leaving the strike-pan the crystals are dried in the centrifugals in the manner already noted. The still slightly moist crystals, as they come from the centrifugal, may be moulded into cubes and dried (loaf-sugar), or dried in larger masses and cut or broken into approximately cubical pieces (cut or broken loaf), or dried and ground to a fine powder (powdered sugar). The hard crystals are also dried in revolving drums heated by steam, and form thus the granulated sugar of commerce, a form in which by far the larger part of refined sugar now reaches the consumer.

The molasses from the first granulation is reboiled and lower grades of nearly white sugar made therefrom. These sugars are sold under many names, such as coffee A, coffee C, brown sugar, etc. A third and even fourth crop of crystals is sometimes obtained, and finally nearly all the sugar originally present in the crude material is secured in a refined state. The art of the sugar-boiler is constantly brought into use to make grades of sugar which the trade demands, and also to use the material placed in his hands to the very best advantage. When his work has been properly conducted there is finally little waste material left to be sold to the mixers or distillers as "black strap."

In some countries, especially in Great Britain, sugar in the form of large yellow crystals is much in demand. These crystals were first made in Demerara, and hence the name which they bear. They are made by building a very large crystal in the strike-pan and then producing thereon a superficial coating of caramel to give a yellow color. This was formerly accomplished by introducing a quantity of sulphuric acid into the pan just before the strike was dropped. At present tin chloride is chiefly used for coloring the crystals. In making these large crystals, after the sirup in the pan has been reduced to a certain consistence, a large quantity of ordinary granulated sugar is put in the pan, and on

these crystals the larger ones are built in the manner already described.

Relative Sweetness of Beet and Cane Sugars.—In chemical and physical character pure refined sugar made from beets is the same as that made from cane. In the raw sugars, however, and in the sugars made from molasses, there are marked differences. The beet contains a large quantity of alkaline salts, and these bodies are found to some extent in the raw beet-sugars and in beet-molasses. An unrefined beet-sugar has a higher percentage of ash than the same grade of cane-sugar. The aromatic organic ethers and essential oils that give an agreeable odor and flavor to cane-sugar are mostly absent from beet-sugar. A stranger entering a cane-sugar factory during the working season will at once notice the agreeable aromatic odor everywhere present. On the contrary, in a beet-sugar factory, especially if much molasses be in process of manufacture, the opposite will be noticed. Raw or unrefined cane-sugar may be used on the table or in the kitchen, and the old-fashioned open-kettle molasses is a luxury. Unrefined beet-sugar can not be used with comfort on the table, and beet-molasses as a culinary article is unknown. Beet-molasses contains a certain quantity of the sugar known as raffinose, which modifies both the physical and chemical characters of the sugars made therefrom. Even in the refined sugars a difference may be noticed between cane and beet sugars if the samples are kept well stoppered for some time. An air-tight package of granulated cane-sugar will have an agreeable aromatic odor when opened, while beet-sugar in the same condition gives an unpleasant sensation to the nostrils. In respect of the sweetening properties of pure cane and beet sugars there is no difference whatever between the two varieties.

Chemistry.—Until within recent years there has been much confusion in the classification of sugars and sugar-like bodies as made by different chemists. By many authors only those bodies were classed as carbohydrates which contain six atoms of carbon or some multiple thereof, together with oxygen and hydrogen in the proportion to form water. In 1882 von Lippmann published a work in which he took the view first proposed by Fittig, that the carbohydrates were all derived from a hypothetical, heptatomic alcohol having the composition $C_7H_{17}(OH_7)$. From this form by dehydration are produced the anhydrides, such as $C_6H_{11}O_5$ or $C_{12}H_{22}O_{11}$, representing glucose and saccharose respectively.

In 1888 a marked advance in the knowledge of carbohydrates was secured by the publication of Tollens's *Handbook*. Tollens defines carbohydrates as always or nearly always neutral bodies which form only loose compounds, especially with the bases, and consequently all bodies, such as methyl-hydroxyglutaric acid ($C_5H_{10}O_6$) and its lactone acid ($C_5H_8O_6$), as well as the saccharines which possess the general formula of carbohydrates but pass over easily into the form of acids, must be excluded from the list.

According to Tollens the carbohydrates have many common properties, and they possess these properties either in themselves, as, for instance, the glucoses, fruit sugars, and dextrose, or they are easily converted into bodies which do possess them, as, for instance, cane-sugar, cellulose, and starch. In some of the undoubted carbohydrates one of the general properties may be wanting, but there are other properties which are indispensable, and those bodies which do not possess them must be left out of the class even should they be indifferent chemically and have the general carbohydrate formula. According to this view the properties peculiar to the true carbohydrates are the following:

- (a) The power of reducing alkaline metallic salt solutions and of forming a yellow color with alkalis.
- (b) When in solution they must possess the ability to rotate the plane of polarized light.
- (c) They must have the power of fermenting when treated with yeast, with the production of alcohol and carbon dioxide.
- (d) When heated with hydrochloric or sulphuric acid they should produce levulinic and formic acids and humus substances.
- (e) They should have the property of giving a yellow crystalline precipitate when treated with phenylhydrazin acetate.
- (f) They should give characteristic color reactions when treated with acids and aromatic alcohols.
- (g) They should be soluble in water either directly or after hydrolysis with an acid.
- (h) When subjected to strong heat all carbohydrates are decomposed, turning brown at first and afterward black, with a production of many different substances.

Tollens, in accordance with his views, classifies the carbohydrates and nearly related bodies according to the number of carbon atoms which they contain, as monosaccharids having 6 atoms of carbon, disaccharids with 12 atoms, and polysaccharids with 18, 24, or 36 atoms, etc. By this classification the number of true carbohydrates is diminished until it is comparatively small, while the number of carbohydrate bodies is large. The common sugars and carbohydrates, according to the above classification, are grouped as follows:

I. Monosaccharids or glucoses, type $C_6H_{12}O_6$.

1. Dextrose.
2. Levulose, invert sugar, mannitolose.
3. Galactose.
4. Sorbin or sorbose.
5. Different little-known glucoses.

II. Disaccharids or saccharoses, type $C_{12}H_{22}O_{11}$.

1. Cane-sugar.
2. Milk-sugar.
3. Maltose.
4. Trehalose.
5. Melezitose.

III. Polysaccharids.

(a) Crystallizable polysaccharids.

1. Raffinose, $C_{18}H_{34}O_{16} + 10H_2O$.
2. Lactosin, $C_{18}H_{34}O_{16}$.

(b) Difficultly or non-crystallizable polysaccharids.

1. Starch.
2. Inulin.
3. Saccharocolloids, gums, and slimes.
4. Cellulose.
5. Pectin and pectose bodies.

IV. Substances which resemble the glucoses, but do not have either the exact composition thereof or for other reasons are not to be classed therewith.

(a) Substances which contain oxygen and hydrogen in the proportion to form water.

1. Arabinose, $C_5H_{10}O_5$.
2. Cerasinose.
3. Formose, $C_6H_{12}O_6$.
4. Phenose, $C_6H_{12}O_6$.
5. Inosit, $C_6H_{12}O_6$.
6. Dambose, $C_6H_{12}O_6$.
7. Scyllit, $C_6H_{12}O_6$.
8. Quercin, $C_6H_{12}O_6$.
9. Bergenin, $C_6H_{12}O_6$.

(b) Substances which contain more hydrogen than would be necessary to form water with the oxygen present.

1. Isodulcitol, $C_6H_{14}O_6$.
2. Quercitol, $C_6H_{14}O_6$.
3. Pinitol, $C_6H_{14}O_6$.
4. Sennitol, $C_6H_{14}O_6$.

(c) Mannit and its isomers.

1. Mannit, $C_6H_{14}O_6$.
2. Dulcitol, $C_6H_{14}O_6$.
3. Perseitol, $C_6H_{14}O_6$.
4. Sorbit, $C_6H_{14}O_6 + \frac{1}{2}(H_2O)$.

(d) Arabitol, $C_6H_{14}O_6$.

Of the carbohydrates conforming to the above definition dextrose, levulose, galactose, and mannitol are types. They respond to the reactions given, and have been found to possess the composition of ketones or aldehydes of the hexavalent alcohol $C_6H_{14}O_6$. On the other hand, there are carbohydrate bodies, such as arabinose, having the formula $C_5H_{10}O_5$, which are sugars having all the properties of a carbohydrate, and evidently should be classed with those bodies. There is another sugar, erythrose, having the formula $C_4H_8O_4$, which is an aldehyde of the tetratomic alcohol erythritol, and another sugar glycerose having the formula $C_3H_6O_3$, which also has valid claims to be classed with the other sugars. From the researches of Fischer on synthetic sugars it appears that the old classification is hardly a proper one, and a new one based on his work is preferable. It appears from these researches that there is a homologous series of aldehyde or ketone alcohols having the general formula $C_nH_{2n}O_n$ which have these common properties: 1, Sweet to the taste; 2, optically active; 3, reducing alkaline metallic solutions; 4, yielding with phenylhydrazin characteristic crystalline compounds. All these bodies therefore possess the essential characteristics of true carbohydrates and are as a consequence eligible to classification as such. According to Fischer, the classification of the substances which consti-

tute this homologous series, so far as they have been made known, is as follows:

1. Trioses, type $C_3H_5O_3$, typical member glyceroe.
2. Tetroses, type $C_4H_7O_4$, typical member erythrore.
3. Pentoses, type $C_5H_{11}O_5$, typical members arabinose, xylose.
4. Hexoses, type $C_6H_{12}O_6$, typical members dextrose, levulose, galactose, mannose.
5. Heptoses, type $C_7H_{13}O_7$, typical member heptose.
6. Octoses, type $C_8H_{15}O_8$, typical member octose.
7. Nonoses, type $C_9H_{17}O_9$, typical member nonose.

According to Fischer, every asymmetric carbon atom in a carbohydrate molecule makes two forms possible. There can therefore be at least eight hexoses, and each of these is optically paired, making sixteen in all. Of the sixteen possible forms, ten have already been discovered. Of the thirty-two possible heptoses only six have been discovered, and of the 128 possible nonoses only two are known. There is every reason to believe that the series will be extended by the discovery of new types, increasing very largely the number of possible sugars. In the sugars classified as above all those which contain three atoms of carbon or multiples of three are susceptible of fermentation, while the intervening members can not be fermented. Thus only the trioses, hexoses, and nonoses are fermentable.

Natural sugars all have the power of rotating a plane of polarized light, and this quality serves as a basis for optical SACCARIMETRY (*q. v.*). Synthetic sugars, on the other hand, are devoid of rotatory power, and this is due to the fact that they are composed of twinned molecules having opposite rotatory powers of equal value. See STEREO-CHEMISTRY.

All sugars, natural or synthetical, containing three atoms of carbon or some multiple thereof in each molecule, are susceptible to fermentation when treated with yeast. The products of fermentation are chiefly alcohol and carbon dioxide, but a large number of secondary products are formed, such as glycerol and organic acids.

Cane-sugar, sucrose, or saccharose forms a molecule represented by the formula $C_{12}H_{22}O_{11}$. Cane-sugar belongs to the disaccharids, according to Tollens's classification, or to the hexoses according to that of Fischer. Under the influence of acids and certain ferments it undergoes hydrolysis, assimilating a molecule of water and forming equal quantities of two hexoses known as dextrose or glucose and levulose or fructose. The reaction which takes place is represented by the formula $C_{12}H_{22}O_{11} + H_2O = C_6H_{12}O_6 + C_6H_{12}O_6$. From the above it is seen that the two sugars formed are chemically identical, but optically and physically they have very different qualities, one being a right-handed sugar and easily crystallizable and the other a left-handed sugar and crystallizable with difficulty.

Cane-sugar forms compact, monoclinic crystals having a specific gravity of 1.58. Sugar is very soluble in water. At a temperature of 32° F. a saturated solution of sugar in water contains in each 100 parts sixty-five parts of sugar, and at 120° F. eighty-three parts. In pure aqueous solutions of sugar the density of the solution is directly proportional to the quantity of sugar present. Upon this fact is based a method of determining the percentage of sugar in a solution from its specific gravity. The instrument most commonly used is the Brix spindle. (See HYDROMETER.) For instance, a sugar solution which marks 5° Brix contains 5 per cent. of sugar and has a specific gravity of 1.0197, and one which marks 50° Brix contains 50 per cent. of sugar and has a specific gravity of 1.2328. Elaborate tables are found in works on sugar analysis, giving the percentages of sugar for varying degrees of density, and the specific gravities for each degree and half degree of the standard hydrometers in common use. It is only when sugar solutions are free of impurities that these tables can be used.

Cane-sugar does not possess the power of reducing an alkaline solution of copper, but the dextrose and levulose produced by the treatment of cane-sugar with an acid or inverting ferment possess this power. The process of converting cane-sugar into dextrose and levulose is known as inversion or hydrolysis. Upon the property of reducing alkaline copper solutions to suboxide is based the process of chemical saccharimetry.

When cane-sugar is subjected to a strong heat it suffers a partial decomposition, becomes brown, and forms caramel or burnt sugar.

Many oxidizing bodies act upon cane-sugar with great vigor. For instance, if a mixture of cane-sugar and potas-

sium chlorate be touched with a drop of sulphuric acid the oxidation will be so rapid as to produce a brilliant deflagration. Hot nitric acid also oxidizes cane-sugar with the production of organic acids. A saturated solution of cane-sugar stirred with strongest sulphuric acid will lose its water of composition, and will give a porous mass of carbon and humus bodies. Cane-sugar unites with the bases, especially those of the alkaline earths, forming distinct chemical compounds known as sucrares. The sucrares of calcium and strontium play an important part in the separation of sugar from beet molasses.

Statistics.—The total production of cane and beet sugar in the world in 1893-94 was over 7,550,000 tons, and in 1864-95 over 8,500,000. The following table includes all the most important countries producing sugar-cane except China. Most of the sugar consumed in Japan (125,000 tons per annum) is imported.

THE WORLD'S PRODUCTION OF SUGAR FROM SUGAR-CANE FOR THREE YEARS, IN TONS OF 2,240 LB.

Willott & Gray's estimates of cane-sugar crops, May 2, 1895.

COUNTRY.	1894-95.	1893-94.	1892-93.
United States.....	285,000	275,000	238,000
Spanish West Indies:			
Cuba, <i>crop</i>	975,000	1,087,000	841,000
Porto Rico.....	52,500	60,000	50,000
British West Indies:			
Trinidad, <i>exports</i>	50,000	49,662	46,820
Barbados, <i>exports</i>	40,000	58,092	59,722
Jamaica.....	30,000	30,000	25,000
Antigua and St. Kitts.....	20,000	25,000	24,000
French West Indies:			
Martinique, <i>exports</i>	25,000	35,854	32,220
Guadeloupe.....	43,000	44,000	42,000
Danish West Indies—St. Croix.....	7,000	8,000	9,000
Haiti and San Domingo.....	38,000	40,000	30,000
Lesser Antilles, not named above.....	8,000	8,000	8,000
Mexico.....	2,000	2,000	2,000
Central America:			
San Salvador, <i>crop</i>	500	500	500
Nicaragua, <i>crop</i>	500	500	500
British Honduras (Belize), <i>crop</i>	200	200	200
South America:			
British Guiana (Demerara), <i>exports</i>	100,000	102,897	108,464
Dutch Guiana (Surinam), <i>crop</i>	6,000	6,000	4,000
Peru, <i>crop</i>	68,000	65,000	67,000
Argentine Republic, <i>crop</i> (no <i>exports</i>).....	75,000	50,000	40,000
Brazil, <i>exports</i>	275,000	275,000	200,000
Total in America.....	2,100,700	2,222,705	1,823,426
Asia:			
British India, <i>exports</i>	50,000	50,000	50,000
Siam, <i>crop</i>	7,000	7,000	7,000
Java, <i>exports</i>	475,000	430,767	454,596
Philippine Islands.....	225,000	220,000	220,758
Cochin-China.....	30,000	30,000	30,000
Total in Asia.....	787,000	717,767	782,354
Australia and Polynesia:			
Queensland.....	100,000	80,000	61,314
New South Wales.....	35,000	35,000	32,000
Hawaiian Islands.....	150,000	140,000	135,000
Fiji Islands.....	10,000	10,000	10,000
Total in Australia and Polynesia.....	295,000	265,000	238,314
Africa:			
Egypt, <i>crop</i>	97,000	85,111	60,000
Mauritius and other British possessions.....	100,000	139,751	70,020
Reunion and other French possessions.....	37,000	37,000	25,000
Total in Africa.....	234,000	261,862	165,020
Europe—Spain.....	20,000	20,000	20,000
Total cane-sugar production.....	3,436,700	3,467,334	3,029,114

PRODUCTION OF BEET-SUGAR IN EUROPE FOR FOUR YEARS, THE LAST YEAR ESTIMATED, IN TONS.

COUNTRY.	1894-95.	1893-94.	1892-93.	1891-92.
German Empire.....	1,850,000	1,381,603	1,225,331	1,198,156
Austria-Hungary.....	1,075,000	841,809	802,577	789,566
France.....	810,000	579,111	588,838	650,377
Russia.....	630,000	658,070	455,000	550,994
Belgium.....	285,000	240,317	196,669	180,377
Holland.....	90,000	75,015	68,070	46,815
Other countries.....	156,000	113,610	92,000	88,635
Totals.....	4,886,000	3,889,535	3,428,515	3,501,920

The annual production of beet-sugar in the U. S. is about 20,000 tons, and in Canada 300 tons.

PRODUCTION OF SUGAR AND MOLASSES IN THE U. S. FOR THE CENSUS YEARS 1849-50, 1859-60, 1869-70, 1879-80, AND 1889-90, FROM THE REPORTS OF THE SEVENTH TO THE ELEVENTH CENSUSES, INCLUSIVE.

YEAR.	SUGAR-CANE.		SORGHUM.	MAPLE.	
	Sugar, pounds.	Molasses, gallons.	Molasses, gallons.	Sugar, pounds.	Molasses, gallons.
1850.....	297,092,400	14,963,996	6,749,123	34,253,436	1,597,589
1860.....	277,178,400	6,593,323	16,030,089	28,443,645	921,057
1870.....	104,451,600	16,573,273	28,444,302	36,576,061	1,796,048
1880.....	214,646,400	25,409,228	24,285,219	32,952,927	2,258,376

CONSUMPTION OF SUGAR IN THE U. S. FROM 1884 TO 1894, IN TONS OF 2,240 LB., AND CONSUMPTION PER CAPITA IN POUNDS.

YEAR.	Tons.	Pounds per capita.
1884.....	1,252,366	51.00
1885.....	1,254,116	49.95
1886.....	1,255,809	52.55
1887.....	1,392,909	53.11
1888.....	1,457,264	54.23
1889.....	1,439,701	52.64
1890.....	1,522,731	54.56
1891.....	1,672,400	67.46
1892.....	1,853,370	63.76
1893.....	1,905,862	63.83
1894.....	2,024,648	67.07

The total consumption of foreign sugar in 1893 was 1,623,872 and in 1894 1,700,635 tons. The total consumption of domestic cane-sugar in 1893 was 235,896 and in 1894 285,500 tons. The total consumption of domestic beet-sugar in 1893 was 20,453 and in 1894 20,000 tons. The total consumption of domestic sorghum-sugar in 1893 was 394 and in 1894 300 tons. The total consumption of domestic maple-sugar for 1893 was 15,257 and for 1894 15,000 tons.

CONSUMPTION OF SUGAR IN EUROPE FOR THE YEAR 1894, IN TONS OF 2,240 LB., AND CONSUMPTION PER CAPITA IN POUNDS.

COUNTRY.	Tons.	Pounds per capita.
Great Britain.....	1,484,000	70
Germany.....	623,000	19
France.....	488,000	24.5
Austria.....	325,000	14
Holland.....	55,000	26
Belgium.....	75,000	26
Russia.....	450,000	10
Italy.....	55,000	4
Spain.....	40,000	6
Sweden and Norway.....	30,000	10

At present (1895) Canada consumes about 140,000 tons of sugar annually, amounting to approximately 56 lb. per capita, and Australia and New Zealand 175,000 tons annually, amounting approximately to 90 lb. per capita. From the above data it is seen that the English-speaking people of the world are the great consumers if not the great producers of sugar.

Prices of Sugar.—It is difficult to compare modern with ancient prices, not only on account of the change in the weights and names of coins, but especially because gold, which is the ultimate standard of value, has itself varied so much in its purchasing power in the last thousand years.

From the best authorities the prices of sugar in England at the dates mentioned below, calculated to the present value of gold, are as follows:

From 1259 to 1350, \$156 per 100 lb.; from 1351 to 1400, \$237 per 100 lb.; from 1401 to 1540, \$150 per 100 lb.; from 1541 to 1582, \$181 per 100 lb.; and from 1583 to 1702, \$106 per 100 lb. From 1700 to 1800 the price varied through wide limits, but still remained pretty high, being in 1800 about \$38 per 100 lb. From that time the price was much less, being \$16 per 100 lb. in 1810 and \$4 per 100 lb. in 1885.

In the U. S. from 1845 to 1895 the average price, duty free, for fair refining sugar, polarizing about 96 per cent., was \$4.38 per 100 lb. The lowest price recorded for fair refining sugar was, Feb. 21, 1895, \$1.94 per 100 lb. net cash, duty free. The selling price of refined granulated sugar, including the duty, was on Feb. 21, 1895, 4 cents a pound.

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HARVEY W. WILEY.

Sugarberry: See HACKBERRY.

Sugar-cane: See SUGAR.

Sugar, Mountain-ash: See SORBITR.

Sugar of Lead: See LEAD (*Compounds of Lead*).

Sugar of Milk: See MILK.

Sugar-palm: See CARYOTA and SUGAR.

SUGDEN, EDWARD BURTENSHAW, Lord St. Leonards, LL. D., D. C. L.; jurist; b. in London, England, Feb. 12, 1781, his father being a wig-maker. He was largely self-educated, and was called to the bar at Lincoln's Inn in 1807. He almost immediately rose to the front rank of his profession by the publication of his *Practical Treatise of Powers*, previous to which he had published (Feb., 1805) his *Concise and Practical Treatise on the Law of Vendors and Purchasers*; was made king's counsel in 1822, and a bench of Lincoln's Inn; was elected M. P. for Weymouth and Malcombe Regis as a Tory; and in 1829 appointed Solicitor-General and knighted; elected M. P. again in 1830, and sat in the Short Parliament which passed the first reform bill, of which he was one of the most persistent and shrewd opponents; was sworn member of the privy council 1834, Lord Chancellor of Ireland 1835, and again 1841-46; Lord High Chancellor of Great Britain from Mar. to Dec., 1852, being raised to the peerage. He was a deputy lieutenant for Sussex, a trustee of the British Museum, and lord high steward of the borough of Kingston-on-Thames. Although a Conservative he effected reforms in the law of contempt of courts, and in the laws relating to the conveyance of the property of infants, lunatics, mortgages, etc. He was recognized as the highest authority on the law of real property, and as the first practitioner of his time in the court of chancery. D. at Boyle Farm, near Thames Ditton, Jan. 29, 1875. Besides his treatise on *Powers*, and great work on the law of *Vendors and Purchasers* (which has gone through many editions), he published many technical works of lesser importance, including *A Handy Book on Real Property Law* (1858). See *Irish Law Times* and *Law Times* for Feb., 1875.

F. STURGES ALLEN.

Suggestio Falsi: See FRAUD.

Suggestion: a great class of phenomena typified by the abrupt entrance from without into consciousness of an idea or image which becomes a part of the stream of thought

and tends to produce the muscular and volitional effects which ordinarily follow upon its presence. I suggest a course of action to my friend—he may adopt it. Besides this fact of ideal suggestion there is what may be called physiological suggestion, covering the same class of phenomena in cases where the suggestion does not attain the standing of a conscious image, but remains subconscious. It is called physiological because the nervous process, as in all cases of very faint degrees of consciousness, is largely self-acting or reflex. By physiological suggestion, therefore, is meant the bringing about of a reaction subconsciously by means of an extra-organic stimulus.

The clearest examples of such suggestions occur in sleep. Words spoken to the sleeper are intelligently answered. Positions given to his limbs lead to others ordinarily associated with them; the sleeper defends himself, withdraws from dangers, etc. The early development of the child's consciousness proceeds largely by such suggestions. Before mental images are definitely formed and subject to association, we find many motor reactions stimulated by such physiological suggestions from the environment.

From physiological the child passes to sensori-motor suggestion, the type of reaction which illustrates most clearly the law of dynamogenesis. In this case it is a sensation, a clear state of consciousness, which liberates motor energy and produces movement. Besides the inherited sensori-motor couples, which are numerous and well marked, other reactions grow up early in life and become habitual. Of the latter the following may be mentioned in particular:

Sleep-suggestions.—The early surroundings and methods of inducing sleep become powerful re-enforcements of the child's drowsiness, or even substitutes for it.

Food-suggestions and Clothing-suggestions.—These represent the spheres of most frequent and highly spiced joys and sorrows, and their reactions soon take on the involuntary and yet highly purposive character which marks our adult attitudes toward dress and the table.

Suggestions of Personality.—The child shows preferences for individuals at a remarkably early age. He seems to learn and respond to a personal presence as a whole. Probably the voice is the first indication of his nurse's or mother's personality to which he responds, then touch, then the sight of the face.

Imitative Suggestion.—The simple imitation of movements and sounds, clearly manifested about the seventh month of life. See IMITATION.

In *ideo-motor* or *ideal* suggestion we pass to the motor aspects of images, reproductions; and here the motor accompaniments are largely associations and follow the laws of association. As soon, further, as reproductions come up, with their suggested trains, we find the rise of will; that is, they become stimuli to the voluntary consciousness. Yet there is a state of conflict and hindrance among presentations which is mechanical in its issue, the attention being drawn in a reflex way. So states of vexation, divided counsel, conflicting impulse, and hasty decision against one's desire for deliberate choice. We often find ourselves drawn violently apart, precipitated through a whirl of suggested courses into a course we feel unwilling to own as our own. This is the case in the disease called *aboulia*, or loss of will. The man is prey to conflicting impulses. This state, called by the writer deliberative suggestion, characterizes many actions of the young child before will is clearly exercised.

Organic Stimuli to Movement.—In general, any condition of the organism, be it active or passive, which is sufficient to reach consciousness, tends to muscular expression, either natural or acquired. Any derangement of the digestion, respiration, or circulation quickens or deadens muscular tone, and comes out, if not in the face, yet in the conduct of the man. The muscular feelings themselves, so large a portion of the general sensibility, reflect direct changes in the tendency and direction of motor reactions. Diseases of the nervous system find their diagnosis in their effects upon the muscular apparatus: paralysis means rigidity; epilepsy, convulsions; sleep, flabbiness of the muscles. The effect of organic stimulation upon the motor consciousness is best seen in conditions of pleasure and pain. Among direct or native reactions an important class are called expressive; they are differentiated muscular movements which reflect uniformly various affective states of consciousness.

Pleasure-suggestion and Pain-suggestion.—Perhaps the most direct and invariable stimulus to involuntary movement is pain; and its motor force is independent, as it seems, of the intrinsic experience of which it is the tone.

The motor force of a sensation of light, for example, may be in direct antagonism to the motor force of the pain which the light causes to a diseased eye. Despair begets inaction, but the painfulness of it begets restlessness. This is only to say that the tone is an element of sensibility apart from the sensation it accompanies, and that both the one and the other have motor force.

Yet the fact that there are no experiences absolutely indifferent as respects pleasure or pain gives the motor aspect of them an universality and importance which must be acknowledged and provided for in any mental theory. It is a question answered often in the negative whether any course of conduct is ever pursued without primary reference to the pleasure it will bring or the pain it will avoid. However this question may be answered, it may be said at this point that no line of muscular reaction is possible in which an element of motor discharge due to pleasure or pain has not entered. This must be true if the fundamental position is true that every ingoing process alters the equilibrium of the central system and modifies the direction of its outward tendency. Pleasure and pain arising from bodily states may therefore be called the most general internal stimuli to the reactive consciousness.

Motor Spontaneity.—The observation of infants clearly tends to show that movement is no less original a fact than feeling. It is impossible to say whether all antenatal movements are in response to feeling conditions, as claimed by some, just as it is impossible to prove that the beginning of feeling is possible only after sufficient physical organization to make motor reaction possible, as claimed by others. It is altogether probable that the two kinds of phenomena are equally original, and depend upon each other. This is certainly the case, at any rate, at the dawn of independent life. Internal conditions of the organism itself are sufficient stimuli to an endless variety of movements. Such reactions, which are simply the discharges, the outbursts, of the organism, independent of definite external stimulation, are called spontaneous. So the incessant random movements of infants and the extraordinary rubber-like activity of the year-old child.

The movements of infants seem to indicate greater suggestibility than is found in adults. A child's extreme restlessness is due to a high feeling of potential or readiness of discharge; and fatigue is accompanied by a correspondingly complete collapse of muscular movements. This follows from the mobility of the infant's cerebral elements before they are pressed into definite connections and systems which give them greater inertia, on the one hand, and greater general capacities for continued expenditure on the other. Upon this superfluity of motor energy is built up the so-called play instinct, which is not definite enough in its channels to be classed properly as an instinct.

REFERENCES.—Bernheim, *Suggestive Therapeutics* (New York, 1890); Baldwin, *Mental Developments: Methods and Processes*, chap. vi. (New York and London, 1895). See also the articles ASSOCIATION OF IDEAS and HYPNOTISM.

J. MARK BALDWIN.

Suhm, soom, PETER FREDERIK: historian; b. in Copenhagen, Denmark, Oct. 18, 1728; studied law and philology at the university of his native city; settled in 1751 in Trondhjem in Norway, where he lived till 1765, devoting himself to the study of Danish and Norwegian history and antiquities in preparation for his great works. D. in Copenhagen, Sept. 7, 1798. Among his many writings relating to the history of Denmark may be mentioned *Forødg til Forbedringer i den gamle danske og norske Historie* (1757); *Om de nordiske Folks ældste Oprindelse* (1770); *Kritisk Historie af Danmark i den hedenske Tid* (4 vols., 1774-81); *Danmarks Historie* (14 vols., 1782-1828). In spite of its many faults of style and arrangement this last still remains the greatest work of its kind in the Danish language, the chief authority from which later historians have borrowed. By his *Letter to the King* (1772), indorsing the conspiracy against Struensee and calling upon Christian VII. to restore the ancient liberties of Denmark, he became for the moment the most popular man in the North. Both as patron and author he devoted himself to the advancement of freedom and culture. His magnificent library, containing 100,000 volumes, he bequeathed to the Royal Library. Of *Scriptores Rerum Danicarum Mediæ ævi* he edited vols. iv.-vii. (1776-92). Revised by D. K. DODGE.

Suicide [Lat. *sui*, of one's self + *ca'dere*, slay, kill]: intentional death by one's own hand. Among the ancients

suicide was considered neither a crime nor dishonorable, Demosthenes, Themistocles, Mark Antony, Cleopatra, Hannibal, and many others having chosen this way of ending their days. The Scriptures and the Apocrypha furnish examples, as Samson, Eleazar, and Judas Iscariot. In modern times history furnishes numerous striking suicides. The famous suicides among the ancients followed various motives, the vindication of honor being a common object. Mithridates and Hannibal died in this way rather than be taken prisoners. Others have committed suicide through false pride or timidity: a striking case in point was the death of Cato; determined not to live under the despotism of Cæsar, he stabbed himself, but, having fainted, his wound was dressed. When he recovered he tore off the bandages, let out his entrails, and expired.

Many writers have defended this crime, the most able of whom were Madame de Staël, Gibbon, Hume, Schopenhauer, and von Hartmann. Suicide is rarely committed, however, except when the functions of the brain have been impaired and the action of the mind perverted and directed in improper channels.

Suicide has sometimes been epidemic in character. A remarkable epidemic prevailed in Versailles in 1793; the number of suicides in that year reached 1,300, which was greatly disproportionate to the population. Instances have been cited where children have followed the example of one of their number and have taken their own lives. An epidemic of suicide took place in the army of the First Napoleon, and it was only after a strong appeal made by the emperor to the pride and courage of the men in the ranks that it was finally stopped. One of these outbreaks followed the suicide of a convict, who hanged himself to the crossbar of his cell. Five others hanged themselves on the same bar within two weeks. The public prints probably have much to do with the increase of suicide. A morbid person who reads the account of such a case will very often have a train of thought started that will end in the com-

The consideration of suicide from the medical point of view has cleared up many mooted points, such as the degree of responsibility the person is under, the degree of prevention possible, etc. In certain forms of insanity the impulse to suicide is now a recognized symptom, notably in all the disorders which involve melancholia. Alcoholic mania is liable also to issue in this impulse. The peculiar liability of persons whose mental balance is at all weakened to the influence of suggestions of all kinds makes it a necessary part of competent medical treatment that any accounts of suicide, murder, or suggestions of death be kept from them. On the other hand, solitary confinement is found to increase the number of suicides; probably because by diminishing the number of the patient's interests his thought is brought home more forcibly to his own condition, grievances, etc.

Statistics.—Thorough and adequate statistics of suicide are not to be had. Those now given are current ones, and should be quoted only with reservation. In Roman Catholic countries the number of suicides is considerably less than in Protestant countries (about half), the figures in the aggregate for Protestant countries being about 175 to 200 for each million of the population. As to the difference between men and women, suicides are oftener men by about three to one.

From Table I. (from Morselli) and other sources we get the average annual number of suicides per million of inhabitants: Denmark, 258; Germany, 175; Norway and Sweden, 100; France, 150; to which may be added England and the U. S., each 70. Among uncivilized and barbarous tribes and peoples, suicide is practically unknown. It is therefore peculiarly a disease of civilization. In all countries it is more frequent among the mercantile than among the professional classes; and more frequent among the responsible heads of institutions, business houses, etc., than among the dependent classes represented by clerks. Indeed the fact of responsibility seems to be a prevailing cause of suicide. Those, on the contrary, who live a most precarious life, such as the day-

TABLE I.—SHOWING THE AVERAGE ANNUAL NUMBER OF SUICIDES PER MILLION INHABITANTS IN VARIOUS COUNTRIES AT SUCCESSIVE PERIODS.

STATES.	1816-20.	1821-25.	1826-30.	1831-35.	1836-40.	1841-45.	1846-50.	1851-55.	1856-60.	1861-65.	1866-70.	1871-75.
Sweden	48	58	69	66	66	67	71	57	78	85	81	
Norway	..	80	97	109	107	110	107	94	85	76	(73)	
Denmark	213	232	258	272	276	288	277	258	
England	628	641	(641)	..	65	66	67	66	
Ireland	10	..	..	..	..	(14)	15	18	
Prussia	74	83	89	96	103	110	123	122	122	142	134	
Hanover	83	..	106	109	118	181	(183)	140	
Mecklenburg	68	..	..	..	..	185	142	..	162	..	167	
Nassau	85	..	..	95	102	147	147	
Kingdom of Saxony	158	198	199	248	245	264	297	
Bavaria	55	73	85	80	90	91	
Württemberg	107	108	..	..	123	169	
Belgium	68	..	108	109	139	156	
France	39	46	62	60	(87)	55	66	68	
Italy	..	54	64	76	85	97	100	110	124	135	150	
	(28)	30	35	

TABLE II.—SHOWING THE NUMBER OF DEATHS BY SUICIDE IN THE CITY OF NEW YORK, ACCORDING TO THE MEANS USED, NATIVITY AND SEX, FROM 1878 TO 1891.

NATIVITY.	Cut and stab.		Drowning.		Gunshot.		Hanging.		Jumping from height.		Poison.		Other means.		Totals.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Austria-Hungary	4	..	1	1	21	3	5	2	3	2	14	6	..	..	48	14
Bohemia	3	1	..	..	11	1	9	..	2	1	9	3	..	..	34	6
Belgium	2	..	..	..	3	..	2	..	..	..	..	..	..	..	7	..
British America	3	..	3	..	6	..	2	1	1	..	3	5	..	..	18	6
England	17	3	2	..	31	..	5	..	5	5	31	10	..	..	91	18
France	6	1	..	1	27	2	9	1	3	3	14	5	..	..	59	13
Germany	92	10	46	16	366	14	232	31	35	10	218	76	..	1	969	158
Ireland	32	10	9	13	87	2	24	14	19	10	59	59	2	..	182	104
Italy	5	..	3	..	17	1	3	..	1	3	5	..	..	..	32	9
Poland	..	..	..	..	11	..	7	..	2	1	5	2	..	..	25	3
Russia	2	..	..	..	7	..	10	2	..	1	4	5	..	..	23	8
Scotland	4	..	1	1	6	..	..	..	1	..	7	..	..	..	19	1
Switzerland	3	..	1	..	17	1	4	1	1	1	3	4	..	..	29	7
Sweden	3	1	1	..	6	..	4	..	1	..	2	..	..	..	17	3
United States	52	9	21	5	251	23	66	11	34	24	131	113	1	..	556	185
Unknown	6	..	10	1	48	1	19	1	2	1	21	4	1	..	107	8
Other foreign countries	5	..	5	1	26	..	10	2	5	2	19	3	..	..	70	8
Totals	239	35	103	39	891	48	411	66	115	64	543	302	4	1	2,306	535

mission of the act. Favorable opportunities for the accomplishment of self-murder will also produce a sudden irresistible impulse. People who have gone up into towers and monuments, or above precipices, have often refrained with difficulty from casting themselves down.

laborers, who may be thrown out of employment at any moment, seem to take their chances with less brooding and personal violence. There is here a discrepancy between the tendency to murder and that to commit suicide; for the murderers are more common among the laboring class, or

still lower classes. Education also seems to increase the propensity to commit suicide. One of the defects of most statistics of suicide is that they do not take account of the unsuccessful attempts at self-destruction, in which the person is equally a suicide.

LITERATURE.—Murelli, *Suicide* (London and New York, 1898); Legoyt, *Le Suicide Ancien et Moderne* (Paris, 1894); statistics contained in successive *Genius Reports* of the different governments; Lewis, *History, Literature, etc., of Suicide* (London, 1883); full list of titles in *Nides and Quince* (1890), p. 499; Tuke, article *Suicide* in *Encyc. of Psych. Medicine* (London, 1892), where statistics are given down to 1890.

J. MARY BARROWS.

SUICIDE IN LAW.—The legal definition of suicide is intentional self-murder by a person of criminal responsibility, in point of age and mental condition. According to Bracton, the early English law treated suicide as a felony, punishable by the forfeiture of lands in case it was committed to escape conviction for a crime, by the forfeiture of goods in all other cases. (2 *De Legibus*, ch. 31.) Later English law imposed the forfeiture of goods and chattels real in all cases. The rule was avoided frequently by a finding of the coroner's jury that the suicide was insane, and was formally abolished in 1570, (32 and 34 Vict., ch. 29.) From an early day the practice prevailed of burying suicides at crossroads with a stake through the body; but it is said to have been without warrant in the common law. (9 *Shepherd's History of Criminal Law*, p. 105.) Its origin is doubtful, but has been ascribed to a Teutonic custom taken up into the canon law. (Guisey, *Penal Laws against Suicide*.) The object of impaling the body appears to have been to keep the ghost from wandering about in the discomfort of the living. (Stranahan, *Suicide and Insanity*, London, 1896.) Parliament abolished the practice in 1828, and later statutes authorize the interment of suicides in churchyards or burial-grounds, with such funeral services as those in charge of the body may provide. (45 and 46 Vict., ch. 19.) The Roman law dealt very leniently with suicide, even to the extent of legalizing it in various circumstances. During the later empire and the Middle Ages the legal rules upon this subject underwent a radical change, produced not only by different ethical and religious views but by political considerations. It was argued that "there could be no patient endurance in the state unless there was patient endurance in the citizen. If the people resorted to suicide to escape trouble, so would the state, and all social order would be at an end."

In the U. S. suicide is not treated as a crime. It is deemed unlawful, however, and a person who unintentionally kills another while attempting to commit suicide is guilty of criminal homicide. (*Commonwealth vs. Mink*, 129 Mass. 422.) At common law a person who kills another at the latter's request, or who persuades another to kill himself, or who agrees to join another in committing suicide, is guilty of murder. Such is still the rule in England, although it is improbable that one who joined another in a common attempt at suicide, but who escaped, would be punished capitally. An unsuccessful attempt at suicide is a common-law misdemeanor. In some of the U. S. such an attempt is punishable as a statutory felony, as is the offense of aiding another to commit suicide, and that of abetting another to attempt suicide. (See New York Penal Code, §§ 172-174.) The Indian penal code provides a severe punishment for persons aiding minors or incompetents to destroy themselves than for those who aid the suicide of sane adults. (§§ 305 and 306.) Macaulay, in his report of the draft of this code, argues strongly against the common-law rule which places the abettor of suicide in the same category with the abettor of murder. (See Wharton, *On Homicide*, § 815, note.) The punishment of one who attempts suicide and fails has been criticised as putting a premium upon the successful completion of the suicidal act.

The law of Scotland does not treat suicide as a crime. It does provide for the sequestration of the suicide's movables; but the proceeding leading to such sequestration is civil and not criminal, and the next of kin to the deceased must be made parties. The proceeding is practically absolute. (Erskine, *Principles of the Law of Scotland*, p. 530, § 39, Rankine's ed., Edinburgh, 1860.) There is no warrant in law or practice for the infliction of any punishment or indignity upon the body of a suicide in Scotland. 1 Hume, *Commentaries on the Criminal Law of Scotland*, p. 309; *Earl of Eglinton vs. Campbell*; Macleod's *Criminal Cases*, 504-551.

The consequences of suicide in life-insurance cases are

discussed in the article on LIFE-INSURANCE under the heading *Perfection*. See also Richards, *On Insurance*, § 159; *Smith vs. National Benefit Society*, 120 New York 85; and *Thom. Life Insurance Company vs. Adams*, 150 United States 499.

FRANCIS M. HARRIS.

Su'idæ [Mod. Lat., named from *Sus*, the typical genus, from Lat. *sus*, hog;] a family of artiodactyl ungulate mammals, of the section *Quadrupedæ* or *Non-ruminantia*, typified by the common hog. The form in all is essentially like that of the domesticated hog, but mostly less gross; the feet are unguligrade (i. e. with the toes only touching the ground), and the external toes and hoofs are reduced in size and do not assist in progression, the median third and fourth of normal series only being functional; the snout is distended and provided with a cartilaginous ring, and in the disk the nostrils are open and forward; the mammae are in considerable number (four in fem, ventral as well as inguinal); the back has no dorsal scent-gland; the tail is short or rudimentary; the tegumentary appendages are developed as stiff bristles; the orbits are directed outward and forward; the occipital bones have long deflected styiform paroccipital processes in front of the occipital condyles; the zygomatic processes overlap the malar bones; the articular surfaces for the lower jaw are transversely convex, antero-posteriorly convex, and limited by no post-glenoid processes; the pterygoid bones are twisted and reflected outward, the crest continued upward and backward into the temporal region; the malar bones are elongated, and have long inferior processes; the teeth are generally in full number, i. e. M $\frac{1}{2}$, P, M, $\frac{1}{2}$ (4), C, $\frac{1}{2}$, I, $\frac{1}{2}$ (3) $\times 2 = 44$; the molars have corrugated cusps, presenting, when worn, deeply sinuated insular areas; the canines of the upper jaw, in the males, are more or less twisted outward and upward, and parallel with the lower. In their anatomy the feet offer characters shared with the wart-hogs and peccaries, and differentiating from the hippopotamids. The living representatives of the family are peculiarly peculiar in the Old World, although in the Tertiary epoch species appeared to have existed in America. Exclusive of the domesticated forms, fifteen species have been recognized. Twelve of these belong to the genus *Sus*, and are all peculiar to Asia, except *S. acrota* (the wild boar of Europe) and *S. senegalensis* of Northern Africa; the genus *Potamochoerus* is confined to West Africa, the single species of *Bobakia* to Celebes and a few of the adjoining islands, and a single species in India and the Archipelago exemplifies the very strongly marked genus *Bobakia*. The domesticated swine are subject to great variation, and Gray even differentiated them into two peculiar genera—*Scofo* for most of the breeds, and *Centurus* for a peculiar race of Japan and China, distinguished by the strongly defined concentric wrinkles of the face. See BARROWS, BODDIE-VAZZ, and SWINE.

Revised by P. A. LUDAN.

Su'idæ [= Lat. = Gr. *Σούιδæ*]; lexicographer. Of his life nothing is known; even the age in which he lived is uncertain, though it may be fixed not later than the twelfth century. His book contains explanations and notices of Greek words and names, illustrated by extracts from older Greek writers. It has evidently gone through many hands before reaching its present form, and it is generally of very little critical value; but as many of the words from which it quotes passages are lost, it has great historical interest. Editions by Gaisford (Oxford, 1834); Bernhardy (Halle, 1834); and Bekker (Berlin, 1854).

Suine, or Butterine. See BUTTER, ARTIFICIAL.

Sukhāvati [Sanskrit, paradise of pleasures]; the heaven over which, according to the Mahā-yāna, or "Great Development" of Buddhist doctrine, a Dharmā-Buddha (see DHARMA-BHONAS) called Amitābha presides, and where the saints, exempt from suffering, death, and sexual distinction (but not from rebirth), may live for countless ages in absolute bliss. Summer and winter are there unknown; the sun never scorches and cold winds never blow; sweet flowers shed their perfume around, and birds of the most beautiful plumage sing day and night of the five chief virtues, the five sources of moral power, and the seven steps in knowledge, and the listener is so affected by their music that he can think of nothing but of Buddha, His law, and His Order. Among the Chinese this paradise is called *Taishan*, the Pure Land in Japanese, *Sōdō*, because its inhabitants are free from the five impurities of this world. Rebirth in Sukhāvati can be secured only by unswerving faith in Amitābha, by fervent prayer addressed to him, and by the practice of every virtue. Amitābha is not only the Buddha of

"boundless light," but also of great mercy and sympathy. His worship is peculiar to the northern school of Buddhists, among whom it takes the place of *NIRVANA* (*q. v.*), which is too difficult of attainment. Sukhāvati is situated in some universe in the far West, and hence is known as the "Paradise of the West."

Sula Islands (Dutch, *Soela*): a group of three islands and many islets in the Dutch Moluccas, E. of Celebes and N. W. of Buru, between lat. 1° 40' S. and 2° 30' S., and 124° and 127° E. lon. Area, 2,590 sq. miles. The largest and westernmost is Taliabu (70 miles long and 15 broad); immediately E. is Mangola, the second in size, and S. of the latter is Besi, the smallest but most thickly populated, and containing Senana, the capital. Pop. about 7,000, formerly six times as large, but depopulated by pirates and slave-merchants. The islands are prosperous under Dutch management. M. W. H.

Suleiman': Ottoman prince. After the battle of Angora (1402) he, as the eldest surviving son of Bayezid I., ascended the throne at Adrianople, but was overthrown by his brother Musa (1410). The Ottoman historians do not consider him a sultan, inasmuch as he reigned only over a part of the empire. E. A. G.

Suleiman: the name of two Ottoman Sultans. **SULEIMAN I.**, EL KANOUNI, the Legislator, often called the Great, the Magnificent, the Sublime (1520-66); b. in 1495, son of Selim I. His reign is a series of generally successful wars, during which he conducted thirteen campaigns in person. In 1521 he crushed a rebellion in Syria, concluded a treaty with Venice, wherein she promised an annual tribute of 10,000 ducats, and captured Belgrade. In 1522 he subdued Rhodes, expelling the Knights of St. John of Jerusalem, whose stronghold it had been 214 years, who found an asylum at Malta. In 1526 he concluded a partial alliance with Francis I. of France against Charles V.; broke the Hungarian power at the battle of Mohacz, where King Louis and 25,000 Hungarians were slain, and brought to Constantinople 100,000 Christian captives, the royal jewels of Hungary, and the precious library of Matthias Corvinus. Besieging Vienna with 120,000 men and 400 cannon, he was repulsed (1529); concluded an offensive and defensive alliance with Francis I. (1533); and took Bagdad from Persia (1534). Meanwhile his admiral, Khafreddin Pasha, terrorized the Mediterranean and subjected Northern Africa. Moldavia and the Khan of the Crimea made submission (1538). Venice, after a disastrous war, purchased peace by promising annual tribute of 300,000 ducats (1539), and Austria, by like tribute of 50,000 ducats (1547). He conquered Persian Kurdistan, captured Van and Tebriz, and partially subdued Georgia (1548). Austria fared better in the next war, defeating the Ottomans with fearful loss in their five months' siege of Erlau (1552). Though Suleiman formed an offensive and defensive alliance with Henry II. of France, dissensions prevented real benefit to either. Fruitless wars followed with Persia (1554-55) and with the Hungarians (1558). Instigated by his favorite, Roxelana, who sought the succession for her son, he put to death his oldest son, Mustapha (1553). Enraged with his son Bayezid, who fled to Persia, he paid the Shah Tahmasp 400,000 gold pieces to insure the murder of the fugitive and of his four sons (1561). To break the naval power of Spain and control the Mediterranean he attacked Malta, but was defeated with the loss of 20,000 men (1565). Carrying on a last war with Austria, he died at the siege of Szigeth (1566), which, after an heroic resistance, fell three weeks later. Meanwhile the death of Suleiman was kept secret, that his successor, Selim II., might have time to reach Constantinople from Kutahia. During his reign the Ottoman empire reached its acme and began its decline. The discipline of the janissaries was relaxed; the harem, in the person of Roxelana, first began to exert undue and hence pernicious influence, and expenditure was carried to its utmost extravagance. More fatal still, during the latter part of his life, Suleiman partially withdrew into Oriental seclusion, leaving affairs to his ministers. Yet this was the golden age of Ottoman jurisprudence, literature, and art. Suleiman remodeled and almost recreated the code, determined ecclesiastical procedure, introduced a less vicious system of taxation, and erected the mosques of Suleiman—the masterpiece of Ottoman architecture—of Selim, the Shahzadeh, Djeanghir, and the Hasseki. He had statesmen and generals of unusual ability in Ibrahim Pasha, Rustem Pasha, and Sokolli Pasha. His admirals, Khafreddin Pasha, Dragut Pasha, and Piali Pasha, were the most skillful naval commanders Turkey has pos-

sessed. But Suleiman was the spoiled favorite of Ottoman fortune, and his successes were mainly won during the early years of his reign. Though he extended the boundaries of his empire, he left it at his death weakened and exhausted. —**SULEIMAN II.** (1687-91), b. in 1642, the son of Sultan Ibrahim. Timid and incapable, he committed the administration of affairs to his vizier, Kupruli Zadek Mustapha Pasha, the Virtuous, who was slain, with 28,000 Ottomans, at the terrible defeat of Selankemen (Aug. 19, 1691), two months after the death of his master. E. A. GROSVENOR.

Suleiman Pasha: Ottoman prince; son of Orkhan and grandson of Osman I. He captured Tzyppe and Gallipoli (1357), the first territorial acquisition made in Europe by the Ottomans. He was killed by a fall from his horse in 1359, and his father died of grief in 1360. E. A. G.

Sul'idæ [Mod. Lat., named from *Sula*, the typical genus, from Icel. *sula*, gannet]: a family of swimming birds of the order *Steganopodes*, limited to the gannets. The neck is moderately long, although shorter and stouter than in either the pelicans or cormorants; the bill about as long as the head, straight, but with the tip decurved, with the lateral grooves well defined, composite as in the other members of the group, and with the edges serrate; narial openings lacking; no gular pouch developed; wings moderately long and pointed; tail long and cuneate, and with twelve to fourteen feathers; tarsi moderately short; toes (four, as in all *Steganopodes*) well developed and connected by a full membrane. The skull is of the desmognathous type, and exhibits modifications co-ordinate with the external characteristics. The species are almost exclusively marine, and one or more may be found on the seacoast of every country. See GANNET. Revised by F. A. LUCAS.

Sulliman' Mountains: a chain of mountains forming the boundary between India and Afghanistan. They range from N. to S., and reach their greatest height, 11,300 feet, in Takht-i-Suliman, in lat. 31° 25' N. They connect S. with the Kurlekhi Mountains of Kelat, and N. with the Seftid Koh, which is 15,622 feet high and ranges from E. to W. The descent toward India is steep, but gentle toward the Afghan plateaus; the valleys drain eastward to the Indus. The most convenient ascent to Kandahar is effected along the Gomal from Dera Ismael Khan on the Indus.

Revised by M. W. HARRINGTON.

Sull'na: the name of the central delta-branch of the Danube. The Danube, at 45 miles from the coast, divides into the Kilja and Toulcha branches, the former conveying more than half the entire discharge. The latter again divides into the Sulina and St. George branches. The Kilja and St. George mouths are 38 miles apart, and the Sulina mouth nearly half way between. The European Commission of the Danube, representing eight European states, was created by the treaty of Paris (1856), for the purpose of removing obstructions to navigation and deepening the channel, and its powers were prolonged until Apr., 1904, by the treaty of London (1883). This commission has so far succeeded that the Sulina branch is navigable by the largest vessels. (See HARBORS.) The town of Sulina, at the corner of the right bank and the Black Sea, originally a miserable fishing-village, has remarkable public works. Pop. (1889) 4,315. E. A. GROSVENOR.

Sul'lotes [deriv. of *Suli*, in the Cassopeian Mountains, formerly their chief village]: a band of 1,500 Albanian Christian warriors who forced the Ottomans to acknowledge their independence about 1730. In 1788 and again in 1792 they successfully resisted Ali Pasha of Tepeleni, who undertook their subjection. From 1799 to 1803 they were blockaded and practically besieged in their mountain fastnesses by Ali Pasha; their strongholds were gradually captured, despite desperate resistance, and they finally surrendered on favorable terms. The conquerors violated their oath, and men, women, and children were indiscriminately massacred. Only a few escaped. The story of the twenty-two Suliote women, who, rather than fall into the hands of the Ottomans, hurled their children from a precipice and then leaped after them, is everywhere known. Marco Botzaris was a Suliote. They were avaricious and haughty, but loved their freedom above all. E. A. GROSVENOR.

Sulla, or **Sylla**, LUCIUS CORNELIUS, surnamed FELIX: dictator; b. 138 B. C.; was noted in youth for his vices, but distinguished himself under Marius as a cavalry leader in the Jugurthine war, and it was through his skill as a negotiator that Jugurtha was surrendered to the Roman general.

From this moment Marius feared and hated him as a rival. In the war against the Cimbri and Teutones (104-101), Sulla commanded with distinction, and in 92 he was sent as proconsul to Cilicia, where he defeated Mithridates, the general of Mithridates, reinstated Ariobaranes as King of Cappadocia, and received an embassy from Arsaces, King of Parthia. In the Social war both Sulla and Marius commanded with success, but it was Sulla who defeated Popilius Mithras, the chief of the Samnites, and took Beneventum, their capital. For the year 88 he was elected consul almost unanimously, and, to the deep mortification of Marius, appointed commander in the Mithridatic war, a war which Marius had in many ways instigated, in the hope of being chosen general. By means exceedingly violent, though in form legal, Marius succeeded in subverting the appointment of Sulla and getting himself appointed, but during the riot which took place in Rome Sulla escaped to Nola in Campania, where his army was stationed. Followed by the rank and file of his army, he now marched on Rome. Marius fled to Africa, and Sulla was perfect master of the situation; but realizing his dependence upon the army, which was eager for the spoils of an Eastern war, he soon left the city and proceeded with the army to Greece. He stayed away four years (87-83). Shortly after his departure he was declared a public enemy; his property was confiscated; his friends were persecuted or slain. Marius returned, and the Marian or popular party dominated in Rome and Italy. But of all this Sulla took no notice; he simply prosecuted the war. Sulla took Athens by storm in 86 and gave it up to plunder. Shortly after he routed one of the hostile armies at Chæronea; next year he totally destroyed another at Orchomenus, and having expelled Mithridates' troops from Greece and pacified the country, he crossed the Hellespont in 84. Pressed at the same time by another Roman army sent out by the Marian party under Plautius and Probus, ill supported by his Greek subjects in Asia, who found him as unamiable as the Romans, and nearly exhausted by his enormous losses in Greece, Mithridates now sued for peace, and after a personal interview between him and Sulla a treaty was concluded, according to which he returned all his conquests in Asia, surrendered a fleet of seventy large vessels, and paid 2,000 talents. Sulla now turned against Phœnicia, whose soldiers deserted him, and who committed suicide; he then regulated the affairs of the province of Asia, from whose cities he made enormous contributions, and finally set sail for Italy, where he landed at Brundisium in the spring of 83. His soldiers were now rich, and they knew that the final success of their general was a condition of the enjoyment of their riches; they clung firmly to him, and he acted cautiously. Marius was dead, but his son was consul and his party in power, strengthened by an alliance with the discontented Italian nations. The final battle was at the gates of Rome, where Sulla's veterans defeated a large body of the Samnites. Sulla was made dictator for life. It was not his purpose, however, to establish a monarchical constitution in Rome. The legislation which he enacted as dictator, the so-called *Leges Corneliae*, aimed simply at the restoration of the old aristocratic constitution, the extension of the authority of the senate, the restriction of the power of the tribunes, etc. In order to establish this constitution firmly and safely, he first determined to extirpate its adversaries, the Marian party. Thousands of men fell under his proscription; that is, they were outlawed and slain, and their property was confiscated and given to soldiers else. He then attempted to form a steady support for it by settling his veterans in military colonies on such Italian soil as had been confiscated in the Social war or afterward, and by organizing a body-guard stationed at Rome. When he considered his work finished, he assembled the people, abdicated the dictatorship, retired to his villa at Puteoli, and returned to the lazy, voluptuous habits of his youth. His death, which occurred in 78 B. C., was hastened by his debaucheries.

Revised by F. M. Conway.

Sullivan: city; capital of Monticello co., Ill.; on the Chi. and R. Ill. the Pac., Des. and Evansv., and the Wabash railways; 14 miles N. W. of Mattoon, 25 miles S. E. of Decatur (for location, see map of Illinois, ref. 7-Ft.). It is in an agricultural and stock-raising region, and contains 2 State banks with combined capital of \$53,000, and 3 weekly newspapers. Pop. (1890) 1,365; (1900) 1,468.

Sullivan: town (founded in 1843); capital of Sullivan co., Ind.; on the Evansv. and Terre Haute and the Ind. and Ill. S. railways; 80 miles S. of Terre Haute (for location, see

map of Indiana, ref. 8-B). It is in a coal-mining region; manufactures lumber, flour, and tile, and contains 6 churches, graded public schools, electric light, 2 State banks with combined capital of \$34,000, and a semi-weekly and 2 weekly periodicals. Pop. (1890) 2,161; (1900) 2,292; (1906) estimated, 2,600. Bureau of "Democrat."

Sullivan, ALEXANDER MAURICE: journalist and politician; b. at Castleown, Ireland, in 1836; was connected in 1855 with the Dublin *Refugee*, of which he was editor and proprietor until 1876. In 1868 he was indicted for sedition in consequence of articles referring to the Manchester executions, and sentenced to four months' imprisonment. He was returned to Parliament in 1874 in the Home-rule interest, a movement with which he was especially identified. Mr. Sullivan represented the county of Louth till the general election of 1890, when he was elected for Meath. In 1893 he withdrew from Parliament in consequence of ill health. He published several works, among which are *A Visit to the Valley of Wyoming*, a pamphlet descriptive of a tour in America made in 1857, and *New Ireland* (1877). D. at Dalkey, Ireland, Oct. 17, 1884. F. M. Conway.

Sullivan, Sir ARTHUR SEYMOUR: composer; b. in Londondun, May 18, 1842; the son of a teacher of music. He was early trained in the art, singing in the chapel royal when a mere child; at the age of fourteen gained the Mendelssohn scholarship, which enabled him to pursue his studies under the best masters at home and on the Continent. For *The Tempest* of Shakespeare he composed incidental music which was performed for the first time at the Crystal Palace in 1862. He was knighted May 15, 1893. His compositions include overtures, symphonies, songs, and piano music; the operettas *Box and Cox*, *Thespia*, and *Comedians of the Sea*; the cantatas *The Bride of North Valley*, *Kenilworth*, and *On Sea and Land*; the oratorios *The Typhoid Men*, brought out at the Worcester musical festival in 1892, and *The Light of the World*, produced at the Birmingham festival in 1873; and an opera, the libretto by Chorley, entitled *The Nymphs' Necklace*. Sullivan's greatest successes have been made with his comic operas, in which he had the invaluable collaboration of William S. Gilbert, the distinguished playwright. Beginning with *H. M. S. Pinafore* (1878), and followed by *The Pirates of Penzance* (1879), *Palmyra* (1881), *Julianth* (1882), *The Mikado* (1885), also *The Yeomen of the Guard*, *The Gondoliers*, etc., his popularity has been greater, perhaps, than that of any other English composer. He has also written a grand opera called *Ionathor*, which did not prove a success.

Revised by DUNCAN HUGH.

Sullivan, RALPH: actor; b. in Birmingham, England, in 1824; made a successful debut on the stage at Cork in 1840, acting thereafter in the principal towns of Ireland, Scotland, and England, and making his first appearance at the Haymarket theater, London, in 1852, as Hamlet. He visited the U. S. in 1857; returned to Great Britain in 1860, and in 1861 made a profitable professional visit to Australia, returning to England in 1863. He subsequently became lessee of the Holborn theater, London, and in 1875 made a second and not very successful visit to the U. S. D. at Brighton, England, May 3, 1891. Revised by B. B. VALENTINE.

Sullivan, FRANCIS STOURTON, LL. D.: lawyer; b. probably in Ireland near the middle of the eighteenth century; became Professor of Common Law in the University of Dublin, and was the author of two legal works of great value, *Historical Treatise on the Feudal Law*, and on the *Constitution and Laws of England* (1772) and *Lectures on the Constitution and Laws of England* (1776). F. S. A.

Sullivan, JAMES, LL. D.: jurist and statesman; b. at Berwick, Me., Apr. 22, 1744; studied law; practiced at Bedford, and in 1770 was appointed king's attorney for York County. As the Revolution approached, he espoused the patriot cause; was a member of the provincial congress of Massachusetts, of which Maine was then a part, and was one of a commission of three who were in 1775 sent on a secret mission to Ticonderoga. In 1776 he was appointed a judge of the superior court, in 1779-80 a member of the State constitutional convention, and a delegate to Congress in 1784-85. He removed to Boston for which he was repeatedly chosen representative in the Legislature; was a member of the executive council and judge of probate in 1787; attorney-general of the State 1790-1807; elected Governor in 1807, and again in 1808. He was the projector of the Middlesex Canal, a member of the American Academy of Arts and Sciences, and for many years president of the Massachusetts

Historical Society. Among his works are *Observations on the Government of the United States* (Boston, 1791); *History of Maine* (1795); *Review of the Causes of the French Revolution* (1798); and *History of Land Titles in Massachusetts* (1801). D. in Boston, Dec., 1808. See *Life*, with selections from his writings, by his grandson, Thomas C. Amory (2 vols., Boston, 1859).

Sullivan, JOHN, LL. D.: soldier; brother of James Sullivan, jurist; b. at Berwick, Me., Feb. 17, 1740; studied law and practiced successfully; was a member of the first general congress, and in Dec., 1774, led a company which captured a fort near Portsmouth, N. H. In June, 1775, Congress appointed him a brigadier-general, and during the siege of Boston he commanded the left wing under Gen. Lee. In 1776 he commanded the Northern army in Canada, attacked Three Rivers unsuccessfully, and retreating, joined at New York the army under Gen. Washington. On Aug. 10, 1776, he was made a major-general, and in the battle of Long Island commanded temporarily the division of Gen. Greene; was taken prisoner, but soon afterward exchanged; commanded at Trenton and Princeton the division of Gen. Lee, who had been captured; at the battle of Brandywine commanded the right wing of the army, and defeated the British left at Germantown. Transferred in the winter to command in Rhode Island, he laid siege to Newport in Aug., 1778, but the French fleet under d'Estaing failed to co-operate, and he was compelled to withdraw his forces from the island, after defeating the enemy at Butt's Hill, Aug. 29. In the summer of 1779 he marched against the Indians of the Six Nations, defeated them and their Tory allies, and laid waste the country to prevent their return. Shortly after, he resigned from the army, and in 1780 was again a member of Congress. Resuming the profession of law in New Hampshire, he was attorney-general 1782-86, and president of the State 1786-89; in 1788 his exertions secured the adoption of the Constitution. In Oct., 1789, he was appointed U. S. district judge of New Hampshire. D. at Durham, N. H., Jan. 28, 1795.

Sullivan's Island: a long, narrow island in Charleston co., S. C.; 6 miles from Charleston, and on the north side of the entrance to Charleston harbor. It is the site of FORT MOULTRIE (q. v.), and is a fashionable resort for sea-bathing. There are many summer residences. The island is connected with Charleston by steam-ferryboats, which convey some 200,000 passengers annually. The island is 6 miles long, and is separated from the mainland by a tidal channel.

Sullivant, WILLIAM STARLING, LL. D.: botanist; b. near Columbus, O., Jan. 15, 1803; graduated at Yale College in 1823; took charge of the extensive landed estates left by his father, and devoted himself with great zeal to botany, making the mosses a special subject of study. He published *Catalogue of Plants Native or Naturalized in the Vicinity of Columbus, Ohio* (1840); *Musci Alleghanienses*, to produce which he made a journey from Maryland to Georgia (1845); *Musci and Hepaticæ of the United States East of the Mississippi River* (1856); *Mosses brought Home by Wilkes's Exploring Expedition* (1859); *Mosses and Hepaticæ, collected mostly in Japan* (1860); *Musci Cubenses* (1861); *Icones Muscorum* (vol. i., 1864; vol. ii. (posthumous), 1874); and in conjunction with L. Lesquereux, two series of *Musci Boreales Americani*. D. in Columbus, Apr. 30, 1873.

Revised by CHARLES E. BESSEY.

Sul'ly, JAMES, M. A., LL. D.: psychologist; b. in Bridgewater, Somersetshire, England, Mar. 3, 1842; educated at Taunton, London, and Göttingen; was lecturer in College of Preceptors, London, until 1892, when he became Professor of Philosophy in University College, London. His principal works are *Sensation and Intuition* (London, 1874); *Pessimism* (London, 1877); *Illusions* (London, 1881); *Outlines of Psychology* (London, 1884); *The Teacher's Handbook of Psychology* (London, 1886); *The Human Mind* (London, 1891).

J. MARK BALDWIN.

Sully, st'lee', MAXIMILIEN DE BÉTHUNE, Baron of Rosny, Duke of: chief minister of Henry IV. of France; b. at Rosny, department of Seine-et-Oise, Dec. 13, 1560, of a Protestant family; was from his eleventh year educated with Henry of Navarre; accompanied him through his shifting fortunes at the court and in the camp, and became his Minister of Finance and chief adviser in all public and private affairs when he ascended the throne under the name of Henry IV. A skillful administrator rather than a statesman, he made no radical changes, but contented himself with

improving the efficiency of the existing system. His chief work was the reform of the finances, which were in a disorganized condition, and managed in such a manner as to invite fraud and corruption. By enforcing a proper system of auditing accounts and by insisting that the levy of all sums should be authorized by the Government, he did away with illegal taxation, saved France more than 120,000,000 francs annually, and amassed a reserve of 80,000,000 livres. His economical views were characteristic of his time; he considered agriculture as the only productive source of the wealth of a nation, but his policy had the advantage of making France independent of foreign nations for the prime necessities of life, at a time when she was on the point of entering upon a long period of war. After the assassination of Henry IV., he resigned his offices and retired into private life. D. at Vieillebon, Dec. 22, 1641. Of his *Mémoires*, two volumes were published by himself in 1634, and two more in 1662 by Jean le Laboureur; translated into English by Mrs. Lenox (1834).

F. M. COLBY.

Sul'ly, THOMAS: painter; b. at Horncastle, Lincolnshire, England, June 8, 1788; was taken to the U. S. by his parents, who were actors, in 1792; lived in Charleston, Richmond, New York, and finally in Philadelphia; painted Jefferson, La Fayette, Washington crossing the Delaware, Fanny Kemble, Charles Kemble, Mrs. Wood, Cooke the tragedian, and other actors of celebrity. In England he painted a portrait of Queen Victoria for the St. George's Society of Philadelphia. The *Jefferson* is at West Point, the *Washington* in Boston. Sully did not, like Stuart, confine himself to portraiture. D. in Philadelphia, Nov. 5, 1872.

Sulphates: See SULPHURIC ACID AND SULPHATES.

Sulphides, or **Sulphurets** [derivs. of *sulphur*]: compounds of sulphur with metals and other elements more basic or less electro-negative than itself. This class of compounds is probably quite as large in number as the oxides. Indeed, sulphur combines with one element, fluorine, which is not known to combine with oxygen at all. There seems a general strict analogy between sulphur and oxygen in combination, running through very extended ranges of compounds. The sulphides of the metals possessing practical importance will generally be found described under the head of the metal.

Sulphites: See SULPHUROUS ACID.

Sulphocyan'ic Acid, also called **Hydrosulphocyanic Acid** and **Sulphocyanhydric Acid** [(the names being various combinations of) *sulphur* + *cyanic* + *hydrogen*]: a compound of cyanogen, CNHS, analogous in composition to cyanic acid, CNHO, in which the atom of oxygen is replaced by one of sulphur. It occurs in saliva, and in some sulphuretted essential oils of plants, such as mustard and radish. It may be prepared from sulphocyanate of mercury, which is first made by precipitating a mercurous salt with sulphocyanate (sulphocyanide) of potassium, the material of the so-called "Pharaoh's serpents." *Potassium sulphocyanate* (CNKS) is a salt of much interest from being an important and delicate laboratory reagent for ferric compounds, with which all soluble sulphocyanates strike a deep and characteristic blood-red color. The potassium salt is prepared by fusing cyanide of potassium and sulphur and subsequently purifying.

Revised by IRA REMSEN.

Sulphur, or **Brimstone** [*sulphur* is from O. Fr. *soulfre* < Lat. *sulfur*, *sulphur*; cf. Sanskr. *śulvāri*, sulphur; *brimstone* is M. Eng. *brimston*, *bremston*, *brenston*, *bermston*; *brennen*, *bernen*, burn + *ston*, stone]: one of the most important of the elements of matter, very abundantly and almost universally distributed throughout the earth and the sea. It occurs native as a mineral in many countries. It is also found in mineral form as GYPSUM (q. v.) and in a great variety of metallic SULPHIDES (q. v.); also dissolved in the ocean as sulphates. It is an important essential element of the blood, muscles, skin, hair, and other parts of animals, and exists also in some essential components of plants, though not in the woody substance thereof. It is evolved also from volcanoes, both as vapor of sulphur and as sulphuretted hydrogen and sulphurous dioxide, these gases being doubtless products of the action of oceanic water, that has penetrated to the volcanic focus, upon metallic sulphides it finds there. Indeed, it is more than probable that such action is itself one *vera causa* of vulcanicity.

Most commercial sulphur is merely the native mineral purified by fusion or further by distillation and sublimation. In Sicily, where the crude sulphur, mixed more or

ness with other minerals, is very abundant, and for some time the method is often adopted of roasting a portion of the sulphur of the ore, furnishing the heat (not very great in amount) necessary to fuse out and separate the rest of the sulphur. The ore is piled in heaps, sometimes in kilns, so constructed that a portion of it can be set on fire and heat the whole mass throughout to the fusing-point of the sulphur. The latter then collects slowly in liquid form in cavities formed for the purpose, and may be ladled out and sold or refined. The Sicilian sulphur, being free from arsenic, which is the most objectionable impurity liable to occur, is highly prized for making Solignum Aem. (q.v.). Deposits of sulphur are reported in various parts of the U. S. Mining operations have been conducted in California, Louisiana, Nevada, and Utah, but in 1893 the total product was only 1,200 tons (value \$42,000), all from Utah. The refined sulphur (brimstone) of commerce and the putrescent material known as flowers of sulphur are products of distillation and sublimation—operations which are often conducted simultaneously, there being aliphatic condensing-chambers, the first of which being hot condenses liquid sulphur, which is drawn off and cast into sticks or cylinders; while in the second, which is kept cool, the vapor precipitates in the form of "flowers," which are, when freshly prepared, composed of a special allotropic modification of sulphur.

Sulphur is one of those elements most liable to assume allotropic states when isolated. These are characterized by differences of crystalline form or by amorphous character, different relations to solvents, and different densities, but not so much by different colors as in the case of phosphorus, arsenic, and tellurium. Native sulphur often occurs in very beautiful and brilliant transparent yellow crystals, which are orthorhombic in form, with two imperfect cleavages. When molten sulphur cools it takes the crystalline form, the crystals belonging to the monoclinic system. Very beautiful crystals of this form are easily obtained by breaking the crust upon a cooling mass of melted sulphur and pouring out the liquid interior. On breaking the mass after cooling, the cavity will be found filled with slender brilliant prisms. Sulphur on heating passes through a succession of changes, melting at about 120° C. to a thin yellow liquid. If again cooled, it becomes a permanently transparent solid. Above 180° the sulphur becomes thick and viscid, losing its fluidity altogether and assuming a brown color at about 250° C. At 400° the mass again becomes liquid. At 440° C. (822° F.) sulphur boils, forming an orange-yellow vapor. Some of the sulphur-allotropes, including the two crystalline forms above described, are soluble in several liquids, such as bisulphide of carbon, oil of turpentine, and others. The bisulphide-of-carbon solution on evaporation yields beautiful transparent crystals similar to those of native sulphur. Flowers of sulphur are composed of an amorphous soluble modification. Sulphur inflames in air at a remarkably low temperature, about 482° F., burning with blue flame and evolution of suffocating sulphurous oxide, SO₂.

Medicinal Uses of Sulphur.—Taken internally, sulphur produces little effect beyond that of a mild and somewhat laxative. Externally, applied in the form of ointment, it is a powerful parasiticide, principally employed to kill the little insect that produces the itch disease. *Potassium asulphide* is a sharp irritant, and in large dose internally a corrosive poison. It may be used instead of the simple sulphur ointment as a local remedy in itch and in other skin diseases, and dissolved in water as a bath is used in skin disease and in lead-poisoning. In common with other sulphides it is sometimes used as a depilatory.

Revised by J. A. RICHES.

Sulphurets. See SULPHIDES.

Sulphuretted Hydrogen, called also **Hydrosulphuric** [*hydrogen + sulphur*], **Acid**, etc., a gas, H₂S, analogous to water, H₂O. It was first discovered by Ruelle the younger, but Scheele first ascertained its nature and properties. Sulphuretted hydrogen is emitted naturally by mineral springs and from volcanoes, and in combination with ammonia is evolved in the putrefaction of animal and vegetable matters. The smell of rotten eggs and that of a privy, generally attributed to sulphuretted hydrogen itself, are due chiefly to the compound it forms with ammonia or sulphide of ammonium. Artificially this gas is prepared by the action of a dilute mineral acid on certain metallic sulphides, of which ferrous sulphide of commerce is the one generally employed, though the native sulphide of antimony may also be used. If hydrogen gas be passed through melted sulphur this com-

ponent is formed, and a convenient way to evolve sulphuretted hydrogen for laboratory use is to melt together in a flask sulphur and paraffin. When pure, sulphuretted hydrogen is a colorless gas of an odorous odor, somewhat recalling that of bitter almonds, which produces immediate vertigo in the case of some persons and acts as a deadly poison upon some animals even in very small proportion. Many persons will, however, inhale it in diluted form without much apparent effect for a considerable time, so that it can not be regarded as necessarily a dangerous poison in the case of mankind, though the unnecessary inhalation in quantity ought to be avoided. The density of the gas is 1.175, air being unity. Faraday reduced it by compression to a liquid whose density he gives as about 0.9. The solubility of the gas in water is given by Brown as 4.97 per cent. of its volume at freezing, and about 1/2 per cent. at normal temperature. Alcohol takes up about three to four times as much as water. It is combustible, with a blue flame burning in water and sulphurous dioxide. This gas is a very important reagent in the laboratory for precipitating metals from their solutions in processes of analysis and in many processes of preparation of organic compounds in pure state, particularly in cases of organic acids, which are first converted into lead salts to be decomposed afterward by sulphuretted hydrogen.

Revised by J. A. RICHES.

Sulphuric Acid and Sulphates: a compound of sulphur, H₂SO₄, and its forms of combination with metals. Sulphuric acid is called also *oil of vitriol*, from its having been originally obtained by distillation from vitriol, or sulphate of iron. This acid was probably known to the Arabian physicians. Basil Valentine, however, is the first known author who, writing in the fifteenth century, mentions the making of sulphuric acid by distilling from vitriol. The manufacture by burning sulphur, as now practiced, was introduced in England by Dr. Roebuck about 1720. The general method is to burn sulphur, either as brimstone or in the form of metallic sulphides, as pyrites, in a draught of air, which is passed into very large chambers built of metallic lead, where the sulphurous oxide gas formed by the combustion is mixed with steam and a quantity of nitrous fumes evolved from a mixture of saltpetre or sodium nitrate with sulphuric acid. The oxides of nitrogen in the presence of water oxidize the sulphurous acid to sulphuric acid, and are themselves reduced to lower forms which, in the presence of air, are converted into higher oxides, among which is nitrogen peroxide NO₂, and these again react with sulphurous acid, so that the operation of a limited amount of nitrous fumes is continuous, acting as a carrier of oxygen to the sulphurous dioxide without consumption of its own substance. The product precipitates with condensing steam upon the walls and floors of the leaden chambers as diluted sulphuric acid, which is then concentrated to oil of vitriol—*drag*, in pans of lead, and when it has become strong enough to attack these, the boiling down is completed in large stills made of glass or platinum.

Sulphuric acid when fully concentrated has a density at 0° C. of 1.840. It is an oily, colorless, inodorous liquid, which boils at 337° F. and freezes at -31°. It absorbs water rapidly from the air, being one of the most useful agents in the laboratory for drying air and for absorbing moisture from other substances, which are for this purpose simply placed in a confined space with a quantity of oil of vitriol, which, through the medium of the air, will gradually abstract all the moisture from such substances. When mixed with water, great heat is developed.

Nordhausen, or Fuming Sulphuric Acid.—This is the acid obtained by distilling ferrous sulphate. It has the composition H₂SO₄, and is considered by some chemists as containing sulphuric trioxide SO₃ or as H₂SO₄.SO₃, but this seems hardly in accordance with the fact that it crystallizes as a whole in transparent crystals at zero. When gently heated, however, it breaks up into sulphuric oxide, which distills over and condenses as a solid body, and ordinary oil of vitriol, which remains behind in the retort. Its name of fuming acid comes from the fact of its forming white fumes in the air, due apparently to the evolution of vapor of SO₃, even at ordinary temperatures. Fuming oil of vitriol is used in the laboratory for dissolving indigo and as a reagent in gas analysis, to absorb the illuminant hydrocarbons from ordinary coal-gas.

Titrated Sulphuric Acid.—It is very useful in chemical and technical operations to be able to determine the strength of a dilute acid from its density as taken with the hydrom-

eter. The following figures are condensed from tabulated determinations of densities of dilute sulphuric acid by J. Kolb:

DEGREES BAUMÉ.	Densities.	SO ₃ in 100 parts.
1	1.007	0.7
5	1.037	4.7
10	1.075	8.8
15	1.116	13.2
20	1.162	18.0
25	1.210	23.2
30	1.263	28.3
35	1.320	33.9
40	1.381	39.5
45	1.453	45.2
50	1.530	51.0
55	1.615	57.1
60	1.711	63.8
65	1.819	73.2
68	1.842	81.6

Uses of Sulphuric Acid.—Among those materials and products of science and art that constitute the main pillars of modern civilization sulphuric acid occupies incontestably a first rank. Probably none other except iron could be justly ranged with it in this regard. This will appear on a mere enumeration of some of the principal products necessary to human life, health, comfort, luxury, or necessity which are dependent, directly or indirectly, upon sulphuric acid as an essential agent in their production: *soda* from common salt, and through this, *glass, soap, sodium, aluminium, magnesium*; *nitric and hydrochloric acids*, upon which depend the arts of refining gold and silver for money and jewelry, with the *electroplater's* and *photographer's* arts; artificial *mineral waters*; all the *vegetable acids and alkaloids*; *alum*; *ammonia*; *ultramarine*; the *aniline colors*; *bleaching-powder*; *chrome compounds*; *chloroform and ether*; *phosphorus and matches*; *artificial fertilizers*; *kerosene*; and so on.

Sulphates.—Among the compounds of sulphuric acid with metals are many of commercial value and importance which are described under the heads of the different metals. The following is a more complete enumeration:

Aluminium Sulphates.—Of these there are several, some of which occur as native minerals. The normal sulphate is $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$, constituting the mineral *alunogen*. The alums (see *ALUM*) are double salts of normal aluminium-sulphate with the sulphates of potash, ammonia, or soda, containing 24 equivalents of crystal-water.

Ammonium Sulphate, $(\text{NH}_4)_2\text{SO}_4$.—A commercial salt of great importance, anhydrous, not deliquescent, made largely from the ammoniacal liquor of gasworks, and used as a fertilizing agent.

Barium Sulphate, the mineral *barite, barytes*, or *heavy spar* (BaSO_4).—Insoluble in water, very heavy; densities, 4.123 and 4.554. The source of most commercial barium compounds. It is ground, purified, and sold largely as a pigment or inferior substitute for white lead.

Calcium Sulphates; the *anhydrite* mineral is CaSO_4 .—It is orthorhombic. Minimum and maximum densities, 2.911 and 3.104. See *GYPSUM* and *SELENITE*.

Cobalt Sulphate ($\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$).—The mineral *bieberite*.

Copper Sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$).—*Blue vitriol*, an important commercial salt. Crystals triclinic.

Iron Sulphates ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$).—*Copperas* or *green vitriol*. A large article of commerce. Crystals monoclinic. This is *ferrous sulphate*. *Ferrie sulphate* (normal) is $\text{O}_2\text{S}_2\text{Fe}_2 \cdot 9\text{H}_2\text{O}$, as the mineral *coquimbite*. There are many basic ferric sulphates.

Lead Sulphate (PbSO_4).—The mineral *anglesite*. Splendid orthorhombic crystals. Minimum and maximum densities, 6.2 and 6.42.

Magnesium Sulphate, *Epsom Salt* ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$). See *MAGNESIUM*.

Manganese Sulphate ($\text{MnSO}_4 \cdot 7\text{H}_2\text{O}$).—Monoclinic, like green vitriol.

Mercury Sulphates.—Mercurous sulphate is Hg_2SO_4 , and mercuric sulphate is HgSO_4 . The former is insoluble, like calomel or mercurous chloride; the latter soluble, like corrosive sublimate or mercuric chloride. The mercuric salt is obtained by boiling mercury with oil of vitriol.

Nickel Sulphate ($\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$).—Very beautiful green crystals, right rhombic and isomorphous with Epsom salt. This salt, of much commercial importance by reason of its large use in nickel-plating, is liable to contain iron and copper as impurities, both wholly destructive to its usefulness.

Potassium Sulphate (K_2SO_4).—A hard anhydrous salt,

crystals trimetric; minimum and maximum densities, 2.422 and 2.888. Much less soluble than other potash-salts generally. Water at 0° C. dissolves but 8.36 per cent. It is a considerable article of commerce for fertilizing purposes, for which it has great power.

Silver Sulphate (Ag_2SO_4).—Trimetric crystals, turned green by light. Requires as much as 200 parts of cold water for solution.

Soda Sulphate or *GLAUBER'S SALT* (*q. v.*).

Strontium Sulphate (SrSO_4) forms the beautiful mineral *celadine*; trimetric. Densities, minimum and maximum, 3.589 and 3.992.

Uranium Sulphate ($\text{U}_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$).—Small lemon-yellow prisms.

Zinc Sulphate ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$), *White Vitriol*, also the mineral species *goslarite*.—Orthorhombic and isomorphous with nickel-sulphate and Epsom salt.

Sulphur forms with oxygen two compounds: sulphur dioxide (SO_2), that combines with water to form *SULPHUROUS ACID* (*q. v.*), and sulphur trioxide (SO_3), that combines with water to form *SULPHURIC ACID* (*q. v.*). Salts of sulphurous acid are called *sulphites*, and salts of sulphuric acid are called *sulphates*. Also there is known in combination sulphur sesquioxide (S_2O_3), which is contained in hyposulphurous acid ($\text{H}_2\text{S}_2\text{O}_4$), whose salts are called *hyposulphites*, and sulphur hexoxide (S_6O_6), which is contained in persulphuric acid ($\text{H}_2\text{S}_6\text{O}_8$), whose salts are called *persulphates*. This sulphuric acid was formerly called *hyposulphurous* or *hyposulphuric acid*, and its salts *hyposulphites* or *hyposulphates*.

Revised by IRA REMSEN.

Sulphuric Ether: See *ETHER*.

Sulphurous Acid: an acid formed when sulphurous dioxide gas is passed into water. A crystalline hydrate, $\text{H}_2\text{SO}_3 \cdot 6\text{H}_2\text{O}$, was obtained by Schönfeld. Sulphurous acid is a strong reducing agent. It deoxidizes iodic, arsenic, chromic, and permanganic acids and gold chloride, precipitating metallic gold from the latter.

Sulphites.—Of these the sulphites of calcium and of sodium only are of much practical interest, they being prepared commercially to some extent for bleaching and for the prevention of fermentation of wines, sirups, and other organic liquids. There are two soda-salts—one neutral, Na_2SO_3 , and one acid, HNaSO_3 . The latter is obtained as a crystalline precipitate on cooling a warm solution of sodium carbonate which has been supersaturated with sulphurous oxide gas. This salt is used as a reagent. Sulphites that contain an additional atom of sulphur are called *hyposulphites*, as sodium hyposulphite ($\text{Na}_2\text{S}_2\text{O}_3$), which is used in medicine for febrile diseases and in dyspepsia. Revised by IRA REMSEN.

Sulphurous Oxide, Sulphur Dioxide, or Sulphurous Anhydride: the gaseous substance (SO_2), formed by the combustion of sulphur in the air. Even in pure oxygen the same compound is formed. It is emitted by volcanoes. It may be obtained artificially, in a pure state, by heating oil of vitriol with some metals, copper and mercury being among these. Sulphate of the metal and water are at the same time formed: $\text{Hg} + 2(\text{H}_2\text{SO}_4) = \text{HgSO}_4 + 2\text{H}_2\text{O} + \text{SO}_2$. It is also obtainable pure by heating together sulphur and sulphure trioxide, SO_3 , in one limb of a sealed U-tube. It then appears as a liquid, condensed by the pressure, in the other limb. Sulphurous oxide is colorless, with the well-known suffocating odor. Bunsen gives its density as 2.2122 (air being 1), and its solubility in water as about 69 per cent. of the volume of the latter at zero, and 41 per cent. at normal temperature. Alcohol at zero takes up nearly five times as much as water. A pressure of about three atmospheres, or the cold of snow and salt, condenses it to a liquid, which produces so much cold in its evaporation as to freeze water when poured upon it. Sulphurous oxide has strong bleaching power over most vegetable colors, and is therefore used for bleaching. See *REFRIGERATING PROCESSES*.

Revised by IRA REMSEN.

Sulphur Springs: city; capital of Hopkins co., Tex.; on the St. L. S. W. and the Sherman, Shreveport, and S. railways; 80 miles E. by N. of Dallas (for location, see map of Texas, ref. 2-1). It is in an agricultural region, and contains Central College (Methodist Episcopal South, opened in 1876), 2 national banks with combined capital of \$200,000, and 4 weekly papers. Pop. (1880) 1,854; (1890) 3,088.

Sulpicia: (1) a Roman poetess, probably the daughter of Servius Sulpicius Rufus, and niece of Messalla, to whom are attributed a group of six charming elegies, describing

several river systems are connected with each other by arms and canals, and on the banks, in the midst of a luxuriant vegetation, stand the towns and villages. The climate varies in the different parts of the island, but is generally healthful, with the exception of the low coast regions to the W. The heat varies on the coast between 82° and 86° F., at an elevation of from 2,500 to 3,000 feet between 64° and 78°; these highlands are known for their healthful climate. The monsoons are not so steady and regular as elsewhere. The dry season lasts N. of the equator from October to May, and S., from the end of April to the end of October.

Natural Products.—The natural productions are more varied and more abundant than those of any other island in the archipelago. Of metals, gold, iron, copper, and tin abound; brown coal occurs, but anthracite is not found. Rice forms the principal food, then sago, beans, and roots (jolicchos, batatas, and dioscereas). The most palatable among the fruits are the mangosteen, durian, rambutan, rambei, pisang, pineapples, etc., many of which thrive only here, and can not be introduced into other countries. Of trees, the species of *Sideroxylon* (justly called *kayu* (wood) *besi* (iron), that is, iron-wood) yield the best wood for ship-building, it being so hard that it blunts the sharpest arrow; teak is not found. The most important plants entering into commerce are cotton, black pepper, caoutchouc, benzoin, gutta-percha, dyestuffs, and camphor, for which the island was celebrated among the ancients. The Dutch have introduced coffee, tobacco, and cacao. The fauna, Indian in its general character, corresponds nearer to that of Borneo than to that of Java. Of mammals there are eighty species, among which are the elephant, rhinoceros, tapir, tiger, panther, and bear; among the ruminants, the *Cervus equinus* is noticeable; among the many species of apes are the orang utan and two gibbons, the siamang (*Hylobates syndactylus*) and the wau-wau (*Hylobates variegatus*); the buffalo occurs both wild and domesticated; the horse is small, but vigorous, adapted to a mountainous country.

Population.—The population, which was 2,972,383 in 1892, is chiefly Malayan. There are about 25,000 Europeans, mostly Dutch, some Chinese, and other Asiatic races. Sumatra was the cradle of the Malays as a nation; in the interior they founded the empire of Manang-Kaban, once very powerful. Next to them the Battas are the most important division; they formerly inhabited the country N. of lat. 1° N., but the population of Achin has separated from them, and they themselves have decreased in number, and are crowded together in a small space. The Orang Koabos live in the forests; in physical respects they do not differ from the other inhabitants of the islands, but they are uncivilized, though harmless; they are agriculturists. The Malays are all Moslems. The Battas are fetich-worshippers and addicted to cannibalism—a custom which the Dutch have tried in vain to abolish.

History.—Ptolemy calls the island *Aurea Chersonesus*, the Arabs *Fantaur*; the name *Sumatra* occurs in 1330, used of the city of Samatrah. The Arabs visited Sumatra about 860 A.D.; Islamism was introduced into Achin in 1205; the Venetian merchant Marco Polo landed here in 1290; the Portuguese under Alvaro Talesso in 1506, the Dutch in 1597; an English squadron appeared before Achin in 1602. The Dutch East Indian Company established settlements on the eastern coast in 1618. Great Britain tried to compete, but was compelled in 1783 to return all its possessions in Sumatra to Holland. In 1811 it once more occupied the island, but by the treaty of Mar. 17, 1824, it exchanged all its possessions in the archipelago for the Malayan peninsula, and thus Holland became the only European power holding dominion in Sumatra. Since then the Dutch have been occupied in gradually extending their conquests over the entire island. The last to hold out were some tribes of the Battas in the interior, and about 150,000 of them were yet practically independent in 1895.

Revised by M. W. HARRINGTON.

Sumba'wa: an island of the Sunda islands, Dutch East Indies, E. of Java, between Lombok and Flores. Area, 5,400 sq. miles. It is high, mountainous, and volcanic. The still active volcano Tambora, on the north coast, 8,940 feet high, caused a terrible destruction by its eruption in 1815; the ashes fell in Sumatra, 840 miles distant, and in a large part of the island itself all vegetation was completely destroyed. The sea also rose and swept away men and houses. More than 12,000 people are said to have lost their lives. Another eruption, less destructive, occurred in 1836. The

principal products are gold, sulphur, saltpeter, rice, various kinds of wood, and a fine breed of horses. The inhabitants, 150,000 in number and closely allied in habits and manners to those of Celebes, live in four states which are under Dutch authority.

Revised by M. W. HARRINGTON.

Sumbul [from Pers. and Hind. *sumbul*, spikenard]: an umbelliferous plant, the *Ferula sumbul*, indigenous to certain parts of Central Asia. It was originally thought to possess the properties of musk, and to be a nervous stimulant, or, more properly, a drug to "steady" the nervous system. In reality it is of very little value, but is popular with some physicians, who give it to nervous women in association with more powerful remedies. H. A. HARE.

Sumerians: the people who are believed by most Assyrian scholars to have occupied Babylonia before the Semites appeared in that region; to have invented the cuneiform script; and to have been the teachers of the Semites, by whom they were finally displaced or absorbed. It would seem that there were two branches of this people—the Sumerians and the Akkadians. To designate the whole people, sometimes one name, sometimes the other, and sometimes the compound name, is employed. In the Sumerian-Akkadian language are written some of the oldest inscriptions from Babylonia, like those discovered by de Sarzec at Telloh. There are also many bilingual productions of a later date, notably from the library of Assurbanipal. These are mainly grammatical, lexical, magical, ritual, or religious in content. The language seems to have become a sacred tongue, like the Latin of the Middle Ages. While this account represents the prevailing view, it must be added that several eminent scholars, in particular Joseph Halévy in France and Friedrich Delitzsch in Germany, deny in toto the existence of a Sumerian-Akkadian people or language. (Cf. J. Halévy, *La prétendue langue d'Accad*, etc. (Paris, 1875); J. Halévy, *Recherche critique sur l'origine de la civilisation babylonienne* (Paris, 1876); F. Delitzsch, *Assyrische Grammatik* (Berlin, 1889), § 25. On the other hand, cf. E. Schrader, in *Zeitschrift der deutschen Morgenländischen Gesellschaft*, xxix., 1-52 (1875); P. Haupt, *Akkadische und Sumerische Keilschrifttexte* (Leipzig, 1881-82); P. Haupt, *Die Akkadische Sprache* (Berlin, 1883).) These scholars maintain that in the so-called Sumerian or Akkadian we have not a language different from Assyrian, but genuine Assyrian in archaic form, or written in a hieratic script. The question is not one of linguistics merely, but it involves the origin of the Babylonian culture. It can not be considered definitely settled so long as the lack of agreement among specialists prevails. The vast majority of Assyrian scholars, however, feel no doubt as to the reality of the Sumerian-Akkadian language and people, as A. H. Sayce, in *Hibbert Lectures for 1887*, pp. 415-436, while others hold themselves neutral, as Tiele does in his *Babylonisch-Assyrische Geschichte*, pp. 58-71.

D. G. LYON.

Sumeru: See MERU.

Summary Proceedings: in a general sense, any legal proceedings, or proceedings before a judicial tribunal, which are of a summary and peremptory nature, that is, those which are short and simple, and ordinarily dispense with the aid of a jury. Such proceedings, except perhaps in cases of contempt, can be instituted only under express authority of statutory laws, which, being in derogation of the common law, must be strictly construed.

The ordinary purposes for which summary proceedings are resorted to are: (a) Ejectment of a tenant for non-payment of rent, or for holding over his term. Authority to bring these proceedings was first granted in England by the Statute of Laborers, followed by others down to the Summary Act of 1879, which greatly extended the power, and in the U. S. it has been granted to a greater or less extent by the statutes of the various States. (b) For the recovery of debts due the state of the U. S. from a collector of taxes or revenue. (c) For the punishment of the contempt of court. (d) For the punishment of many minor offenses, violations of municipal ordinances, etc., which may be proceeded against without a jury; while in respect to others, the constitutional requirements as to due process of law are satisfied if a trial by jury in an appellate court is accorded the accused.

In the U. S. statutes authorizing summary proceedings are unconstitutional and invalid when they conflict with the constitutional provisions requiring that a trial by jury shall remain inviolate. Such provisions as to the right of trial by jury did not extend the right, but prevented its being abridged. The offense to be punishable by summary pro-

summitage must be petty or trivial, and not of a serious character affecting the public at large; nor on the right of appeal be done away with. They are usually such offenses as were punished by fines, though in some cases by short terms of imprisonment. Violations of municipal ordinances are not strictly criminal in nature, but they are generally undeniably punishable.

The procedure is statutory, and the violator must be strictly complied with.

See *McAdams on Landlord and Tenant*; *Dillon's Law of Municipal Corporations*; *Stephen's History of the Criminal Law of England*; *Cooley's Constitutional Limitations*.
P. THOMAS ADAMS.

Summer-duck: See WOOD-DUCK.

Summers, Thomas Osborn, D. D., LL. D., clergyman and author; b. near Corfe Castle, Isle of Purbeck, Dorsetshire, England, Oct. 11, 1812; removed to the U. S. 1830, and prepared for the ministry; was "scholastic on trial" 1850 the Baltimore Conference of the Methodist Episcopal Church in 1845; aided in organizing the Texas Conference Dec. 1849; was transferred to the Alabama Conference; became assistant editor of *The Northern Christian Advocate*, Charleston, S. C., 1846; was secretary of the Louisville convention in 1845, at which the Methodist Episcopal Church South was organized; compiled hymn-books for the connection; was the general book-editor of the Church from its organization; founded and edited for four years *The Sunday-school Visitor*; removed to Nashville in 1855, the publishing-house being there located; edited *The Quarterly Review of the Methodist Episcopal Church South*; revised and edited hundreds of books for the Church. Dr. Summers was the author of *Commentaries on the Gospels, the Acts, and the Epistles of the Methodist Episcopal Church South* (6 vols.); a *Treatise on Baptism, on the Holy Spirit, The Sunday-school Teacher, or the Catechist's Office of the Church; Sermons, Months, and Days; Talks Pleasant and Profitable; Refutations of the Theological Works of Prince* (not answered in Bishop Watson's *Apology*); *The Golden Censer, an Essay on Prayer*, with a collection of forms for all occasions; and of minor works. He returned Feb., 1862, to Alabama; in 1866 was re-elected general editor, and editor of *The Sunday-school Visitor*; became also editor of *The Christian Advocate*; was Professor of Systematic Theology in Vanderbilt University and dean of the theological faculty, and ex-officio pastor of that institution. D. at Nashville, Tenn., May 8, 1882. See his *Life*, by O. P. Fitzgerald (Nashville, Tenn., 1884).
Revised by A. OSBORN.

Summerside: port of entry in Prince County, Prince Edward island (see map of Quebec, etc., ref. 1-B). It is the second town in size in the province, and has a good harbor, rather difficult of access, a large export trade, considerable ship-building, a public hall, and several manufactures. Pop. (1901) 2,882.

Summers' or Somers's Islands: See BERMUDA ISLANDS.

Summerville: town; Berkeley co., S. C.; on the S. C. and Ga. Railroad; 22 miles N. W. of Charleston (for location, see map of South Carolina, ref. 7-P). It is a noted winter resort for invalids, on a pine-clad ridge extending from the Cooper to the Ashley rivers, and contains several hotels and boarding-houses, brick-works, sawmills, and a weekly newspaper. Pop. (1880) 698; (1900) 2,210.

Sumner, Charles: scholar and Senator; b. in Boston, Mass., Jan. 6, 1811, educated at the Boston Public Latin School and at Harvard College, where he graduated in 1830. He was a recluse and studious boy, seldom joining in any amusement or athletic games; and this mood lasted through his college years. Though a diligent student, he gave more attention to general literature than to the special studies of the university. After his graduation he gave a year to science, belles-lettres, history, and art. In 1831 he joined the Harvard Law School, then under the charge of Judge Story, and entered on his studies with enthusiasm, renouncing all other subjects, and giving himself, without any relaxation, to a profound study of law. This devotion gained him the warm friendship of Story, who treated him as a son. Admitted to the bar in 1834, he visited Washington with such warm letters of introduction from Story as secured him the friendship of Kent, Horace Binney, Judge Marshall, and others, who frankly expressed their wishes that before long he should find his place on the bench. Appointed by Story reporter to his circuit court, he published three volumes of Story's *Decisions*, and often supplied his place as lecturer at

the law school, where he was himself lecturer from 1837 to 1837 and in 1842. In 1838 he edited *Barry's Admiralty Treatise*. In 1837 he went to Europe with numerous letters of introduction; was received with most flattering attention, and became personally acquainted with almost every leading man and woman in Europe. While his days were passed in society and galleries, his nights were spent in study; for he early learned that almost irresistible power of working which distinguished him through life. Returning in 1840 from Europe, he again opened a law office, and, with J. C. Perkins, edited twenty volumes of *Vane's Reports*. It was during this labor that his health broke down, and an illness followed which nearly proved fatal. He could have had, after Story's death (1845), his professorship at the law school, but declined it. In 1845 he was chosen by the city of Boston to pronounce the Fourth of July oration, and took for his subject the *True Freedom of Nations*. This was a plea for peace, and was bitterly-cried at home, though welcomed abroad, and pronounced by Calhoun "the most noble contribution made by any modern writer to the cause of peace." His protest against war he repeated frequently in later years.

Favorite as he had been, and great as was his promise at the bar, his decided anti-slavery position created a resolution to crush him socially and professionally. This hostility pervaded Boston society, her merchants, and the Suffolk bar till the civil war broke out. Sumner valued his social position very highly. He had not inherited it, but had himself achieved it. It is unpeakably in his credit that, when he saw this long-coveted and hardily earned distinction and all his professional prospects crumbling around him, though too tender perhaps of praise and keenly sensitive to blame, he never retreated an inch or remodeled a phrase to regain his place or conciliate opposition. From this moment, however, he was recognized as the leader of the young men of the Commonwealth, and bidden in their hearts. No matter that in after years the Legislature censured, the press abused, and politicians criticized him. He always had, to the day of his death, the hearty, entire, steadfast, and loving confidence of the young men of Massachusetts. This explains his strength and influence in years when, judging of public opinion by the ordinary signs, he seemed to have lost his hold and to be near defeat.

In 1849 he maintained before the Supreme Court of Massachusetts the unconstitutionality of separate schools for whites and blacks. The decision was against him. In 1851, by a coalition between Free-Soilers and Democrats, he was elected Senator of the U. S., the first civil office, and the only one, he ever held. There were twenty-six ballots, and the struggle lasted three months. He took his seat Dec. 1, 1851. Once in the Senate, the force of his will, the almost entire devotion of his time to one cause, the aggressive attitude he took, and the vigor and ability of his innumerable assaults, made him indisputably the leader of the political anti-slavery movement.

In Aug., 1852, he began his congressional assault on slavery by an argument for the repeal of the Fugitive Slave law, entitled *Freedom National—Slavery Fugitive*. This phrase became the watchword of his party, and gave the key to most of his later arguments. In May, 1856, he made one of his ablest speeches, *The Crime against Kansas*, advocating the admission of that State to protect it from slavery. His comments on the conduct of several Senators who had taken a part in the debate, especially Butler of South Carolina, Douglas of Illinois, and Mason of Virginia, and his indignant reply to their personal attacks on himself, led to a scene which Sir George C. Lewis characterized as "the beginning of the civil war." On May 22, 1856, Preston S. Brooks, a nephew of Senator Butler, and one of the Representatives from South Carolina, approached Sumner while writing at his desk in the Senate chamber and struck him, without warning, repeatedly over the head with a heavy cane. Sumner, blinded by the blows, strove to rise and free himself from the restraint of the desk. He succeeded in wrenching it from the floor, to which it was screwed, but fell unconscious from the repeated blows. The indignation at the North was wild and hot, but while Massachusetts and the North generally thrilled with indignation, leading citizens of Boston refused to take part in meetings called to protest, and when Sumner returned to Boston, Nov. 3, 1856, though received by crowds in the streets and by the State authorities, the windows of every house in Beacon Street, through which he passed, except those of Prescott and Sumner Appleton, had their blinds closed to show indifference or contempt.

His injuries proved more serious than was at first supposed. Illness detained him nearly four years from Congress, with the exception of one brief attempt in the winter of 1857-58 to attend the Senate sessions, to which he found himself unequal. Two visits to Europe, rest, and the best medical skill of both hemispheres enabled him at last to resume his seat on Dec. 5, 1859. On Jan. 13, 1857, during his illness, he had been elected unanimously by the Senate, and almost unanimously by the House of Representatives of Massachusetts, to the senatorship. Again in Jan., 1863, and subsequently in 1869, he was re-elected, passing the last twenty-three years of his life in the Senate.

His attention was by no means given exclusively to slavery. His speeches cover all topics of national importance, and are always able. He took a leading part in all great debates. His speech in Jan., 1862, advocating the surrender of Mason and Slidell, taken from the British mail-steamer Trent, is a masterly exhibition of maritime law, and did much to reconcile the republic to that distasteful course. His speech on the Alabama claims in 1869, bitterly offensive to all his English friends and severely criticised by John Bright, was undoubtedly a fair representation of opinion in the U. S., and was the basis of final settlement. His addresses on the constitutional law respecting seceding States, on reconstruction, the war powers of the Government, international relations, internal improvements, etc., exhaust the subjects of which they treat. His sketches of Story, Allston, Granville Sharpe, Lincoln, and Lafayette show rare powers of portraiture. His articles on *White Slavery in the Barbary States*, *Prophetic Voices concerning America*, and other literary efforts, show good taste, ingenious research, and exact scholarship.

Worn down by the labor and excitement of the session, and by a return of the illness which Brooks's assault produced, he again sailed for Europe on Sept. 5, 1872, returning in November. In May, 1872, he had moved in the Senate that the names of victories in the civil war should not be inscribed on the regimental flags. On Dec. 2, 1872, the first day of the session, he again introduced a similar resolve to the Senate. For this he was censured by the Legislature of Massachusetts Dec. 18, 1872. This was rather a political trick than any real expression of Massachusetts feeling. The censure was rescinded the last month of his life. During this session of 1872-73, and the following one, he gave most of his time to his Civil Rights Bill, which puts the Negro on the exact level of the white in respect to inns, juries, schools, churches, public conveyances, and all civil privileges. His health was much broken, however, and an attack of his old malady, agony of the chest, in the Senate Mar. 10, 1874, proved fatal in his own house at Washington on Mar. 11, 1874. Almost his last words were addressed to Judge Hoar: "Take care of my Civil Rights Bill."

His natural powers were not of the highest order. "Industry was his talisman." He knew how to work, and had, as he said of Story, "the genius for labor." In mind he was more like Story, trained to exhaustive research and clear statement, than like Kent and Marshall, born lawyers. In preparing to write or speak he ransacked libraries, laying under contribution all ages and tongues. He had read everything and listened to everybody. His memory never lost a phrase or a fact he had once heard, and could always recall it at the right moment. His wealth of illustration was no effort, but the natural action of a full and ready mind. When first in the Senate his speeches were carefully prepared and written out. It took him five to seven years to acquire the power of extemporaneous debate; but to the last he usually wrote out his speeches. It has been generally supposed he was a mere scholar, fit only for investigation or debate. In truth, no man in Congress was more methodical, exact, painstaking, prompt, and efficient in attending to the details of business pertaining to his office. His eloquence belongs to the school of Burke, whom he liked to be thought to resemble, as indeed he did in features. His speeches had more learning than Burke cared to show, but in wealth of illustration, gorgeous rhetoric, lofty tone, and a "gigantic morality which treads all sophistry under foot," the resemblance was close. His real power lay in the sincerity and fiery enthusiasm of the speaker, whose whole soul freighted his words, and in the fact that there was "always a man behind the speech." He did not know what fear was. Alone in Baltimore on Apr. 18, 1861, he yielded nothing to that mob which the day after shot down the Massachusetts troops. For ten years he walked Washington streets, his life constantly threatened, and well knowing that if a fanatic's or drunkard's hand took

his life the assassin would not only be sheltered by the power of ten States, but petted and applauded as a champion. When he entered the Senate, free speech could not be said to exist there. To him, as much as to any man, was due the breaking of that chain. Sumner was exact in all etiquette, careful in dress, fond of society, easy of access, and had always time for every comer, his hours of study running to midnight and long after. His manner was always courteous, but in his last years had a marked tenderness. To the very last day of his life he was a loving student of the classics of all languages; a "bite of the classics" being his preparation for bed somewhere about two or three o'clock in the morning. He cultivated art, and was a diligent collector of autographs, pictures, rare books, bronzes, and other objects of *virtu*, most of which he bequeathed to the Art Museum of Boston and to Harvard College. To the college library he also gave half of his estate. He was married Oct. 17, 1866, to Alice (Mason) Hooper, widow of W. S. Hooper, of Boston. They separated very soon, and he was divorced May 10, 1873. His complete works were published in 15 volumes (Boston, 1870-83). Eleven of the volumes, with copious notes, were published under his own supervision. For full details of his life, see Pierce's *Life of Charles Sumner* (4 vols., Boston, 1877).

WENDELL PHILLIPS.

Revised by C. K. ADAMS.

Sumner, CHARLES RICHARD, D. D.: bishop and author; b. at Kenilworth, Warwickshire, England, Nov. 22, 1790; educated at Eton and Cambridge (B. A. 1814); took holy orders; became curate of Highclere 1816; librarian and historiographer to George IV. and chaplain to his majesty's household at Carlton House, London, and rector of Abingdon—all in 1821; was made prebendary of Worcester in 1822 and of Canterbury in 1825; dean of St. Paul's and Bishop of Llandaff 1826; in 1827 was transferred to the more important see of Winchester, which he resigned in 1869 on account of the infirmities of age. He published *Praelectiones Academicæ Oxon. habitæ* (London) and the *Ministerial Character of Christ Practically Considered* (1824), besides several *Charges*, and edited in the original and translated the long-lost Latin manuscript of Milton, *De Doctrina Christiana* (1825), which gave occasion to Macaulay's brilliant essay on Milton. He was a brother of John Bird Sumner, Archbishop of Canterbury. D. at Farnham Castle, Surrey, Aug. 15, 1874. His *Life*, by G. H. Sumner, appeared in 1878 (London).

Revised by S. M. JACKSON.

Sumner, INCREASE, LL. D.: jurist; b. at Roxbury, Mass., Nov. 27, 1746; was admitted to the bar in 1770, and began practice in his native town; was representative in the Legislature 1776-80, State Senator 1780-82, associate judge of the Supreme Court 1782-97, Governor of Massachusetts 1797-99, and in 1789 member of the convention for the adoption of the U. S. Constitution. D. at Roxbury, June 7, 1799.

Sumner, WILLIAM GRAHAM, LL. D.: economist; b. at Paterson, N. J., Oct. 30, 1840; prepared for college at Hartford (Conn.) grammar school; graduated at Yale College 1863; traveled in Europe, residing at Geneva during winter of 1863-64; studied philosophy at the University of Göttingen 1864-66, and at Oxford, England; was tutor in Yale College 1866-69; took orders in the Protestant Episcopal Church Dec. 29, 1867; was for a time assistant minister of Calvary church, New York; appointed Professor of Political and Social Science at Yale College 1872. Among his works are a *History of American Currency* (1874); *Collected Essays in Political and Social Science* (1885); *Protectionism, the System which teaches that Waste makes Wealth* (1885); *The Financier and Finances of the American Revolution* (1891); and *Robert Morris* (1892).

Sumptuary Laws [from Lat. *sumptuosus*, deriv. of *sumptus*, expense, extravagance]: laws which seek to restrict and regulate private expenditures, and generally are aimed at extravagant outlays for food, for clothing, or for funerals. Such laws were enforced, in past centuries, by every nation of the Old World, and have been indulged in, to some extent, even by the modern States of North America. For example, Massachusetts thought it necessary at one time to regulate by legislation the cost of funerals. These laws have flourished most abundantly in the periods of transition from semi-barbarism to civilization. Witness the legislation of Lycurgus and of Solon, in Greece, that of the Roman republic especially from the Twelve Tables to the second century before Christ, and that of modern European states during the thirteenth, fourteenth, and fifteenth centuries.

The reason for this is twofold: First, public opinion among the governing class does not keep pace with the rapidly increasing conveniences and refinements of life, but insists upon tabulating them as conducive to ostentation. Second, the state has unlimited confidence in its strength and wisdom and undertakes to guard its subjects with paternal care. Some of the most interesting specimens of sumptuary legislation in modern Europe are found among the laws of Frederick II. in Italy, of Edward III. in England, and of Philip IV. in France. One of these statutes (10 Ed. III., c. 5), ordaining that no man should be served at dinner or supper with more than two courses, except upon certain great holidays, when he might be served with three, was not repealed until the nineteenth century.

This kind of legislation is condemned generally by modern political writers. Adam Smith declares, "It is the highest impertinence and presumption in kings and ministers to pretend to watch over the economy of private people and to restrain their expenses, either by sumptuary laws or by prohibiting the importation of foreign luxuries." Richter, however, contends that while such laws are at present useless or harmful, they have proved salutary at times, citing in support of his view the laws of Florence in the fifteenth century against extravagant outlays upon personal pleasures, which, he believes, tended to promote indolence in the nobler luxury of building churches and palaces, of collecting libraries, and of encouraging artists; and the laws of the Roman empire which drove the most vicious forms of vice under cover.

During the sixteenth and seventeenth centuries the nature of sumptuary legislation underwent a change. It was enacted not so much from a benevolent regard for the spendthrift as from commercial and police considerations. English legislators, for example, prohibited the wearing of silk on garments, not with a view to limit personal expenditures, but to promote domestic manufactures of wool. In various countries laws assuring a sumptuary appearance were passed for the purpose of maintaining class distinctions. The latest piece of true sumptuary legislation in Great Britain is the Scotch luxury law of 1621. In our day the bare sumptuary is often applied to laws curtailing or prohibiting the liquor traffic. They are dealt with by the courts, however, as police regulations. Under the Federal and State constitutions of the U. S., with their special guarantee of individual liberty, it is held that the habits, occupation, food and drink—the life of the individuals—are several matters for his own determination. They can be abridged by the majority of the people, speaking through the Legislature, only when the public safety, the public health, or the public protection requires it. The constitutional guaranty of life, liberty, and the pursuit of happiness can be limited only by the absolute necessities of the public. *Infamousness Doctrine Case*, 25 Kan. 751, 755; *Mugler vs. Kansas*, 123 U. S. 623.

FRANCIS M. HODGINS.

Sumter, city; capital of Sumter co., S. C.; on the Atlantic Coast, the Cent. of S. C., and the Charleston, Sumter and S. railways; 40 miles E. by S. of Columbia; 33 miles N. by W. of Charleston (for location, see map of South Carolina, ref. 5-17). It is in an agricultural and a tobacco and truck raising region; ships annually 25,000 bales of cotton; and contains 4 churches for white people and 4 for colored, 5 public-school buildings, 2 academies for young ladies, 2 planing-mills, cotton, telephone, and sack and blind factories, improved system of water-works, electric lights, a national bank with capital of \$75,000, a State bank with capital of \$75,000, and 6 newspapers. Pop. (1890) 3,611; (1896) 4,865; (1898) 5,812.

EDWIN DE HERAULT.

Sumter, Thomas (soldier); b. in Virginia in 1754; removed in early life to South Carolina; participated in the Cherokee war, and was a prominent actor in the events which preceded the Revolution; was appointed lieutenant-colonel of the Second Regiment of riflemen in Mar., 1776, of which he became colonel; served in the interior of the State until the fall of Charleston; went to North Carolina and raised a large force, with which he defeated July 12, 1780, a force of British and Tories; made an unsuccessful attack on the post at Rocky Mount Aug. 1, but Aug. 4 defeated and routed the Prince of Wales regiment at Hanging Rock, and dispersed a large body of Tories; was defeated and routed by Tarleton on the 16th at Fishing Creek; gained a victory at Broad river Nov. 12, and on the 26th defeated Tarleton at Mudasawka, and was severely wounded; had previously been appointed brigadier-general of South

Carolina militia in Jan., 1781; received a vote of thanks from Congress for his valiant services; having raised three regiments of rangers, incorporated with Marion, Pickens, and other partisan leaders, was member of the convention which adopted the Federal Constitution; was member of Congress 1791-93 and 1797-1801, U. S. Senator 1801-08, and U. S. minister to Brazil 1809-11; D. at South Mount, near Camden, S. C., June 1, 1832.

Sumner, Fort: see FORT SUMNER.

Sun (U. Eng. *sun*; *son* (U. H. *son*), *son* (Mod. Germ. *sonne*); Ital. *sonno* (U. *sonno*, *sonno*; of, with different suffixes); U. Eng. *son*; Goth. *son*; *son* (Goth. *son*); Lat. *sol*; *sol* (U. *sol*), the most important body in the universe, next to the earth on which we dwell. It is the great center around which all the planets of our system revolve, and without its vivifying influence the whole earth would speedily be enveloped in a mantle of ice, in which no living being could exist. Yet to the question what the sun is, science can not as yet return an entirely satisfactory answer. The ancients knew that it was a shining sphere, and it is now known to be a very hot body; what is known more than this consists rather of fragments than of a well-rounded body of knowledge. Numerous though the fragments are, it is true that modern science has raised more questions about the sun than it has conclusively answered.

Beginning with certain particulars on which there is exact knowledge, it may be stated that the mass and volume of the sun are enormous compared with those of the earth, and that nature here conducts her operations on a scale of which we can form no conception. In volume it is more than a million times that of our earth; its mass more than 333,000 times. Its density is about one-fourth that of the average of the materials which make up the earth, and therefore only about half as much again as that of water. Its mean distance from us is 93,000,000 miles; its diameter 866,000 miles. The force of gravity on its surface is twenty-seven times what it is on the earth. Under such circumstances a man attempting to stand up would be instantly crushed to death by his own weight. High mountains could scarcely exist, because they would be flattened out by the pressure, and vegetation of the sort familiar to us would not be possible.

Like the earth and planets, the sun rotates from W. toward E. on an axis nearly perpendicular to the ecliptic. It has therefore two poles, where the axis intersects its surface, and an equator of its own. The period of rotation is about 26 days. A curious circumstance is that the equatorial regions rotate in less time than those nearer to the poles, the range being perhaps from 25 to 28½ days.

Temperature and Physical Constitution.—The flood of heat which the sun sends us at the enormous distance indicates that the matter composing it is intensely hot; but estimates of the actual temperature have differed widely. It appears higher than any that we have yet produced, even in the electric arc; probably more than 10,000° F. This statement applies to the photosphere, or visible surface of the sun; the great invisible interior must be at a much higher temperature. There must be a constant intermingling of matter between the interior and the surface, else the latter would speedily cool off under the influence of its rapid rotation. Consequently the interior must be, at least in the great mass, either liquid or gaseous. The best sustained view at the present time is that at such a temperature as that within the sun, no permanent chemical combination is possible. There can be only an indiscriminate mixture of elements; for example, a mixture of oxygen and hydrogen, instead of water. Moreover, the distinction between a liquid and a gas becomes obliterated under the unusual effect of the temperature and the pressure. We must therefore regard the sun as a mass of gas, condensed nearly to the density of a liquid by the pressure of its own mass. The visible photosphere is, indeed, sometimes supposed to be wholly or partially solid. This is a point not yet settled. It may be that, under the influence of rapid cooling, the substances which rise to the surface are constantly condensing to solids, and then falling down again are once more melted by the heat of the interior; but it has also been pointed out that a purely gaseous envelope around the sun would increase so rapidly in density toward the interior, owing to the enormous pressure of gravity, that it would present the same appearance that the sun actually does.

Appearance of the Photosphere.—Through a good telescope, under favorable conditions, the photosphere is seen to have a mottled or mottled appearance, looking much like a

plate of rice soup. This appearance probably arises from a constant rising of currents of heated matter from the interior. Although attempts have been made to assign definite shapes to these seeming rice-grains, the writer believes that they are quite irregular, both in size and shape, and have no well-marked outline or distinctive features.

When the apparent center of the sun is compared with the edge of the disk, it is seen to be markedly brighter; this difference can be seen without a telescope, if the sun is examined through a very dark-green or blue glass, so as no longer to dazzle the eye. It is attributed to absorption of the rays by the solar atmosphere, a view which is confirmed by the fact that different rays of the spectrum are absorbed in very different degrees. The absorption is greatest of all in the case of the photographic rays, so that a photograph of the sun will ordinarily show very dark at the extreme limb unless over-exposed at the center. The absorption is less in the visual rays and still less in the heat rays, which shows that as we descend in the spectrum the transparency of the sun's atmosphere to the rays increases.

Solar Spots.—The most striking and peculiar feature of the photosphere is formed by the spots, which may nearly always be seen when the sun is examined with a telescope. They were seen by the earliest telescopes, and have formed a subject of constant study by astronomers ever since. When examined with a high power, and under favorable conditions, a sun-spot is found to possess marked peculiarities



FIG. 1.

of structure. A general idea of the appearance may be formed from Fig. 1. We have in the center a dark portion called the nucleus, or *umbra*, which is commonly of irregular form. The word dark must, however, be interpreted in a relative sense; though apparently dark in contrast with the effulgence of the photosphere, the spot would be intensely bright if isolated. Around this dark center is a gray fringe intermediate in brightness between the nucleus and the photosphere, which is called the *penumbra*. To ordinary examination the penumbra appears to be nearly uniformly gray, but when best seen in a good telescope it is found to have a striated or fibrous appearance, being composed of an immense number of root-like filaments directed from the outside toward the center. Groups of minute specks, brighter than the general surface of the sun, are often seen in the neighborhood of spots or elsewhere and are called *faculae*.

The spots vary in size from the smallest visible points to objects large enough to be seen with the naked eye, and therefore nearly 100,000 miles in diameter. A curious circumstance is that the spots are not seen all over the solar disk, but only near to what, in our globe, would correspond to the tropics. They are most numerous about twenty degrees on each side of the solar equator; they are rarely seen exactly at the equator, and scarcely ever in more than thirty-five or forty degrees of latitude. They frequently appear in groups comprising two or three, and sometimes many more. In consequence of the sun's rotation, each spot is seen to move slowly across its disk, occupying about thirteen days from the time it appears on one side until it disappears on the other, always supposing that it endures as long as this. The duration of a spot is very variable, ranging from a few days to several months.

A view very generally entertained is that the spots are cavities in the photosphere. This was believed because, as the spot approaches the edge of the sun, the umbra is supposed to appear wider on the side toward the sun's limb, which would be the case if it were a hollow cone at which we were looking obliquely. But the figure and size of the penumbra are so irregular that it is not easy to establish such a fact as this, and Schörrer, of Potsdam, one of the industrious students of solar spots, denies that there is any such difference. According to his view, the penumbra is on the same level with the photosphere. Yet another view is that the spots are cooled portions of matter floating, as it were, upon the hotter photosphere. They have also been attributed to down-rushes of matter, carrying the cooler portions near the surface with them. Between these various views it is impossible at present to decide.

Periodicity of the Spots.—It has been well established by careful observation since about 1850, as well as by previous

records, that the frequency of the sun-spots goes through a fairly regular period of about eleven years. In recent years the maxima have occurred about the years 1848, 1860, 1870, 1881, and 1892. The next maximum may therefore be expected about the year 1903 or 1904. During the years of maximum the sun is rarely seen without spots, and generally with a considerable number. During the intermediate years of minima the sun is seen without spots about half the time. The variation does not, however, go on with entire uniformity, the general rule being that the rise from minimum to maximum is more rapid than the fall from the maximum to the minimum. For instance, a maximum occurred about the year 1860, a minimum about 1867, and another maximum about 1870. Thus the number of spots took seven years to fall to a minimum, and only three to rise to a maximum. We also have here an illustration of the irregularity of the period. The interval is not always exactly eleven years, but sometimes a little more and sometimes a little less, varying in an irregular manner. Sufficient data have not yet been accumulated to determine accurately the law of change. It was formerly supposed that the maxima and minima might be associated with the revolutions of the planets, a view which was first suggested by the close approximation of the period of the sun-spots to that of Jupiter, the latter being somewhat less than twelve years; but careful investigation shows that the sun-spot period can not be as great as the period of Jupiter, so that the close approach to coincidence can be regarded only as an accident. The fact seems to be that the variation occurs in consequence of a cycle of changes going on within the body of the sun itself, but of the nature of those changes nothing is known.

The Sun's Surroundings.—The glare of the sun's rays in our atmosphere, even in the finest climates, is such that objects in its immediate neighborhood are ordinarily invisible. But from time to time there are a few rare minutes in which this glare is removed, in consequence of the moon passing over the sun's disk in a total eclipse. The opportunities thus offered for scrutinizing the immediate neighborhood of the sun have resulted in bringing to light a number of singular phenomena, many of which can be seen only during total eclipses. (See CORONA.) It is known that the photosphere is surrounded by a comparatively thin layer of vaporized or gaseous matter, known as the *chromosphere*. Continuous with this layer, and yet possibly having a different origin, are the protuberances, which appear to consist of vast masses of glowing gas ejected from the sun with inconceivable force, the velocity sometimes amounting to 200 miles a second. These protuberances exhibit a great variety of the most fantastic forms, sometimes appearing like immense flames, sometimes like clouds floating above the sun and remaining for hours, or even days, in the same region. It has been noticed that they are more frequently seen in the neighborhood of sun-spots than elsewhere, yet not necessarily over the spots. Some of the forms are shown in Fig. 2, on a scale

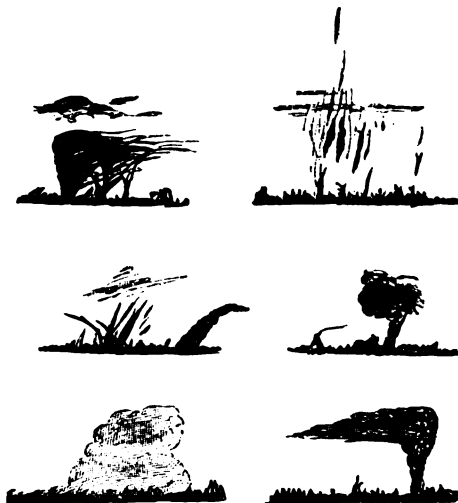


FIG. 2.

on which the earth would be represented by a globe of perhaps one-eighth of an inch in diameter.

The coronal light is so much fainter than that of the

perpendiculars that it can not be detected, even by the spectroscopes except during total eclipses. (See ECLIPSE.) It can be plainly seen extending to a distance from the sun, nearly equal to its semi-diameter, but it also shows rays or streamers extending to much greater distances, sometimes a degree more, and therefore millions of miles in extent. The most remarkable feature of its spectrum is a bright line in the green, which was discovered independently by Young and Harkness during the total eclipse of 1860. This line has not certainly been identified as belonging to any substance known to exist on the earth, and the term coronium has been applied to the unknown element which causes it. Repeated study of the corona seems to show that it generally has the greatest extent about the middle latitudes of the sun, and that its structure is of a peculiar filamentous character like that of combed wool. A resemblance of these filaments to the lines of magnetic force has been brought out by Prof. P. H. Bigelow, who has constructed a magnetic or polar theory of the corona, ascribing it to the sun's magnetism. It can not be said, however, that any entirely satisfactory theory of this object has yet been established. Magnetic force may very well account for the structure and appearance, but the great difficulty is how substances of any sort can remain at rest so near the sun, under the enormous gravitating force of the latter. The corona has sometimes been described as a solar atmosphere, but it can not be such in the sense in which we use the term atmosphere. The fact that comets have passed through its substance with a speed of several hundred miles a second, without suffering, so far as could be seen, the slightest retardation or disturbance, shows that there can be in the corona no substance but such as are of the utmost tenuity—particles so light that the thinnest air would be as lead in comparison. It has been suggested that these particles may be held up by electrical repulsion, or that they may be in a state of projection, continually thrown up from the sun and falling back again upon its surface. All these hypotheses are possible, and some may be more or less probable, but no one is yet proved to the exclusion of the others.

Elements which compose the Sun.—A comparison of the solar spectrum with the spectra of the various elements found on the earth shows that the sun is composed very largely of the same substances as the earth. The most thorough comparison of this kind is that of Rowland, which is still in progress. He finds that thirty-six terrestrial elements may be detected in the sun. Of these, calcium, iron, and sodium are among those most strongly marked. The elements not yet detected are mostly those which are found on the earth in comparatively small quantities, such as antimony, arsenic, gold, mercury, etc. The most curious case among the doubtful elements is that of oxygen. It is not yet certainly decided whether the spectrum of the sun does or does not show the existence of oxygen in that body. It is to be remarked that the absence of the lines of an element in the solar spectrum does not prove the absence of that element. The solar spectrum shows only the lines of those elements which are vaporized at its surface; hence if any elements do not come to the surface at all, or do not form a vapor there, they will not show themselves in the solar spectrum. The general result has been summed up by Rowland in the remark that were the earth heated up to the temperature of the sun, its spectrum would probably resemble that of the sun very closely. It is also to be remarked that there are lines in the spectrum of the sun, or of its surrounding atmosphere, which have not yet been identified as belonging to any terrestrial element. Of these the most noteworthy is a line, D_3 , found in the spectrum of the chromosphere and attributed to a non-terrestrial substance which has received the name *helium*. It has been announced by Ramsay (1868), however, that a gas obtained from cleveite, a rare mineral from Norway, shows this line, and therefore may be presumed to be helium. For an illustration of the solar spectrum see the article SPECTRUM.

The question whether the sun affects the earth otherwise than by its light, heat, and gravitation is one with which science is busy, but on which no positive conclusions are yet reached. A relation between the period of the sun and that of the sunspots seems to be not improbable, but the question whether auroras are themselves excited by actions going on in the sun is an open one. This whole class of questions can be settled only by long-continued observation and careful study.

The Sun's Heat.—The question of the permanence of the sun's heat is presented in a new light by these generaliza-

tions of modern science which relate to the conservation of energy. To our ancestors there was no apparent reason why the sun should not continue to light and warm the earth and planets forever; but modern science shows that the radiation of heat from the sun to the earth involves a continuous expenditure of an agent called energy, of which the supply is necessarily limited.

The quantity of heat which is received from the sun has been determined by several experimenters. The recent observations of Langley probably give the most accurate result, which may be expressed in the following way: Let us consider a cubic centimeter of water, that is, a cube about four-tenths of an inch on each side. We may realize this cube in the form of a thin metallic vessel, filled with water. Let this vessel be covered with lampblack, and one side of it be exposed perpendicularly to the rays of the sun. Langley's result is that if these rays reached the earth without being absorbed by our atmosphere, they would, when absorbed by the cube, heat it at a rate of 26° C., or 64° F., per minute. Taking as the unit of heat the quantity which would raise the temperature of 1 cubic cm. of water 1° C., we may say that the sun radiates upon each square centimeter of surface 26 heat units per minute. Imagine a spherical surface surrounding the sun, at a distance equal to that of the earth's orbit. Every square centimeter of that surface would receive this quantity of heat from the sun. We may state this result in another way. If the amount of heat falling on a square centimeter were transformed into a lifting force, without any loss whatever, it would raise a cubic centimeter of water against the force of gravity at the rate of about 4,500 feet per minute. A similar computation shows that the heat which the sun, when near the zenith, radiates upon the deck of a steamship would suffice, could it be turned into work without loss, to drive her at a fair rate of speed.

Considering the sun simply as a hot body, it would be cooled by the heat which it radiates, and calculation shows that the amount of heat radiated would result in a cooling of 5° , more or less, per year, assuming in the specific heat of the substances which compose it. It follows that, in such a case, the sun would cool off entirely in a very few thousand years. As no actual cooling seems to take place, the question arises how the heat is kept up.

Two theories on this subject have been maintained in recent times. One, known as the meteoric theory, is that the countless meteors which are known to be moving in all directions through the solar system are continually falling into the sun and supplying it with the heat generated by the impact. As to this theory it can only be said that it seems impossible that meteoric matter in sufficient quantity could be falling into the sun. The other theory, which is now universally accepted, at least provisionally, by the ablest physicists, is that the heat is kept up by the contraction of the sun's volume as it cools. A very curious result of this contraction was reached some years ago by an American investigator, J. Homer Lane, who showed that as the sun contracted it would actually become hotter, because although heat was lost by radiation, yet, so far as temperature was concerned, this loss would be more than made up by the resulting contraction, so long as the sun remained gaseous. This, however, does not mean that the heat would last indefinitely. After contracting to a certain point the matter composing the sun would necessarily begin to assume a solid or liquid form, and then would rapidly cool off. The available supply of energy would then be exhausted forever, and our system would be overtaken by eternal cold and darkness. Thus the physical conclusion to which we are led by a study of the laws of nature is that the sun, like a living being, must have had a birth and will have an end. From the known amount of heat which it radiates we can even, in a rude way, calculate the probable length of its life. From fifteen to twenty millions of years seems to be the limit of its age in the past, and it may exist a few millions of years, perhaps five or ten, in the future.

These computations have brought the conclusions of physics and astronomy into collision with those of geology. About the middle of the nineteenth century geologists were led by a study of the rocks composing the earth's surface in successive periods of their deposit to conclude that geological processes must have been going on for hundreds of millions of years. It can not be said that a complete reconciliation has yet been reached; but the writer believes that the general tendency of late years has been to shake the confidence formerly felt in the great length of the geological ages.

Connected with and yet apart from this is the question of the invariability of the supply of heat. Can we be sure that this supply has been every year the same during many ages past, and that it will remain unchanged for ages in the future? May it not be that the glacial epoch was due to a diminution of the sun's radiation? May this radiation not increase or diminish in the future to such an extent as to affect seriously the activities and destiny of the human race? These are questions to which the science of to-day can return no positive answer. All that can be said is that during the two or three centuries of accurate observations of temperature and climate there is no evidence of any permanent change. Adding to this the fact that a comparison of the ancient records of the magnitude of the stars with their present magnitudes does not show any evidence of change, and that the sun is undoubtedly a star which is brighter than others because we are so much nearer to it, the conclusion is that there is no reason to apprehend any sudden or rapid changes in the supply of solar heat.

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SIMON NEWCOMB.

Sun Animalcules: See HELIOZOA.

Sun-bird: any bird of the family *Nectariniidae*, inhabiting a great part of Africa, Southern Asia, and Australasia. Although only distantly related, the sun-birds have a superficial resemblance to the humming-birds, with which they are generally confounded by colonists, in their smallness, slender build, brilliant, often metallic colors, and habits of feeding from flowers, but belong to a different order, the passerines. The tongue is practically tubular and suctorial, although their food consists mainly of insects. Their nests, which are roofed over, are swung from a slender twig or the tip of a leaf; the eggs, generally three in number, are white, plentifully sprinkled with grayish green. There are over 100 species, which have been described in a *Monograph of the Sun-birds*, by Capt. Shelley (London, 1876-80).

F. A. LUCAS.

Sun-bittern: a wading bird (*Eurypyga helias*) of somewhat uncertain affinities, but usually placed in a separate family (*Eurypygidæ*) near the cranes and rails. It is about 16 inches long. The head is black, with a white stripe above and beneath each eye; the balance of the plumage is curiously and elaborately mottled with black, white, chestnut, and various shades of buff and brown. The sun-bittern is found along the banks of rivers in the northern and eastern parts of South America, and feeds on fishes and insects. Its nearest relative is the Kagu (*q. v.*).

F. A. LUCAS.

Sunbury: borough; capital of Northumberland co., Pa.; at the junction of the northern and western branches of the Susquehanna river; on the N. Cent., the Penn., and the Phila. and Reading railways; 54 miles N. of Harrisburg, the State capital (for location, see map of Pennsylvania, ref. 4-G). It is in a lumbering region; is an important shipping-point for coal; and contains the repair-shops of the Phila. and Erie Division of the Penn. Railroad, rolling-mill, organ-factory, saw and planing mills, nail-works, and coffin, table, and sash and door factories, a national bank with capital of \$200,000, a trust and safe-deposit company with capital of \$125,000, and a daily, a monthly, and two weekly periodicals. The borough was founded in 1772; was the site of the Indian village of Shamokin and of Fort Augusta, erected by the provincial government in 1756 as a defense against the French and Indians, the magazine of which is preserved in the Fifth Ward of the borough; and is separated from East Sunbury borough (incorporated in 1891) by a small stream. The interests of the two boroughs are identical. Pop. (1880) 4,077; (1890) 5,930; (1895) estimated, Sunbury, 8,000; East Sunbury, 2,000.

EDITOR OF "SUNBURY DAILY."

Sunda Islands: the chain of large islands belonging to the Malay Archipelago, which, beginning with Sumatra and ending with Timor, separates the Java Sea from the Indian Ocean. The name is derived from the indigenous name of the western part of Java, adjoining the Sunda Straits. See JAVA.

M. W. H.

Sun'darbans, or Sunderbunds: the part of the delta of the Ganges which extends from the Hugli to the Megna. It

has an area estimated at 7,550 sq. miles, and consists of a great number of smaller and larger islands covered with dense forests and infested by tigers and crocodiles. As this tract of land is in the highest degree pestiferous, the Government has taken measures to improve it, or at least make it innoxious, and in many places the forests have been cleared and the ground transformed into fields of rice and sugar.

Revised by M. W. HARRINGTON.

Sunday [O. Eng. *sunmandæg* (*sunne*, sun + *dæg*, day, transl. of Lat. *dies solis*; *dies*, day + *solis*, genit. of *sol*, sun. See SUN); the secular name of the first day of the week, which is held among Christians as a Sabbath, or rest-day, and in remembrance of Christ's resurrection. As soon as the Christian religion was recognized by the state, laws were enacted for the observance of Sunday. Constantine (321) prohibited all business except agricultural labor and all legal proceedings except the manumission of slaves. Subsequent emperors made similar enactments. Theodosius II. (425) forbade games and theatrical exhibitions on Sunday (*Cod. Theod.*, xv., tit. 7). The most strict of these laws is that of Leo and Anthemius (469, *Cod. Justin.*, iii., tit. 12). The laws of Theodoric the Great, several kings of France, and especially Charlemagne (813), prohibited servile work and secular business.

In England Sunday laws were of very early origin. The common law distinguished Sunday from other days by allowing no judicial acts on that day, according to the maxim, *Dies dominicus non est juridicus*. The code of Ina, King of the West Saxons (about 603), punished servile work by fine. Alfred the Great (876) forbade work, traffic, and legal proceedings on Sunday. Similar laws were in force through all the Saxon period, and were often enacted in subsequent reigns. The statute 27 Hen. IV., c. 5, enacts that all fairs and markets on Sundays, except in harvest, shall cease on pain of forfeiture of goods. The statute 5 and 6 Edw. VI., c. 3, makes Sundays, with Christmas, Easter, etc., holy days, but permits work in harvest and in other cases of need. The statute 1 Eliz., c. 2, punishes by fine persons absenting themselves from church without excuse. In 1618 James I. issued his *Book of Sports*, in which he declares certain games, sports, etc., lawful on Sundays after divine service. Charles I. in 1638 reissued the *Book of Sports*. The most important of the English statutes is 29 Chas. II., c. 7, which prohibits all worldly labor or business (works of necessity and charity only excepted), the sale of goods, traveling for purposes of trade, and the serving or executing of any process or warrant, except in case of treason, felony, or breach of peace. The dressing of meat in families and its sale in inns and eating-shops and the crying of milk before nine and after four are allowed. This statute, somewhat modified by subsequent laws, is the present Sunday law of Great Britain, and lies at the basis of the Sunday laws of the U. S.

In France, during the Revolution, when the Christian calendar was abolished and the decade substituted for the week, each tenth day was made a rest-day, and its observance was enforced by a law (17 Thermidor, An VI.) which required the public offices, schools, workshops, stores, etc., to be closed, and prohibited sales except of eatables and medicines, and public labor except in the country during seed-time and harvest. On the restoration of the Gregorian calendar, Sunday was recognized in the *Code Napoléon* (Art. 25, 260). A law of Nov. 18, 1814, prohibited ordinary labor, traffic, etc., and, though declared by the courts in 1838 and 1845 to be still in force, it has been for many years a dead letter. The International Sunday-rest Congress, in connection with the Paris Exposition of 1889, and the Berlin Labor Conference, convened by the German emperor in 1890, gave increased prominence to the question of the legal protection of Sunday rest which had been previously agitated by labor and other associations. Laws restricting Sunday labor and trade to a greater or less extent exist in Germany, Switzerland, Austria, Hungary, Belgium, Holland, Denmark, Sweden, and Norway.

The early English colonists of North America brought with them the observance of Sunday, both as a religious and as a civil institution, and both the religious and secular observance of the day was enforced by laws similar to the English statutes, though modified by the popular feelings and modes of life. The early laws of Massachusetts, Connecticut, Georgia, South Carolina, and Virginia compelled attendance at church, the Massachusetts law (1782) providing that such attendance was not required where there was no place of worship which the person could conscientiously

crusade attend. (The oft-quoted Black Letter (q. v.) of Parliament are a pure fiction, first published in London in 1786 by Samuel Parnis, in revenge for having driven from the colony on account of his obstinate republicanism.) After the establishment of the Federal Government, as the separation between church and state came to be more fully understood and carried out, the earlier Sunday laws were modified in conformity with this principle, and the legislatures and courts have been careful to distinguish between Sunday observance as a religious and as a civil institution, and to enforce only the latter. The existing Sunday laws rest chiefly upon the following grounds: The right of all classes, so far as practicable, to rest one day in seven; the right to undisturbed worship on the day set apart for this purpose by the great majority of the people; the devout respect which should be paid to the religious institutions of the people; the value to the state itself of the Sunday observance as a means of that popular intelligence and morality on which these institutions are conditioned. The Federal Constitution provides that Sunday shall not be reckoned in the ten days within which the President may return any bill; the Federal courts and the offices of the departments are closed; the exercise of the post-office is restricted; no session of Congress is held, and provision is made by act of Congress for the observance of Sunday in the army and navy. Beyond this, Sunday legislation does not come within the sphere of the Federal Government. The constitutionality of all but a very few of the States, like the Federal Constitution, except Sunday in reckoning the time within which the executive may return a bill to the legislature. Sunday laws exist in all the States, with a single exception. The statutes of the States differ somewhat in details and strictness. Sunday is everywhere held as a *dieu non*. Public affairs are suspended; the legislatures do not sit; courts are not held, except that in some other police courts are open for six hours or two; legal processes are not served. In most of the States common labor and traffic are prohibited; amusements made or the services on Sunday are invalid; public amusements are restricted or forbidden. In many States partial exception is made for those who observe the seventh day of the week. The constitutionality of Sunday laws has been decided frequently by the highest State courts.

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Sunday Letter: See DOMINICAL LETTER.

Sunday-schools: gatherings for religious instruction and worship, in which the learners are clustered in classes under separate teachers, all the classes being associated under a common head, and the form of instruction being introductory or colloquial. These characteristics include many schools which are held on Saturday, or which are known as First-day schools.

Modern Sunday-schools.—These had their origin in a movement begun by Robert Raikes, the proprietor of *The Gloucester Journal*, in Gloucester, England, in July, 1780. His purpose was to provide instruction in reading, and in the Church of England catechism, for the neglected children of a manufacturing district of that city. His first school was gathered on a Sunday in a private house under the charge of four women, who were employed at a shilling a day. Its forenoon session was from ten to twelve o'clock. In the afternoon, after a brief session, the children were conducted to the parish church for a part in worship, and were afterwards examined in the catechism. The Rev. Thomas Stothard, a parish clergyman, assisted Mr. Raikes in this work, and gave an extra shilling a day to the teachers.

Descriptions of this movement in *The Gloucester Journal* and other periodicals in 1788 called public attention to it, and it soon became widely popular. Voluntary teachers took the place of paid ones. The queen gave it her approval by sending for Mr. Raikes to tell her its story, and to congratulate him on what he was doing. Bishop Porteus was an early and earnest friend of the movement. John Wesley introduced its plan of work into his religious operations. A general Sunday-school society was organized with the aid of William Fox and James Hailey, having its center in London. The success of the movement was quickly

assured, although not without opposition from ecclesiastical authorities and timid reformers. A council of bishops was summoned by the Archbishop of Canterbury to consider the best means of checking the innovation; and the Presbyterians of Scotland and the Unitarianismists of New England took stand against it as tending to the secularization of the Sabbath. Within four years from the public announcement of his work by Mr. Raikes, however, the membership of such schools in the United Kingdom numbered over a quarter of a million, and the increase of their numbers has been constant.

Ancient Jewish Schools.—Although this was the beginning of the modern Sunday-school movement, its idea was of ancient origin, and had found expression in various forms all along the ages. Religious instruction, apart from that which was given in the family, seems to have been practiced in the days of Abraham (Gen. xiv. 13). Home instruction was not deemed sufficient for the children under the Mosaic law (Deut. xxxi. 12-13). The Levites were traveling Bible-teachers in the days of the kings of Judah (2 Chron. xvii. 9). The synagogue seems to have included in its exercises from its beginning, during the captivity, the study of the law by introductory methods. According to the Talmud and to Josephus, a system of religious schools in connection with the synagogues was organized in the century before Christ. This system included many of the features of the modern Sunday-school. The size of classes was limited to the capability of the teacher. Selected Bible lessons were arranged for a series of years. Attention was given to the fitness of instruction to the ability and needs of the pupils. Freedom in questions and answers was cultivated. Such schools were general in Palestine in the days of Jesus, and there is reason to suppose that he was a pupil in one of these in his Nazareth home.

Early Christian Schools.—The religious school was a prominent agency in the early Christian Church. "The apostolic Church," says Baron Hume, "made the school the connecting link between herself and the world." Catechizing engaged the best efforts of the best Christian teachers. A compulsory system of Bible schools for children in every city was in force in extensive fields as early as the fourth century, and charity schools in all country churches were ordered by a general council of the Church in A. D. 680. Such work was never wholly lost sight of even in the Dark Ages, although as the ecclesiastical spirit began to predominate over the evangelical less attention was given to it. In the Reformation of the sixteenth century the school idea gained new prominence. Paul Luther: "For the Church's sake Christian schools must be established and maintained. . . . God maintains the Church through the schools." And he acted on this idea, as did also Calvin, Zwingle, Beza, Knox, Cranmer, Ridley, Fisher, and others. Under Jesuit lead the Roman Catholic Church paid fresh attention to schools, and regained a measure of its lost ground through methods with children similar to those now in use in Sunday-schools generally. Two epochs combined to check the progress of what might be called "the Sunday-school idea" after its revival in the sixteenth century. The unintelligent memorizing of set answers, in catechisms intended as a mere guide in teaching, gradually took the place of religious teaching; and the polemical spirit among Protestants lifted argument into an undue prominence over Bible study. A marked religious decline was the result, and social and personal morals were at a very low point in the latter half of the eighteenth century, when the new movement in favor of Sunday-schools was begun by Robert Raikes.

Modern Beginnings before Raikes.—The plan of Raikes was only the new application of an old idea, but the circumstances of his beginning gave fresh importance to his work, and therefore its date marks a new era. Single schools much like his are claimed to have been started before that date, as follows: In Bath, England (by Rev. Joseph Allibon, in 1665-66); in Heshbury, Mass., in 1674; in Norwich, Conn., in 1676; in Plymouth, Mass., in 1699; in Newtown, Long Island (by Rev. Morgan Jones, in 1693); in England (by Bishop Prebington), in 1693; in Berks and Montgomery cos., Pa. (by the Schwankholders, in 1734); in Savannah, Ga. (by Rev. John Wesley, in 1737); in Ephrata, Pa. (by Jacob Hooker, in 1740); in Bethlehem, Conn. (by Rev. Joseph Bellamy, in 1740); in Philadelphia, Pa. (by Mrs. Greenough, in 1744); in Northern Scotland (by Rev. Mr. Morrison, in 1757); in Brechin, Scotland (by Rev. David Blane, in 1760); in Caterick, England (by Rev. Theophilus Lindsay, in 1763); in Columbia, Conn. (by Rev. Eleazer Wheelock, in

1763; in Bedale, England (by Miss Harrison), in 1765; in High Wycombe, England (by Miss Hannah Ball), in 1769; in Doagh, County Antrim, Ireland (by William Galt), in 1770; in Bright, County Down, Ireland (by Rev. Dr. Kennedy), in 1774; in Little Lever, near Bolton, England (by James Heys), in 1775; in Mansfield, England (by Rev. David Simpson), in 1778; also about the same time in Asbury, England (by Rev. Thomas Stock), and in Dursley, England (by William King).

Beginnings in the U. S.—For the credit of introducing the modern Sunday-school into the U. S. there are many claimants. It would seem that in several places Sunday-schools which were started within a few years after Raikes's beginning in Gloucester were continued for a time and then given up without leaving immediate successors. Thus a Sunday-school was organized under the direction of Bishop Asbury at the house of Thomas Crenshaw, in Hanover co., Va., in 1786; yet little is known of it save its beginning. A minute in favor of organizing Sunday-schools was adopted by the Methodist Conference in Charleston, S. C., in Feb., 1790; yet no record is found of Sunday-schools organized. In Dec., 1790, a meeting was called in Philadelphia to consider the importance of this work, and early in Jan., 1791, the First-day or Sunday-school Society was formed for the purpose of securing religious instruction to poor children on Sunday. This society is still active, yet its schools, like those of Robert Raikes, had paid teachers during the earlier years of its operation. In 1791 there was started a Sunday-school in Boston; in 1793 one in New York by Katy Ferguson, a Negro; in 1794 one in Paterson, N. J.; in 1797 one in Pawtucket, R. I., by Samuel Slater; in 1800 one in Pittsburg, Pa. In 1803 a Sunday-school was gathered by Mr. and Mrs. Divie Bethune in New York, and subsequently other schools were begun by them. Mrs. Bethune was a daughter of Mrs. Isabella Graham the philanthropist. Mr. Bethune had seen something of Raikes's work in England, and the New York school was in imitation of that. In the same year with this beginning in New York a Sunday-school was begun in Portsmouth, N. H., and the year following one in Baltimore, Md. In 1809 a systematic Sunday-school movement was organized in Pittsburg, Pa. The Rev. Robert May, from London, gave a new start to Sunday-schools in Philadelphia in 1811, which proved a beginning of permanent progress. A local union for Sunday-school work was organized in New York in 1816, another in Boston the same year, and another in Philadelphia in 1817. These societies became the nucleus of the American Sunday-school Union, a national society organized in 1824.

Progress and Influence.—The Sunday-school movement led to a new interest in popular education, and to new measures for the Christian evangelization of the home field and the foreign. J. R. Green, the historian, says: "The Sunday-schools established by Mr. Raikes . . . were the beginning of popular education." The system of penny postage, and the organization of the British and Foreign Bible Society, and of other benevolent societies, were an outgrowth of interest in this movement. Adam Smith said at the time: "No plan has promised to effect a change of manners, with equal ease and simplicity, since the days of the apostles." A century later John Bright, looking back on the record, said: "There is no field of labor, no field of Christian benevolence, which has yielded a greater harvest to our national interests and national character than the great institution of Sunday-schools."

In the U. S. the influence of the Sunday-school has been even more important than in Great Britain. When the Sunday-school was introduced as a practical power into the U. S., unbelief and error were already largely in the ascendant, and a flood of godless immigration was making the matter worse year by year. The new agency was by various changes adapted to the peculiar needs of the republic, and it became a means of instructing and influencing children and youth in the field of organized churches and of pioneer religious work in new communities.

Present Status.—The Sunday-school is a recognized department of the Church in the U. S. for the religious instruction of the young, and for systematic Bible study by young and old. It is also employed as a pioneer agency of evangelism in newer portions of both the older and the newer communities, as in the outlying districts of cities and villages, and on the borders of an advancing and extending population, beyond the limits of existing church organizations. Both as a denominational and as an undenominational

agency it is of marked and growing prominence. Protestants and Roman Catholics alike recognize its importance, and it is in favor among the Jews as among Christians. Its management varies according to the ecclesiastical systems of which it has become a part, but its main features are alike throughout.

Buildings for the use of Sunday-schools are often arranged so that numerous rooms can be used separately, and yet all opened together into the sight of the superintendent's desk at a moment's notice. Sunday-school hymns and music are an important aid to social worship. An extensive literature, in the form of books and periodicals, has been created by and for the Sunday-school. Improved methods of teaching have been promoted by Sunday-school normal classes and teachers' institutes. Conventions and assemblies have extended the influence and uplifted the standard of Sunday-school instruction.

International Lessons.—In 1873 a plan of uniform Bible lessons was formally inaugurated, on the recommendation of a national convention of Sunday-school workers, and that plan was approved in Canada and England, and came to be known as the international system. Gradually this system overbore opposition, and was employed more and more generally in North America and throughout the world, until now from 6,000,000 to 8,000,000 are engaged each week in the study of the Bible according to its outline. This centering of interest on particular portions of the Bible has justified the issue of many special works as aids to intelligent study, and of the employment of the ablest scholarship and talent for critical and popular expositions. As a result, there is more of biblical study and of interest in biblical research than at any previous stage in the world's history. Criticisms of this international system and attempts at a better one have been incessant, but it has made progress steadily in public favor. A scheme of Bible lessons widely used in the U. S., and considered by many as an improvement upon the international lessons, is known as the Blakeslee or inductive system; and other schemes have their enthusiastic advocates.

The influence of the Sunday-school has been manifestly for good over the individual, the family, and the community; and schools, colleges, and churches have felt that influence, as widely and as steadily as the Sunday-school has made progress.

The following statistics of Sunday-schools in all nations were compiled for the second world's Sunday-school convention, at St. Louis, Mo., Sept. 4 and 5, 1893:

COUNTRY.	Sunday-schools.	Teachers.	Scholars.
EUROPE:			
England and Wales.....	37,301	585,487	5,978,537
Scotland.....	6,375	62,994	694,840
Ireland.....	3,584	27,740	308,516
Belgium.....	89	310	4,112
Austria.....	212	513	7,195
Denmark.....	506	3,043	55,316
Finland.....	6,883	11,534	147,134
France.....	1,450	3,800	60,010
Germany.....	5,900	34,953	749,796
Greece.....	4	7	180
Holland.....	1,560	4,600	163,000
Italy.....	403	654	10,969
Norway.....	550	4,300	63,980
Portugal.....	11	56	1,066
Russia.....	88	777	15,524
Spain.....	86	180	3,230
Sweden.....	5,750	17,300	242,150
Switzerland.....	1,637	6,916	113,382
European Turkey.....	35	173	1,364
ASIA:			
India and Ceylon.....	5,548	10,715	197,754
Persia.....	107	440	4,876
Siam.....	16	64	879
China.....	105	1,053	5,284
Japan.....	150	390	7,019
Central Turkey.....	516	2,450	25,833
AFRICA:	4,246	8,435	161,394
NORTH AMERICA:			
United States.....	123,173	1,305,039	9,718,438
Canada.....	8,386	69,521	575,064
Newfoundland and Labrador.....	359	2,975	22,976
West Indies.....	2,185	9,673	110,231
Central America and Mexico.....	550	1,300	15,000
SOUTH AMERICA:	350	3,000	150,000
OCEANIA:			
Australasia.....	4,786	54,211	586,029
Fiji Islands.....	1,474	2,700	42,900
Hawaiian Islands.....	380	1,413	15,840
Other Islands.....	210	800	10,000
Totals.....	224,562	2,239,738	20,268,933

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H. CLAY TRUMBULL.

Sunderland: town in the county of Durham, England, at the mouth of the Wear; 12 miles S. E. of Newcastle-upon-Tyne and 13 miles N. E. of Durham (see map of England, vol. 4-11). The borough includes Sunderland proper and other townships on the south side of the Wear, and Monkwearmouth on the north side, the river being crossed by two iron bridges. Sunderland is a well-built modern town with broad streets. Among the principal buildings are the Renaissance town-hall, completed in 1890, and the museum, art gallery, etc. (1919). The harbor is formed by two piers, 1,850 and 650 feet long respectively. Two new piers 2,570 and 2,700 feet long, including a harbor of 125 acres, are in process of construction (1895). Four docks, covering a total space of 48 acres, are capable of receiving the largest vessels. The shipments of coal and coke average upward of 4,000,000 tons; in 1892 1,369,546 tons were exported. Glass, earthenware, iron, lime, cement, and chemicals are also exported. The principal imports are iron ores, timber, chalk, and agricultural produce. The total tonnage entered and cleared in 1899, exclusive of that coastwise, was 1,979,793. Ship-building is largely carried on; in 1892 67 steamers, with a total tonnage of 174,940, were launched. Other industries are iron-works, bottle-works, chemical works, ropewalks, paper-mills, and breweries. In Monkwearmouth is one of the deepest collieries in the world (281 fathoms). Pop. of the municipal borough (1894) 136,101; of the parliamentary borough, returning two members (1891), 142,097. R. A. B.

Sunderland, JAMES THOMAS, A. B., B. D., A. M.; clergyman and author; b. at Howarth, Yorkshire, England, Feb. 11, 1842; educated at Madison University, Hamilton, N. Y., University of Chicago, and Union Baptist Theological Seminary, Chicago; held pastorates in Milwaukee, Wis., North-Rail, Mass., Chicago, Ill., and Ann Arbor, Mich.; published *A Rational Faith* (1878); *What is the Bible?* (1878); *The Liberal Christian Ministry* (1889); *Home Travel in Bible Lands* (1891); *The Bible, its Origin, Growth, and Character and Place among the Sacred Books of the World* (1893); and various minor works; established and became the editor of *The Unitarian*, a monthly, in 1896.

Sunderland, ROBERT SPOONER, Second Earl of; politician; b. in 1640; lived on the Continent during the time of the Commonwealth; returned to England at the restoration of Charles II.; was sent on embassies to Madrid, Paris, and Cologne, 1671-73, and became Secretary of State in 1679. He at first opposed and then supported the bill for the exclusion of the Duke of York, afterward James II., and was removed from office by Charles in 1691, but was reinstated in 1692, and exercised a controlling influence in the Government during the remainder of the reign. He was continued in office by James II. and is said to have become a Roman Catholic, but, being opposed to some of the radical measures of the court, was dismissed in 1688, and took refuge in Holland. He gained the favor of William, and in 1697 was made lord chamberlain, but retired from public life in 1697 with the reputation of having been the basest public man of his age. D. at his seat, Althorpe, Sept. 28, 1762.—CHARLES SPOONER, his son, the third earl, b. in 1674, professed liberal principles, and was returned to Parliament for Tiverton in 1695. His first wife, a daughter of the Duke of Newcastle, having died, he married in 1699 a daughter of the Duke of Marlborough, thereby strengthening his alliance with the dominant Whig party. He succeeded to the earldom in 1702; distinguished himself on a mission to Vienna, and from 1701 to 1710 was Secretary of State; was dismissed in 1710, declining a large pension offered him by the queen. Upon the accession of George I. in 1714, he was made Lord-Lieutenant of Ireland, in 1715 Lord Privy Seal, and in 1718 Prime Minister. He was apparently deeply involved in the South Sea

Bubble, and though in an investigation by the House of Commons he was acquitted of personal corruption by a vote of 221 to 173, he was driven from office in 1721. D. Apr. 19, 1722. P. M. COLBY.

Sunder: See DUMBERA AND INSECTIVOROUS PLANTS.

Sun-dial: See DIAL.

Sun-dog: See HALO.

Sunfish: a name given to different aquatic animals on account of their brilliant colors, shape, or habit of basking in the sun. (1) In the U. S. and Canada it is most frequently applied to species of freshwater fishes belonging to the family *Centropomidae*, and chiefly to the genus *Lepomis*. These are readily recognized by the extension of the opercula backward into narrow or less enlarged or elongated membranous, highly colored, sail-like lobes, and the radial formula—viz., dorsal fin with ten spines and ten or eleven rays, and anal fin with three spines and nine or ten rays; the colors are always quite brilliant. The species are quite numerous. The best known in the Northern States are the (1) *Lepomis gibbosus vulgaris*; (2) *L. auratus*; and (3) *Lepomis pallidus*. The *L. gibbosus* is the common sunfish of New England and the Middle States, and is at once recognizable by the ear-flaps being black, tipped with scarlet, and by the orange spots of the sides. The *L. auratus* is equally readily distinguishable by the very long black not distinct edged ear-flaps. The *L. pallidus* has sparsely black ear-flaps. The first is the smallest, and the last two the largest of the species mentioned. Wherever found, they are generally among the most common fishes. They are quite carnivorous and bold, and take a look baited with the common earthworm with avidity. Many of the species build curious nests. (2) On the seacoast, to some extent, but more especially in Great Britain, the name is given to species of *Orthopristis* or *Mola*, fishes of an almost circular outline, with high anal and dorsal fins and an aborted tail. (3) In some parts of England the name is also applied to the basking shark (*Cetorhinus* or *Detorhinus maximus*). (4) It is also frequently applied by sailors to the species of floating water-leaves or jellyfishes. Revised by P. A. LORAN.

Sunflower: the *Helianthus annuus*, a coarse and tall annual plant of the family *Compositae*. It is often seen in gardens and is well known for its large and showy compound flowers. It is a native of the Great Plains of North America, where it grows in great abundance. In Europe the plant is raised for its seeds, which afford a good drying oil, nearly equal to that of linseed. The leaves are fed to cattle, the seeds to poultry, and the flowers yield good honey. The planting of sunflowers is reputed to be a preventive of miasmatic fevers. The pith is sometimes used instead of the true moss. In tropical America the sunflower often attains a height of 20 feet and produces a flower of from 1 to 2 feet in diameter. In Southern Europe it is cultivated as a field-crop on account of its seed. See COMPOSITEAE for illustration. Revised by CHARLES E. HANSEN.

Sunflower Family: another name for the *Compositae* (q. v.).

Sungaria, or **Zungaria** (sometimes *Jungoria*): the country of the Sungars or Kalmauks; a geographical expression of no scientific value, loosely used to indicate the region that was once the center of the kingdom established early in the eighteenth century by the Sungars or Manchu of the left wing. It is a plateau of moderate elevation, bounded on the S. by an eastern extension of the Tianshan or Celestial Mountains; has the Russian provinces of Semirechinsk and Semipalatinsk on the W. and N. W., and is separated on the N. E. from Kokoda in Mongolia by the Great Altai Mountains. It is intersected by minor chains which divide the region into several basins with a number of considerable lakes. It includes the valley of the Ili, and with Chinese Turkestan to the S. it forms what is called *Sinkiang* (or *shing*), the "New Frontier" province of the Chinese empire. The population of Sungaria has been estimated at 2,000,000. Capital, Kulja. R. L.

Sunn Hemp: the fiber of the *Crotalaria juncea*, a leguminous herb of Bengal, extensively cultivated in India both for its fiber and as a forage-plant for cows. The sunn hemp is exported extensively. It is inferior to true hemp, but better than jute, and is used for cables and manes.

Sun'nites: all methods Musulmans. They are so called as adherents of the *Sunnah* or tradition, a collection of prophetic laws, which embrace (1) the remarks and com-

sels uttered by the Prophet; (2) his deeds and practices; and (3) his silence, it being considered that what the Prophet abstained from doing or saying fully indicates his opinion and hence the duty of his followers. The Sunnites are divided as to ritual into four classes, the Hanefites, Malekites, Schafites, and Hannbelites. See MOHAMMEDANISM. E. A. G.

Sunstroke, Insolation, or Coup de Soleil: See THERMIC FEVER.

Sun-worship: commonly regarded as one of the characteristic features of the religion of ancient Persia. The Peruvians of old who worshiped every aspect of nature, paid the chief honors to the sun. The Egyptians, the Greeks, the Italians of antiquity, and the Celtic and Teutonic races, the East Indians, and some African pagans, were, as some heathen races still are, sun-worshippers. In fact, sun-worship is one of the most widely diffused forms of nature-worship, the genial and fructifying warmth and brightness, the mysterious nature, and the constant course of the great luminary appealing powerfully to the religious feelings of the ruder peoples. See the article WORSHIP.

Revised by A. V. WILLIAMS JACKSON.

Supererogation, Works of [*supererogation* is from Late Lat. *supererogatio*, deriv. of *supererogare*, pay out in addition; Lat. *super*, over, above + *erogare*, pay out, expend; *e*, out + *roga're*, ask]: in the Roman Catholic Church, good works performed by a Christian over and above his simple duty. These works, it is alleged, constitute a fund of merit which is applied to the relief of souls in purgatory. The definition is based on a distinction between what is commanded and what is only counseled—a distinction which is known only to Roman Catholic dogmatics.

Superior: city: port of entry: capital of Douglas co., Wis.: at the head of Lake Superior, on St. Louis, Superior, and Allouez Bays, and the Gt. North. N. Pac., Chi., St. P., Minn. and Om., St. P. and Duluth, Dul. and Winnipeg, and the Dul., S. Shore and Atl. railways; opposite Duluth, Minn. (for location, see map of Wisconsin, ref. 2-B). It has three perfect landlocked harbors, all connected, with total length of 13 miles and width of from 1 to 3 miles. The city is platted at right angles to the water front, with streets 80 feet wide, avenues 100 feet, and alleys 20 feet. The climate is crisp, dry, and healthful, with average temperature for twenty years 40°; average velocity of wind, 7 miles per hour; average number of fair and clear days per annum, 260. The water-supply is drawn from Lake Superior, and the sewerage system, planned when the city was laid out, is sufficient for a city of 1,500,000 people. There are 31 miles of paved streets, 89 miles of graded streets, 47 miles of sewers, 87 miles of sidewalks, 43 miles of water-mains, 15 miles of gas-mains, and 15 miles of double-track electric railway.

Churches and Schools.—Superior has 36 church organizations and 35 church edifices. There are 12 public schools, with 96 teachers and 5,160 pupils, 4 parochial schools, a Finnish university, and a business college. The public-school buildings cost \$456,000.

Finances and Banking.—The assessed valuation in 1894 was \$19,680,000; bonded debt, general, \$363,598; special improvements, \$942,667; school district bonds, \$235,000. In 1895 there were 3 national banks with combined capital of \$635,000, 8 State banks with capital of \$600,000, 5 loan and investment companies, and 5 building and loan associations, local and serial, with 447 shareholders and 7,159 shares in force.

Business Interests.—The manufactures are chiefly flour, lumber, lath, shingles, iron, wagons, chairs, barrels, bags, coke, and woolen goods. There are 8 flour-mills with a combined capacity of 23,000 barrels per day; 9 elevators with a storage capacity of 15,000,000 bush.; 8 coal-docks with a capacity of 6,000,000 tons, one of which is the largest in the world, with capacity of 4,000,000 tons, and one of solid steel in which all coal-handling is done in large steel tunnels beneath the ground; a bank of coking-ovens; an iron-ore dock; shipyards for the construction of whaleback steamers; 4 sawmills; the largest dry dock on the Great Lakes; and many other industrial plants. The receipts by water are coal, oil, salt, cement, sugar, iron, and general merchandise; shipments, wheat, flour, lumber, copper, and wool. The port collector's official report for 1894 showed, arrivals and clearances, 2,001; tonnage, 2,830,000; coal receipts, 1,142,614 tons; wheat shipped, 10,739,000 bush.; flour shipped, 3,077,000 barrels; lumber shipped, 24,600,000 feet; copper, iron ore, etc., shipped, 560,000 tons; and wheat in store on Jan. 1, 1895, 7,110,000 bush.

Shipping Facilities.—Besides those furnished by the railways, the city has exceptional facilities for receiving and shipping freight by water. The water front is divided into harbor districts, so that the city may make improvements in any one of them when needed and charge the cost to the property in the district. There are 10 miles of substantial wharfage, and the water front may be slipped so as to furnish 138 miles of wharfage. The U. S. Government has expended \$650,000, and private parties about \$600,000 in harbor improvements; and the city \$3,200,000 and private corporations and parties \$2,225,000 on docks.

History.—Superior was a station of the Hudson Bay Company, over 200 years ago; trading-post for Daniel Greyschlon du Lhut (Duluth) in 1680; and headquarters for Radisson and Grosseilliers in 1661. In 1853, when it was supposed the U. S. Congress would charter and subsidize the Northern Pac. Railroad from Lake Superior to the Pacific Ocean, and after the great land grant had been made by Congress to the State of Michigan to aid in constructing the first canal and locks around St. Mary's Falls, distinguished men preempted the land where Superior now stands for a town-site. The canal was completed and a land office and lighthouse established at Superior in 1855, and the town boomed. The Northern Pacific charter failed and the panic of 1857 paralyzed the city. In 1881 the Northern Pacific Railroad, for a gift of about half the town-site, built a branch to the water front and erected a dock. In 1883 Gen. John H. Hammond organized a company which acquired land W. of the original town-site, on St. Louis and Superior Bays, and in 1885 platted a new city. In laying out the town a right of way was provided for terminal tracks to reach every railway coming to the head of the lake, and connecting them with every dock and slip on the entire 90 miles of water front. More than 1,000 acres of land near the bay and on one side of the town, separated from all residence and business streets, was reserved exclusively for railway, switching, and storage yards. Thus every dock, mill, and wholesale house has equal facilities for receiving and shipping freight over all the railways at the head of the lake. The city comprises the parts locally known as East Superior, West Superior, South Superior, and Old Superior. Pop. (1880) Douglas County, 655; (1890) city, 11,983; (1894) estimate on school census, 35,000.

FRANK A. FLOWER, PROPRIETOR OF "LEADER."

Superior, Lake: the largest of the Laurentian chain of lakes. It is also the largest fresh-water lake in the world, and the largest inland water-body except the Caspian Sea. Its area, as determined from the charts of the U. S. lake survey, is 30,829 sq. miles; another computation from the same data gave 31,200 sq. miles. The only possible rival to Lake Superior in size is Lake Victoria Nyanza, which is estimated to have an area of 27,000 sq. miles. The mean elevation of the surface of Lake Superior is 602 feet above the sea, and 20 feet above Lake Huron, into which it discharges through St. Mary's river. Its greatest measured depth is 1,008 feet; the bottom of the basin is therefore over 400 feet below sea-level. Its hydrographic basin, including the lake surface, has an area of about 85,000 sq. miles. The mean discharge through St. Mary's river is estimated at 16,000 cubic feet per second. In the deeper portions of the lake the temperature varies but little from 39° F., the temperature of water at its maximum density. Analyses have shown that the water at all depths is fresh.

The boundary between Canada and the U. S. passes through the lake, about one-third of the area of the latter belonging to the Dominion. The north shore is formed of crystalline rocks, and in places is bold and picturesque. The southern shore is mostly low and covered to a great extent with blown sand, glacial deposits, and fine, evenly laminated, pinkish clays, which were deposited from the lake during a former high-water stage, when it extended for many miles S. of its present boundaries. The rocks beneath those superficial deposits belong mainly to the Algonkian period, which includes the copper and iron bearing series, and to the Cambrian period, which includes the red sandstone, largely used for building in Marquette and other cities. The Pictured Rocks, about 100 miles W. of the outlet of the lake, are cliffs of sandstone, formed by the edges of nearly horizontal strata, and together with other bold features about the lake are remnants of an old topography which was fashioned by stream erosion and weathering previous to the Glacial period.

The land bordering Lake Superior is not well adapted for

agriculture, but rich deposits of copper and iron, and abundant forests of pine, together with fisheries and the facilities for transportation which the lake affords, have led to rapid developments. See also ST. LAWRENCE RIVER AND GULF.

ISRAEL C. RUSSELL.

Supernatural: See MIRACLES.

Suphis [Egypt, *Khufu*, the *Cheops* of Herodotus and the *Chummi* of Diodorus]: name given by Manetho to the second king of the fourth Egyptian dynasty. Besides prosecuting the wars inaugurated by his predecessor, Snofru (see *SORIS*), against the tribes of Sinai, he was engaged in gigantic building operations in Egypt. The largest pyramid at Gizeh (see *PYRAMIDS*) was erected as his tomb, and three smaller pyramids near by were erected for relatives. The founding of the temple of Hathor at Denderah is also ascribed to him. According to Manetho he reigned sixty-three years, but the Turin papyrus reduces the time to twenty-three or twenty-four years.

CHARLES R. GILLET.

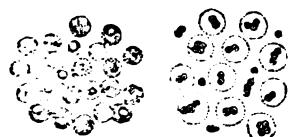
Suppé, soop'pá', FRANZ, von: opera-composer, whose baptismal name was Francesco Ezechiele Ermengildo Cavaliere Suppé Demelli: b. Apr. 18, 1820, on board ship near Spalato. He very early manifested musical talent, and at fifteen composed a mass which was sung at the Franciscan church at Zara. After study with the best masters he became conductor at the Josephstadt theater, Vienna, succeeded by other similar engagements. His first operatic work was *Sommernachts Traum*, founded on Shakspeare, in 1844. Then came a long list of operettas, many of which were very popular. In the U. S. he is best known by his *Faluitza*, *Boccaccio*, and his overture *Poet and Peasant*. D. in Vienna, May 21, 1895.

D. E. HERVEY.

Supper, Lord's: See EUCARIST.

Suppressio Veri: See FRAUD.

Suppuration [from Lat. *suppuratio*, deriv. of *suppurare*, suppurate, form matter: *sub*, under, from under, (in compos.) up + *pus*, *puris*, matter, pus]: a form of inflammation which goes on to the development of *pus* or matter. This is seen in abscesses, inflammations of the mucous membranes, and in granulating wounds. The product is a creamy yellow liquid composed of a fluid part, the *liquor purus*, and cellular elements, the *pus corpuscles*. The causes of suppuration have occasioned much study. Formerly a variety of traumatic, chemical, or other local injuries, together with certain general bodily conditions, were regarded as causes; but after the development of bacteriology attention was directed to micro-organisms as the active agents. Certain bacteria are now recognized as pus-producing or *pyogenic*; but it is also admitted that suppuration may occur spontaneously or experimentally without the presence of bacteria. Injections of calomel, turpentine, and certain other substances, for example, are capable of exciting suppuration. In studying the process microscopically it is found that, as in other forms of inflammation, the white blood-corpuscles of the blood leave the vessels and accumulate in the tissues;



Pus corpuscles, as seen in healthy pus. The same, after the addition of acetic acid.

at the same time a quantity of the fluid part of the blood exudes. Eventually the cellular exudate softens by degeneration, and yellowish pus results. At the same time the surrounding tissues produce a wall of young cells around the periphery of the suppurating focus, and thus an abscess with a retaining wall is formed. The older theory of the origin of pus-cells, viz., that they are altered tissue-cells, is thus seen to be abandoned. It is likely, of course, that some of the cells of a tissue are loosened and mingle with the pus, but the true pus-corpuscle itself is a white blood-corpuscle which has emerged from the blood-vessels and subsequently undergone more or less degeneration. When treated with acetic acid the protoplasm of the cells clears, and reveals a multiple nucleus, as shown in the accompanying illustration. The multinuclear character of the pus-cells is explained by the discovery that only these forms of white corpuscles have the property of readily escaping from the blood-vessels.

Pus formed on the free surfaces, as in bronchitis, nasal catarrh, in granulating wounds, and the like, comes from the underlying blood-vessels, and filters through the superficial lining cells. Spreading suppuration is found in erysipelas, and certain other conditions in the submucous or

subcutaneous tissues. The symptoms indicative of suppuration are those of inflammation—heat, redness, pain, and swelling; but the pain has often a peculiar throbbing character, and the swelling is found to be fluctuating or elastic. In addition, general fever of irregular type, sweats, or chills may be noted; and general infection of the blood (pyæmia and septicæmia) may occur.

The treatment of suppuration consists in abortive measures, and, these failing, in measures to promote "pointing," and in the evacuation of the abscess. Applications of cold are most useful for the first purpose; for the second heat, and especially poultices, is of value. After the development of fluctuation incision is called for.

W. PEPPER.

Supremacy, Act of: See ACT.

Sur, or **Noor** (anc. *Tyros*): town: in the province of Syria, Asiatic Turkey; on an island in the Mediterranean, which Alexander the Great, when besieging Tyre, connected with the mainland by a broad dam. Sur has suffered very much from earthquakes, and its harbor has become so silted up as to be accessible for small vessels only. Pop. about 5,000.

Surabaya, soo-rû-bi-ân: town on the north coast of Java; capital of the Dutch province of Surabaya; opposite Madura, at the mouth of the Kediri (see map of East Indies, ref. 8-E). It has a good harbor, is strongly fortified, and contains barracks, magazines, hospitals, and other military establishments. It is a station on the railway from Surakarta to Probolinggo, communicates regularly with Samarang, Batavia, and other places by steamboats, and carries on an important trade, exporting annually rice, coffee, cotton, sugar, tobacco, and coconuts. Its ship-building is also extensive. Pop. (1890) 107,878, of whom 6,000 (1892) are Europeans, the rest Javanese, Malays, and Chinese.

Revised by M. W. HARRINGTON.

Surakarta: town of Java; capital of the Dutch residency of Surakarta; on the left bank of the Solo; connected with Samarang and Surabaya by railway (see map of East Indies, ref. 8-E). It contains a magnificent palace of the native emperor, who lives here as a pensioned rather than as a tributary prince; the Dutch fortress is opposite the emperor's palace. The trade is very large, especially in pepper, vanilla, and cacao. Pop. (1890) 91,368.

Surat: town: in the presidency of Bombay, British India; on the Taptee, in lat. 21° 12' N., lon. 72° 47' E. (see map of S. India, ref. 2-C). It is 6 miles in circumference, and surrounded by walls surmounted by towers. It is said to have had 800,000 inhabitants at the end of the eighteenth century, but its manufactures died out, its trade is lost, and many of the Dutch, French, and Portuguese establishments are deserted. The place is most important from a military point of view. Pop. (1891) 109,229.

M. W. H.

Surd: See SOXANT.

Surety: See GUARANTY and SURETYSHIP.

Suretyship [viâ O. Fr. from Lat. *securitas*, safety, security, (Late Lat.) security for a debt]: a term covering all cases of secondary liability of one person for the debt, default, or miscarriage of another, who is the primary obligor, whether the relationship results from express agreement or from implication. GUARANTY (*q. v.*) and indorsement (see BILL OF EXCHANGE and NEGOTIABLE INSTRUMENTS) are embraced by this definition. The word is used frequently in a specific sense to designate the relationship existing where the primary and secondary obligations are assumed in a single contract, as where one person signs a promissory note as maker and another adds his signature as surety. The distinction between suretyship in this sense and guaranty is stated clearly in a leading case as follows: "A contract of suretyship is a direct liability to the creditor for the act to be performed by the debtor, and a guaranty is a liability only for his ability to perform this act. From the nature of the former the undertaking is immediate and direct that the act shall be done, which if not done makes the surety responsible at once."

The creditor is under no legal obligation, as a rule, to disclose all the facts affecting the surety's risk. If, however, he makes any misrepresentation as to the subject-matter of the surety's undertaking, the latter will not be bound. The general principles governing the formation of this contract have been thus stated: "The surety is entitled to know the real nature of the transaction he guarantees and of the liability he is undertaking, and generally and naturally he looks to the creditor for information on this point, although he usually is acting at the debtor's request and as his friend,

and so relies on him for collateral information as to general credit and the like. In that case the creditor's description of the transaction amounts to or is at least evidence of a representation that there is nothing further that might not naturally be expected to take place between the parties to a transaction such as described." Accordingly, it has been held that a bank can not enforce against the sureties a bond for the faithful and honest conduct of a teller who was known to the bank officers to have been dishonest unless such dishonesty was disclosed to the sureties before their execution of the bond. The failure to communicate such knowledge is declared to be fraudulent toward the sureties. Express contracts of suretyship are to be construed so as to give effect to the intention of the parties. The language is to be read in the light of the circumstances surrounding the execution of the instrument, and full effect is to be given to its meaning as thus ascertained. The surety's responsibility is not to be extended or enlarged by implication or construction, but is to be treated as *strictissimi juris*. It is also well established that any change in the contract made by the creditor and primary debtor without the surety's consent discharges the latter. Nor will the courts inquire whether the change operates to increase or diminish the surety's burden. He has a right to stand upon his own terms. An extension of the term of credit, however slight, pursuant to a binding agreement between the principals, must be assented to by the surety or he will be released.

Upon discharging his principal's obligation the surety is entitled to SUBROGATION (*q. v.*), to all the creditor's rights and securities. If there are two or more sureties either is entitled to CONTRIBUTION (*q. v.*) from the others.

FRANCIS M. BURDICK.

Surface: in mathematics, the locus of a point in space whose co-ordinates are connected by a single relation. It may also be generated by the movement of a straight or curved line. A surface forms the superficial configuration or boundary of a solid. It is said to be of the *n*th degree, when it is intersected by an arbitrary line in *n* points, real or imaginary. The surface of the first degree is a plane, and the surface of the second degree includes several varieties, treated under CONE, CYLINDER, HYPERBOLOID, PARABOLOID, SPHERE, and SPHEROID (*qq. v.*).

Surf-bird: a small wading bird (*Aphriza virgata*) of the American Pacific coasts, about 10 inches long, named from its habit of allowing the surf occasionally to dash over it as it seeks its prey on the rocky shores. Its flight is short and irregular. It is related to the oyster-catchers and the turnstones.

F. A. L.

Surf-duck: a seacoast duck of America, the *Oidemia perspicillata*, known to gunners as the skunk-head coot. It belongs to the group called scoters in Great Britain and coots in the U. S. It is quite black, except a little patch of white on the head and another on the nape.

F. A. L.

Surgeon, or Surgeon-fish: a fish of the family ACANTHURIDÆ (*q. v.*).

Surgery [M. Eng. *surgerie*, from O. Fr. *chirurgie* > Fr. *chirurgie* < Lat. *chirurgi'a* = Gr. *χειρουργία*, handicraft, skill, surgery, deriv. of *χειρουργός*, working by hand, handicraftsman, skilled workman, surgeon; *χείρ*, hand + *εργον*, work]: that branch of medical science which has for its object the treatment by manual operations of all lesions or malformations of the human body.

It is probable that in antiquity of origin surgery must take precedence of medicine, since attempts to assuage the pain or to remove the inconveniences of wounds or injuries resulting from external violence would be likely to be made before internal diseases were in any degree understood or supposed to be within the control of human means. Baron Percy has remarked that, while the internal diseases of mankind were still ascribed to the anger of the gods, and the smoke of expiatory sacrifices ascended from altars, surgeons had already become renowned by bold and salutary operations. He is inclined to attribute the origin of this art to the first occasion when some one, pierced by a foreign body, invoked the aid of a skillful comrade for its removal, remarking that in ancient times it was sufficient to extract adroitly darts or arrows, and to place on the wounded part some soothing balm, in order to be reckoned a benefactor of humanity entitled to divine honors (Homer, *Iliad*, lib. xi.). Students of Sanskrit literature, and those who have sought to decipher the inscriptions of Egyptian and Assyrian ruins, find some grounds for the belief that surgery was more

advanced among those ancient peoples than is commonly supposed, pictures and *bass-reliefs* having been found displaying surgical instruments and operations not unlike many in use in modern times. It is certain, at least, that the custom of embalming the dead, which implies some anatomical and surgical knowledge, was prevalent in very early times, and that among the Jews the operation of circumcision was practiced by divine command through many ages.

Greek.—The first definite traditions regarding surgery, and the first collected body of doctrine, came from the Greeks, who were, however, the pupils of the Asiatics and Egyptians, and Dujardin, in his erudite *History of Surgery*, has carefully traced the channels through which information was transmitted to a more gifted and brilliant nation. He would accept Plutarch's account, that Agenor, a Phœnician king, practiced surgery with distinction, dressing the wounded arm of a son of Priam, and devising the scarf or sling now so indispensable in many injuries of the upper extremities. Chiron, the Thessalian centaur, is more generally accredited the father of surgery in the fabulous ages of Grecian history. His reputation is eclipsed by that of Æsculapius, a son of Apollo, by some reckoned the pupil of Chiron, by others his contemporary and superior, believed to have been deified fifty years before the Trojan war, although skeptics have called his very existence in question. Jason, Theseus, and Hercules practiced surgery, and Epione, the wife of Æsculapius, as well as Medea, proved that women thus early not only shared with men the perils of war, but aided in repairing its ravages. A Thracian king, Orpheus, had such knowledge of the virtue of plants that he cured a woman bitten by a snake, whence arose the fable that he had rescued her from hell. The Greeks, prodigal in apotheosis, made many demigods partly because of their achievements in the healing art. Two sons of Æsculapius are named among the heroes of the *Iliad*. Menelaus, wounded by an arrow from Pandarus, and Philoctetes, struck by a poisoned javelin, are cured by the skillful Machaon; and Pausanias records that the Messenians, over whom he reigned, raised a temple to his honor. Podalirius, his brother, though much praised for his surgical skill in the Trojan war, has no important cures circumstantially ascribed to him, except that of the daughter of Damœtus, King of Caria, whom he bled from both arms when she was stunned by a fall, and, on her survival, married her, receiving the province of the Chersonese as a dowry. Hence the origin of phlebotomy is attributed to this surgeon. The surgical attainments of these sons of Æsculapius seem not to have extended further than the extraction of darts, the suppression of hæmorrhage by pressure or styptics, and the application of lenitive salves. Homer says that when the warriors at the Trojan siege sustained fractures of the bones, recourse was had, as when pestilence arose, to invocations to the gods.

For six centuries after the Trojan war there is little information of any advances in surgery. In common with other branches of knowledge, it was passing through that stage in which the intervention of supernatural powers is recognized rather than the scope of human possibilities. It was thus with the Asclepiadæ, or reputed descendants of Æsculapius, in the course of whose long monopoly, however, schools for the instruction in such surgical information as the professors possessed or were willing to impart were established about the temples, and those at Rhodes, Cnidos, and Cos became distinguished. Real achievements in surgery appear to have been known during this period, such as cutting for the stone and operating for cataract, although these advances were discredited by the priests, as suitable only for specialists of the baser sort.

Hippocratic Surgery.—It was not until Pythagoras brought the light of philosophy to bear upon the practice of the healing art that the way was paved toward raising its dignity in the direction of positive knowledge. The school that he founded at Crotona not only produced surgeons of distinction (among others, Damocedes, who, made captive by the Persians, treated Darius for a dislocated ankle and his Queen Atossa for a cancer of the breast), but also inspired the schools of Cnidos and Cos with the philosophic spirit, so that, a century later, there appeared in the latter that splendid genius Hippocrates. Born in the 80th Olympiad, about 460 years before the Christian era, this great man did much to free medicine from the absurdities with which superstition and ignorance had surrounded it, and through a long life gave a noble example of persevering industry, of philosophical research, and of lofty moral

wealth. His attention was more turned to medicine than to surgery, yet in the latter branch his practice was bold and fearless. He commended some operations that have only of late years been acknowledged to be legitimate surgical measures, such as tapping the chest for empyema, nephostomy for calculus lodged in the kidney, and trephining the skull for persistent headache. He was familiar with cauterization and venesection and cupping; with operations on the canals, nasal polyps, and ganglia; with the treatment of piths and disabs by ligatures; with tapping in dropsies, advising even paracentesis in hydrocephalus; with all the external procedures known in his day except the operations for lithotomy and cataract, which seem to have been confined to specialists. He gave rules for the most part rarely and cruel, for the reduction and treatment of dislocations and fractures, and anticipated a multitude of the practices that have been vaunted by the moderns. For many generations after Hippocrates surgery made little progress. The religious prejudices that forbade the dissection of the human body precluded the acquirement of any definite knowledge of anatomy, and there was a barren interval of several centuries. Of the more immediate successors of Hippocrates, Diocles of Carystus was one of the most prominent in surgery. He devised sundry bandages, especially for wounds of the head, and improved the *seton*, an instrument for extracting arrow-heads and darts, invented during the Peloponnesian war. Praxagoras of Cos is reported to have been a very bold surgeon, incising the fauces freely in cases of cyanosis, and laying open the abdomen for the removal of intestinal obstructions.

Alexandrian Period.—The labors of Aristotle had some influence in promoting the healing art; but there was no advance of any practical importance until, on the dismemberment of the great empire of Macedonia, the chief center of learning was transferred to Alexandria, and the Egyptian school took its rise (c. 300). Herophilus of Chalcedon and Erasistratus were the more conspicuous leaders of the Egyptian school. The former was a pupil of Praxagoras. He was the first to direct attention to the radial pulse as an index of the varying conditions of health and disease. According to Galen, he held as an anatomist among the ancients the same place as Vesalius among the moderns. That he dissected human bodies is expressly asserted by Galen. Dr. Marx is satisfied that he discriminated nerves of motion from those of sensation; that he described the occipital depression now known as the torcular Herophili as the point at which the sinuses of the dura mater converge; distinguished the cerebrum from the cerebellum; and named the *calamus scriptorius* of the medulla oblongata, and the *duodenum*, and also carefully dissected the tunics of the eye and originated the term *reflex*; and came near anticipating Aescli in the discovery of the bacteria, recognizing their relation with the mesenteric glands. Yet he fell into palpable mistakes, confounding the tendons and ligaments with nerves, and possibly the trachea with the *corda*.

Erasistratus, a native of Chios, who had studied philosophy under Theophrastus, is also greatly distinguished as an anatomist, but his erroneous interpretation of the function of the arteries, overthrown by Galen, retarded the discovery of the circulation, reserved for the illustrious Harvey. Erasistratus is reported to have been a very bold surgeon, not hesitating to excise portions of the liver and of the spleen. The invention of a metallic catheter is ascribed to him. Xenophon of Cos, a pupil of Erasistratus, is said to have been among the first to restrain hemorrhage from the limbs by tightly encircling the member with a ligature. Ammonius, surnamed *Lithotomus*, invented an instrument for crushing vesical concretions too large to be extracted through the ordinary incision—what would now be called a lithotome—and hence is erroneously accredited with anticipating Ovide in the invention of the lithotrite, an instrument for crushing stones without a cutting operation.

Celsus, Aulus.—From the time when the empire of the world was transferred to Rome until the reign of Augustus there appeared no surgical practitioner or writer of note until Aulus Cornelius Celsus, of whose numerous writings the eight books *De re Medica* are alone preserved. The last four books treat exclusively of surgery. He advises the amputation of limbs affected by gangrene. The method of lithotomy he describes is still regarded as of value in certain cases. He gives rules for the removal of cataract by depression, for forming an artificial pupil, and for the recognition and reduction of several varieties of hernia. The diagnosis

and treatment of fractures and lacerations he treats of judiciously and in detail. He is thought to have been the first to point out ruptures of the intracranial blood-vessels occasioned by fracture. In the twenty-sixth chapter of his fifth book occurs the remarkable passage in which he advises that the bleeding from a wounded vessel, if it can not be otherwise restrained, shall be controlled by two ligatures, placed one above and the other below the bleeding point. He recommended the ligature also in varices and hemorrhoids. It would be an endless labor, however, to particularize. Not only the value of his authorship, but the purity and elegance of his style, have made the work of Celsus classical and immortal. Aulus of Cappadocia practiced in Rome in the latter part of the first century. His instructions on catarrhism and on lithotomy are interesting; he opened hepatic abscesses and used the trephine for the cure of epilepsy. The doctor, the medical adviser of Trajan, was the author of some good observations on injuries of the head. Rufus of Ephesus is said to have been the first to be successfully an artery for an aneurism at the bend of the elbow caused by venesection. He left a treatise on diseases of the bladder. No great surgical writer appeared from the time of Celsus in that of Galen (c. 200), toward the close of the second century. He was a surgeon at Pergamum (c. 160), and afterward practiced his profession at Rome.

Aetlius, Alexander of Tralles.—After Galen, in the third century came Aetlius, who was a bold and successful surgeon. He recommended extraction for hard cataract, but cautiously, advising the operation only when the cataract was small. He also suggested arteriotomy in place of venesection in some cases, arguing that there was not risk of excessive bleeding since the hemorrhage might be controlled by cutting the vessel completely across. His name is associated with an operation for aneurism, revived by Syme of Edinburgh, and still occasionally employed, especially in cases of traumatic origin. Oribasius (380-400 A. D.) was the author of a valuable compilation of surgical knowledge, and alluded to the partial or bent fracture of the long bones of children (greenstick fracture)—an observation for which Malgaigne accredits Lanfranc, a surgeon of the thirteenth century. Aetlius (529 A. D.) was the first Greek medical man of prominence to embrace Christianity, and the bias of his religious ideas is clearly indicated in his writings. Alexander of Tralles (529 A. D.) appears to have been an independent thinker, and at the close of a long and useful career wrote from his own experience with such sound judgment that his work in twelve books is a valuable relic.

Probus, Apollonius, who was a professor at Alexandria about the time (640 A. D.) of his final subjugation by the Saracens, wrote a compendium of the healing art which is even more circumstantial than that of Celsus. The excellent translation by Adams, published by the Sydenham Society, has made the work familiar to English-speaking surgeons. In lithotomy he advised, after exploring by the rectum, an incision in the left of the raphe, or the modern lateral operation, instead of the median incision of Celsus. He discriminated aneurism by anastomosis, and performed ablation of the mamma, laryngotomy, and herniotomy in strangulation. He first treated of fractures of the patella. He was pre-eminent as an accoucheur, and is reputed to have devised the procedure of embryotomy. He was surnamed *Obstetricus*. He was the last of the Alexandrian school of any note.

Arabian Surgery.—In the seventh century, contemporaneously with the vast achievements and conquests of the followers of Mohammed, learning was gradually communicated to the Arabians, and for the next five centuries anything noteworthy in surgery must be looked for in this direction. Rhazes (852-932 A. D.) practiced and taught at Bagdad at the close of the ninth and beginning of the tenth century. He was the first to describe *spina bifida*. He cauterized the bites of rabid animals. He gave a better account of hernia than his predecessors. He seems to have had little confidence in ophthalmic surgery, for when he was old he had cataract, but could not be induced to submit to an operation. Haly Abbas lived at the end of the tenth century, and was a voluminous writer. In tapping for ascites he preferred to puncture in the linea alba, and he used cautery for hæmorrhoids of hæmorrhoids. Avicenna (980-1037 A. D.), educated in the schools of Bagdad, acquired an extraordinary distinction, but the most important to surgery among the Arabian celebrities is Albucares (1110 A. D.). The edition of his *Chirurgia*, by Channing of Oxford, is still consulted, and contains the most complete view there is of the knowledge of surgery that then existed. He seems to have

abused the actual cautery, and enthusiastically extols the surgical virtues of fire. He employed the cautery to suppress hæmorrhage, and styptics likewise, but also complete division of the vessel, and even the ligature. He was the first, apparently, to remark the occlusion of a divided artery by a coagulum. He practiced enterorrhaphy, and invented a probang for dislodging foreign bodies from the gullet, and an instrument for operating in lachrymal fistula. These and various other instruments he figures in his writings. After Albucasis arose two notabilities of the Saracenic school who were natives of Spain, yet wrote in the Arabic language. Avenzoar (1162 A. D.), a Jew, practiced at Seville in Andalusia, and his compendium entitled *Thaissy*, though mainly a compilation, contains some original matter. He describes abscess of the mediastinum, and a case of suppuration of the kidney with discharge of 14 pints of pus. He treats judiciously of fracture involving the hip-joint, and of wounds of the blood-vessels. His pupil, Averroës (1198 A. D.), a native of Cordova, achieved a great reputation. A manuscript of 336 quarto pages, by an unknown author, was discovered in 1863 in the library of the University of Madrid, which gives an extended view of the Arabic treatment of wounds, including shot wounds by missiles of iron and stone. In a prize essay by Dr. Don Antonio, entitled *Memoria sobre el Origen y Vicisitudes de la Terapéutica que han usado los Cirujanos españoles en las Heridas de Arma de Fuego* (Madrid, 1863), it is claimed that the nature and treatment of shot wounds are judiciously discussed in this parchment, and that it dates from the closing part of the fourteenth century, or shortly after the introduction of gunpowder in warfare. Should the date and authenticity of this manuscript be established, it would be the earliest treatise on shot injuries extant. Neither Arnold of Villanova nor Guy of Chauliac mentions these injuries, and priority in adverting to them has commonly been ascribed to the German surgeon Heinrich von Pflsprundt (1460 A. D.), whose manuscript, *Buch der Wundt-Artzney*, was printed in 1668 by Haeser and Middeldorpf.

Medieval.—For several centuries there is among the successors of the Greeks and Romans no name in surgery to arrest attention by association with improvements either in theory or practice. The only attempts worthy of notice are in connection with the schools established at Salerno and Monte Casino, which maintained their prestige until the thirteenth century, when they were eclipsed by the rising reputation of the schools of Bologna and Paris. Most of the Italian surgeons of the thirteenth century whose names have left any trace in the history of the art appear to have derived their knowledge from one or the other of these schools. The first of these in date is Rogerius of Parma (about 1206). His *Chirurgia Magna* was long a textbook in Italy. He practiced enterorrhaphy, even in cases of complete division of the intestine, attempting to unite the divided surfaces by direct apposition over a cylinder of elder-wood. His disciple, Roland Capelluti, professed surgery at Bologna (1264), and composed a voluminous commentary on the work of his preceptor—whom he far surpasses in erudition—citing the Greek classics as well as the works of the Arabians. In a case of hernia of the lung he excised the protruding part, and the patient survived. Another disciple of Rogerius was Jamerius, who is described by Guy of Chauliac as a brutal and eccentric surgeon, but is placed by Peter of Argelata among celebrated operators of his time. Great obscurity envelops the history, and even the names, of the Four Masters, to whom are ascribed some important improvements in surgery, especially a method of suture of wounded intestines which still holds a place in the art. According to Devaux, they were four monks living at Paris in the time of Lanfranc (at the close of the thirteenth century), devoting themselves to good works. According to others, they were four teachers of surgery, who professed in four languages—Magister Salernus in Latin, M. Pontus in Greek, M. Abdallah in Arabic, and Rabbi Elimus in Hebrew. Weber and others believe that Rogerius, Jamerius, Theodoric, and William of Salicet are the four teachers referred to under the designation of the Four Masters. The little evidence extant gives most plausibility to the first of these conjectures. Manuscript copies of their voluminous work on surgery existed in the seventeenth century at Avignon and at Paris, and some fragments are said to be still preserved in the Bodleian Library at Oxford; but the work was never printed, and the opinions of these skillful masters are known only through citations in the works of their contemporaries. Hugo of

Lucca (d. 1252) is regarded as the founder of the Bolognese school. He reduced a luxation at the hip of a year's standing in a man of twenty-five, and used alcoholic lotions largely as topical applications to wounds. After Hugo came Brunus of Longobucco, a professor at Padua (1262). He composed a *Chirurgia Magna*, and approved of dry dressings to wounds. Theodoric of Cervia, a pupil—and, according to Tiraboschi, a son—of Hugo of Lucca, expounded the views of his predecessors. He is accredited with having substituted soft and simple bandages and splints in fractures for the cruel appliances in vogue in his day. According to Guy of Chauliac, the Italian surgeons of this period may be classified in two schools. One, with Rogerius, Rolandus, Jamerius, and the Four Masters as its exponents, treated all wounds and ulcers by emollient fomentations and cataplasms; the other, in which Hugo, Brunus, and Theodoric were conspicuous, employed dry dressings or desiccating lotions. William of Salicet (b. at Piacenza in 1210) practiced in armies and at Cremona, Pavia, and Verona, and finally went to Bologna, and there (June 8, 1275) completed his work on surgery. He is the first Italian surgeon who treats at any length of the surgical affections of women. Gilbertus Anglicanus (1290) appears to be the first English writer on surgery. In 1271 Pitard founded the College of St. Côme at Paris, which was the origin of the Academy of Surgery that became so famous in later years. Pitard was a man of eminence in his day, and his observations on wounds of the head and on poisoned wounds are still remembered. Lanfranc, a Milanese and a pupil of William of Salicet, is generally regarded as the creator of surgery in France. He was the first to speak of the healing of wounds by "first intention." At this time flourished Master Jehan Ypermann (1295–1350), lately styled the father of Flemish surgery, whose manuscript treatise on the art was discovered and published as late as 1854 by the medical Society of Ghent. During the fourteenth century surgical science was dead in Italy. Rienzi states that Bartolomeo de Varignana dissected human bodies in 1290. Mondini de Lucei also publicly dissected at Bologna the cadavers of two women, braving the prejudices of his time, and published an anatomical work illustrated by wood engravings (1325).

Fourteenth and Fifteenth Centuries.—Early in the fourteenth century John of Gaddesden, after studying at Montpellier, practiced surgery with success at Oxford, and composed his *Rosa Anglica*. John of Arden flourished in Newark about 1350, and subsequently removed to London. He compiled voluminously, but a treatise on *fistula in ano*, published in 1588 by John Reed, is the only one of his writings that was printed. Guy of Chauliac practiced in Avignon in the middle of the fourteenth century with renown. In his writings is found the first mention of the Cesarean operation. Guy is esteemed a bolder surgeon than Lanfranc. Ackerman declares that his *Grande Chirurgie* embraces all of value written on surgery up to its epoch. Pre-eminence in surgical knowledge seems to have passed from Salerno to Bologna, and thence to Montpellier. The latter school, fostered by the neighboring papal court at Avignon, was enriched by manuscripts from both Spain and Italy. Guy described the use of weight-extension in fractures of the lower extremity (now commonly known as the "American method"), and treated indolent ulcers by binding on them a leaden plate. In the latter part of the fourteenth century the school of Montpellier rapidly declined. Both Italy and France were desolated by contending factions; the library of Guy was scattered. Balescon of Taranta, a Portuguese professor who succeeded to the chair of surgery, laments the loss of the works of Paulus, Rufus, and others. Balescon (or Valescus, as his name is sometimes Latinized) is said to have first advised the employment of mercurial ointment for the removal of lice and other parasitic vermin. Leonardo Bertapaglia (1429) is said to have practiced human dissections, and to have brought a certain luster upon the chair of surgery at Padua. He wrote on ulcers and wounds, and enumerates twenty-two kinds of punctured wounds by darts and arrows. He seems to have first described the tenaculum. Among other Italian surgeons who in some measure aided in the progress of surgery may be mentioned Guainerius, professor at Pavia, who wrote on diseases of the joints; his successor, Matthew of Gradi; and Bartolomeo Montagnana (1441), professor at Padua, who wrote on hernia, and first distinguished that variety of ventral hernia that protrudes through the linea alba. Arculanus also (1427) taught with credit at Verona and Ferrara, and devised several kinds of trusses and an instrument for extracting foreign bodies from

the ear. He ligated the jugular vein in tortoises and wrote judiciously of colicropion. *Messias Commens* was a surgeon in the Venetian army in 1493 at the invasion of Turkey VIII, and treated haemorrhoidal wounds with boiling oil, regarding them as poisonous. Antonio Benivento a Florentine oculician (1499) is probably the first writer treating systematically of morbid anatomy. He dissected two cases of ophthalmia, an affection which J. L. Petit is sometimes supposed to have first described. Holmich von Probenhoff, after participating in the great war in Poland in 1524, wrote his *Deich der Wundt-arterien*, containing an early observation on shot wounds. He describes a rhinoplastic operation, anticipating Tagliacozzi by a century. In 1599 Cullen, a French surgeon in favor with Louis XI of France, performed lithotomy successfully on a child without external, and this operation, previously abandoned in the worst quacks, became a part of the legitimate practice of surgery. Paracelsus (p. 15) noted in his time both as practitioner and author, was the introducer of many reforms.

Sixteenth Century.—With the revival of letters and of the natural sciences in the sixteenth century a new era dawned on surgery. Investigation of anatomy in the true sense was undertaken by Vesalius (1514-44), Fallopius (1522-42) and Rueschius (1580-79) wonderfully succeeded this founder of modern anatomy. Patients of Aspernabende (1537-1519), a pupil of Fallopius, was the teacher of William Harvey (1578-1657), the immortal discoverer of the circulation of the blood. Gasparo Aselli (1581-1630) followed with the discovery of the lymphatic vessels. The way was thus paved for advances in surgery, which, illuminated by science, became a worthy pursuit for men of talent and education.

Paris.—Presided by John di Vigo (1530), who still believed shot wounds poisonous, and by the Swiss surgeons Huse von Gersdorff (1529) and Felix Wirtz (1570), who have left original descriptions of value, the latter being reputed the first surgeon who ventured to amputate in the thigh, appears Andreas Paré, the founder of the modern French school, and reckoned the ablest of early army surgeons. If not the inventor, he was the restorer of the art of securing arteries by ligature after amputation—an advance which alone sufficed to secure for him immortality. Though originally a barber-surgeon, he became the counselor of four kings of France, and acquired such esteem that "his mere presence in a besieged town was enough to reanimate the garrison." His complete works were collected and published by his pupil, Guillemeau, in 1602, and have passed through many editions in many languages. Pupil of Guillemeau succeeded Paré in his high dignities, and received great praise from his contemporaries. Mercurius succeeded him with instructing ambulance-wounds, an advance in military administration usually ascribed to Larrey in the nineteenth century. Guillemeau, besides editing Paré, distinguished himself in operative midwifery. In Italy at this period appeared several treatises on shot wounds. Maggiori wrote the *Falunco Bombardamento di Sceloporum Locutione* at Bologna in 1522. The work of Leonardo Botai on the cure of shot wounds (Lyons, 1560) is, after the writings of Paré, the most valued of the treatises on shot wounds of this period. Caranus, of Milan (1573), and Heremgarus, of Carpi (1580), published original but little-known treatises on injuries of the head. Marius Sanctus, of Barletta, near Naples (1550), suggested improvements in lithotomy, and Tagliacozzi published in 1587 at Venice his treatise on plastic operations. The English surgeons of this period are not conspicuous. Thomas Gale, who served in 1544 with the army of Henry VIII. at Montreuil, published (1592) the *Institution of a Chirurgeon* and a treatise on gunshot wounds, which had the merit of denying the poisonous nature of such injuries. J. Hall (1591) also treated of shot wounds. John Wastell, who served in France in 1593, and was afterward surgeon-general of the East India Company's forces, published a *Military and Domestic Surgery*. William Clowes, a naval surgeon, wrote (1591) a *Practical Practice in Rurselaga by Gunpowder*. Peter Lowe, who served in France and Flanders, printed (1597) an *Army Surgery* that went through several editions. The work of Doctore (alias Quercetanus) on shot wounds (1579) was translated into English. In Germany A. Schenckius, professor at Presburg (1531-96), compiled a voluminous work of rare surgical cases, which remains a mine of interesting information.

Seventeenth Century.—In the seventeenth century the impulse given to the sciences by the diffusion of learning led to further improvements. Gasar Magalini, professor at Ferrara, simplified the treatment of wounds. His work (*De*

Rea Meditacione Vulnerum, Venice, 1616) is still consulted with advantage. Valerius Hildanus, of Bern (1560-1634), by some styled the father of German surgery, was a man of great attainments, but along to old prejudices and unsympathetic with radical surgery. Richard Wiseman, surgeon to Charles II., has often been styled the true father of English surgery, but his *Several Chirurgical Treatises* (1619) really contain no positive addition to the knowledge of the time. John Brown, another chirurgeon in ordinary to Charles II., a naval surgeon, published a *Treatise on Wounds, general and particular*, and a *Treatise of Gunshot Wounds*. In London in 1678—a work deduced from his practice in the navy in the Dutch war of 1665, in which he was severely wounded. Holland, destined to liberty in this century, furnished several good surgeons who promoted their art. Johann J. Rea, of Leyden, was probably the most successful lithotomist in record. Philp (1648-1734) was distinguished for devising a new plan for internal sinuses. Roonhuyzen (1690), by his operations for very neck, may be regarded as the inventor of tracheotomy. Peter Verduyn, of Amsterdam, proposed (1698) an important modification in the flap method of amputating the leg. In France the tourniquet was first used in amputations by Morel at the siege of Rouen (1674). Pierre Jaques improved the manual procedure of lithotomy, while Bellac (1696) deserves credit for denouncing the abuse of tents and complicated dressings then in vogue.

Nineteenth Century.—France. In the eighteenth century we find great advances in surgery, and the French surgeons in the front rank. Jean Louis Petit (1674-1769) occupies a proud prominence among the early educated writers on the art. His treatise on diseases of the bones is classic; his work on general surgery is still consulted with profit. He devised the now ubiquitous instrument for a century an essential appliance in amputations. Le Dron (1686-1773), with less genius, was an original and successful author. His copious writings abound in practical wisdom. Pierre J. Desault (1744-83) is one of the great names in surgery. He was the first who taught systematically surgical anatomy. His improvements in the treatment of fractures are illustrated in the everyday practice of the present time. He substituted straight supinating knives for the formidable sickle-shaped weapons previously employed. He improved the procedure for ligating arteries, and proposed the plan for the cure of aneurisms by distal ligature that bears the name of "Desault's method." Dominique Arcl, of Toulouse (1678-1743) secured a permanent niche in the annals of surgery by first proposing the proximal ligature of the main trunk in aneurisms. The institution of the Royal Academy of Surgery in Paris (1731) had great influence on the advancement of surgery not only in France, but throughout the world. Its *Mémoires*, composed of contributions from the most eminent men, constitutes a rich mine of information which has been diligently worked by many compilers, for the most part with worthy acknowledgment. Merit may be regarded as the leading authority on wounds of the abdomen. David, the central, Bellac, well known by his name, Le Cat, the lithotomist, and Moreau, the founder of the practice of excision or resection of joints, are conspicuous among the specialists. Besides these academicians were many French writers who held an honorable place in surgical literature. Baron Percy, whose invaluable manual for the army surgeon was published in 1792, may be esteemed the foremost military surgeon between Paré and Larrey. The name of Xavier Bichat (1771-1802) closes this era in French surgery. This illustrious founder of general anatomy, the great genius who accomplished so much in his short span of life, commenced his career as a surgeon, and his earlier works are unimpaired editions of the teachings of his great preceptor, Desault.

Great Britain.—In Great Britain surgery attained great eminence in this century. William Clowes (1668-1732), Samuel Sharp (1700-68), Percival Pott (1713-88), W. Bromfield (1719-82), Benjamin Bell (1740-1806), and the brilliant John Hunter (1763-1793), all secured a permanent place in the literature of surgery, while the illustrious John Hunter (1728-93), a philosopher as well as an anatomist and surgeon, is justly ranked with the greatest minds that have graced the profession. Moore (1697-1767) is indissolubly associated with the birth and fame of the Edinburgh school. C. White, of Manchester (1770), revealed the achievements of the Marquis in France in excising the larger joints.

Continental Europe.—In Italy, Scarpa (1747-1823), by his researches on hernia and aneurism, attained a high reputation. In Spain the name of Gibberson is eminent.

Hendrik Callisen (1740-1824) was the most prominent surgeon of Denmark of his time. In Germany, Heister (1683-1758) wrote a system of surgery that was translated into many languages, and still enjoys a certain repute; and the encyclopædic Albert von Haller (1708-77) was Professor of Surgery at Göttingen.

United States.—Dr. William Shippen, of Philadelphia, in 1763 first delivered lectures on anatomy and surgery, and the first medical school in America (the University of Pennsylvania) was founded by Dr. Morgan in 1765. Dr. John Warren (1753-1815), Professor of Surgery in Harvard College, and James Tilton (1745-1822), a surgeon of the Revolutionary war and afterward surgeon-general of the army, were likewise eminent.

Nineteenth Century.—Europe.—At the beginning of the nineteenth century French surgeons were still in the foreground. Jean Dominique Larrey (1776-1842), the friend of Napoleon I., was an almost undisputed authority in military surgery in his time. Boyer (1757-1833) prepared a systematic treatise on surgery that was long a standard text-book. Delpech (1776-1832) taught surgery at Montpellier with nearly equal reputation. Dupuytren (1777-1835) may be regarded almost as the founder of a school. Many of the great French surgeons of the middle of the century were his pupils—Vespeau (1795-1867), Malgaigne (1806-65), Jobert (1799-1868), Vidal (1803-56), Nélaton (1807-73), and Goyrand of Aix; Roux (1780-1854) was Dupuytren's contemporary and rival. It would be endless to enumerate the eminent surgeons of the time. Lisfranc (1788-1847) acquired an unrivaled distinction in operative surgery. Cloquet (1790-1855) was renowned as a clinical teacher. Civiale (1794-1867) originated and Leroy (1798-1861) improved lithotomy. Bonnet of Lyons (1809-58) was among the first to treat in a scientific manner of diseases of the joints. Follin (1823-67), Guérin, and Sédillot, also were distinguished. In Germany the advance of surgery, if not as brilliant, was relatively as decided. Kern, of Vienna (1760-1829), Rust, of Berlin (1775-1840), von Walther, of Munich (1782-1842), Graefe, of Berlin (1787-1840), Konrad J. M. Langenbeck, of Göttingen (1776-1850), Dieffenbach, of Berlin (1795-1847), C. von Textor, of Würzburg (1782-1860), all aided the progress of surgery by their writings, and several of them made important improvements in the art. At the beginning of the century the Vienna school in ophthalmology was pre-eminent. G. J. Beer (1762-1821) was perhaps its most distinguished representative. The name of Albrecht von Graefe, of Berlin (1828-70), is indissolubly associated with the modern methods of treating glaucoma and cataract. The great illustrator of military surgery in Germany, the illustrious Louis Stromeyer (1804-76), the worthy successor of Paré and Larrey, was one of the founders of modern conservative surgery in cases of injury. Volkmann (1801-77) and Nussbaum (1829-90) stand high in the annals of German surgery. In Belgium, Seutin devised the method of treating fractures by starch bandages, which has led the way to the plaster treatment of the present time. In Italy, Assalini (1765-1840) and Porta acquired distinction. In Great Britain a succession of surgeons of the first merit rivaled their French contemporaries. The London school points with pride to Cline (1750-1827), to Abernethy (1764-1831), to Sir Astley Cooper (1768-1841), to Wardrop, Earle, Stanley, Travers, Hodgson, Lawrence, and Aston Key; to Sir Charles Bell; to the ophthalmic surgeons Tyrrell, Saunders, and Dalrymple; and to the illustrious Sir Benjamin C. Brodie (1783-1862). In Ireland, Colles, Carmichael, Jacob, Bellingham, and Tufnell are known by original researches, and Cusack, Crampton, R. W. Smith, and Maurice Collis earned high reputations. Scotland may boast of Liston, of Miller, of Syme, of Spence, and of Sir J. Y. Simpson, the obstetrician who recommended acupressure as a substitute for the ligature, and introduced chloroform as an anæsthetic. The annals of British surgery in the century are further advanced by two names that will always be remembered in the front rank of military surgeons—John Hennen (1770-1829) and G. J. Guthrie (1785-1856). Worthy contemporaries of Larrey, their works will ever be read with reverence by students of army surgery. The names of Fergusson, Callender, Savory, and many others, now deceased, add lustre to the annals of British surgery, while Paget, Erichsen, Henry Thompson, Spencer Wells, Hutchinson, Holmes, Lister, and many more worthily sustain the reputation of their predecessors.

United States.—In the U. S. in the nineteenth century great advances have been made in practical surgery. A

pupil of John Hunter, Philip Syng Physick (1768-1837), is often styled the father of American surgery. He left no work to record his vast experience, but his views were to some extent recorded by his nephew, John S. Dorsey (1783-1818), the author of the first systematic treatise on surgery published in America. John Collins Warren, of Boston (1778-1856), wrote a treatise on tumors, and was the first to perform (Oct. 16, 1846) an operation of importance on a patient anesthetized by ether. Valentine Mott (1785-1865) acquired an immense fame by his daring operations on the arteries. According to Prof. Gross, "no surgeon, living or dead, ever tied so many vessels, or so successfully, for the cure of aneurism, the relief of injury, or the arrest of morbid growths." Benjamin Winslow Dudley (1785-1870), of Kentucky, had marvelous success as a lithotomist, and was noted for his dexterity in bandaging. Ephraim McDowell (1771-1830), of Kentucky, first performed ovariectomy (1809). William Gibson (1788-1866), of Philadelphia, was the first to tie the common iliac artery and to successfully perform the Cesarean operation twice on the same subject. Nathan Smith (1762-1828), of New Haven, was a bold surgeon of indomitable industry and great versatility. Thomas D. Mütter (1811-59) was noted for his skill in the treatment of deformities. He bequeathed a valuable surgical museum to the Philadelphia College of Physicians, with a liberal endowment fund. George Hayward, of Boston (1791-1863), J. Rhea Barton (1796-1871) and George W. Norris (1808-75), of Philadelphia, and J. Mason Warren (1811-67), of Boston, were able hospital surgeons, whose contributions to the literature of the art are of permanent value. Other eminent names are those of Gross, Pancoast, and Agnew, of Philadelphia; of Van Buren, Hamilton, and Post, of New York; of Nathan R. Smith, of Baltimore, Eve, of Nashville, Hodgen, of St. Louis, and Bigelow, of Boston.

Advances in the Art.—The boundaries of nationality seem to be vanishing from the domain of surgery. With marvelously increased facilities of intercommunication, all advances are speedily known throughout the civilized world. At no former period, assuredly, was there greater scientific activity. One result of the emulative ardor with which surgery has been latterly cultivated is the prevalent tendency to pursue special branches of the art. Ophthalmology, invoking the aid of physical science, has been revolutionized, and in many other directions light has been thrown upon branches of surgery until lately enveloped in the deepest obscurity. The discoveries and improvements in surgery in the nineteenth century are not inferior to those of any preceding age. The practical use of anæsthetics, introduced in the shape of ether-inhalation by Morton in 1846, and by the use of chloroform by Simpson in 1847, constitutes an epoch-making advance in the art, while the employment of cocaine for securing local anæsthesia is a discovery of real though minor importance. The introduction of ovariectomy (1809) by McDowell, of lithotomy (1822) by Civiale, and of litholapaxy (1878) by Bigelow, are improvements of the first order. The extensions of reparative surgery to the relief of cleft palate, vesico-vaginal fistula, and a great variety of deformities, have been of much value. The employment of metallic sutures and ligatures (Levert, 1829), of immovable apparatus in the treatment of fractures (Seutin, 1842) and spinal affections (Sayre, 1877), and of manipulation in the reduction of luxations (W. W. Reid, 1855), are most important innovations. The bloodless method of Esmarch (1873) and the antiseptic method of Lister (1869) are of far-reaching application. The great advances made in the treatment of diseases of the joints, of blood-vessels and nerves, of the brain and spinal cord, eye, ear, larynx, thoracic and abdominal viscera, urethra, and rectum, and of outgrowths and tumors, are most creditable.

It would be impossible within the limits of this article even to enumerate, still less to describe, the many triumphs of the surgical art which have been won during the latter half of the nineteenth century, but a few of them may be briefly referred to. Beginning with the external integument, the introduction of *skin-grafting* has rendered it possible by the transplantation of small portions of cuticle, taken from the patient himself or borrowed from other individuals, to secure the healing of large ulcerated surfaces after burns or other injuries, which formerly would have been abandoned as totally incurable. The dread which the older surgeons felt in dealing with *nerves* has been replaced by a boldness which enables the modern operator to sew or splice nerves which have been accidentally severed, thus restoring function and preventing loss of power, and on the other

lived in intense intractable neuralgia by nerve-stretching or excision; and for this purpose surgeons have not hesitated to open the skull or vertebral column, so as to attack the diseased nerve directly at its origin from the base of the brain or spinal cord. Operations on the blood-vessels have become so much safer since the general adoption of aseptic methods that the surgeon now has without fear the largest vessels when they are accidentally wounded, those presenting directly from hemorrhage, while the lessened risk attending the ligation of large arteries enables him to attack arterial aneurisms which a few years since were not thought amenable to surgical interference. Aneurisms of the thoracic aorta and innominate artery are successfully treated by simultaneous ligation of their principal branches; a subclavian aneurism has been successfully dissected out and removed bodily, as if it had been a solid tumor; and even abdominal aneurisms have been cured by firm pressure maintained for many hours while the patient was kept in a state of anesthesia, and in at least one instance by abdominal section and the introduction into the aneurismal sac of a coil of silver wire.

Diseases of the Joints.—In the treatment of these affections surgery has made marvellous progress. It is no longer thought essential, unless in exceptional cases, to amputate the thigh for scrophulous or tuberculous disease of the knee (knee swelling); but the surgeon cuts out the offending articulation, preserving a useful limb, or in milder cases simply opens the joint and scrapes out the diseased tissue, or even effects a cure by the injection of iodoform and glycerine. Hip disease is no longer the prohibition of surgery which it was; it is often curable in its milder forms by fixation and extension, followed by the use of judiciously planned orthopædic apparatus, and in its worst forms, osteotomy, or even excision, is successfully resorted to, and the patient is often restored to the duties of an active life with a limb somewhat shortened, but strong and enduring. Orthopædic surgeons deal with the distressing deformities due to rickets with a boldness which a few years since would have been thought almost criminally reckless. Knock-knees and bow-legs are straightened by cutting across the deformed bones with an osteotome or chisel, and the limbs are encased in plaster-of-Paris bandages with confidence that they will quietly and surely regain their firmness in their improved position. Boleping or inveterate club-foot is successfully treated by boldly cutting through and separating all the contracted tissues, or even by cutting out the malshaped bones thus making the foot both symmetrical and useful. Ununited fractures and false joint, after an arm or a leg is broken, are no longer divided as they were by our ancestors; the surgeon cuts boldly down upon the seat of injury, drills the bones, and joins them with a thick silver wire, or secures them with a silver splint directly applied to the fragments themselves and held in place by screws, and then closes the wound with the expectation that it will heal soundly over the inserted metal, which will supply the needed firmness to the broken bone and remain indefinitely, quietly buried in the surrounding tissues.

Surgery can no longer be considered as an equivalent term for external medicine, for the modern surgeon opens without hesitation all the great cavities of the body, explores with sight and touch the condition of the internal organs, and subjects them to such operative measures as may seem indicated. The skull is opened to permit the arrest of intracranial bleeding, the evacuation of intracranial abscesses, and the removal from the brain of tumors the exact site of which has been determined beforehand by the rules of cerebral localization. The thorax is cut into for the relief of emphysema, or even morbid conditions of the lung itself, and after evacuation of the pleural contents reaccumulation is prevented by securing free drainage, cutting away, if necessary, considerable portions of the ribs in order to permit ventilation and healing.

Abdominal surgery has perhaps made more striking progress than any other department of the art; hardly any organ of the abdominal cavity but is subjected to exploration, and, in cases otherwise incurable, to complete or partial extirpation. The surgeon cuts into a kidney, removes stones from its interior, strikes it into its proper place when it is displaced, and when hopelessly disorganized removes it entirely from the body. The spleen is excised, as is the pancreas; wounds of the liver are sewed up or plugged in prevent hemorrhage; stones are removed from the gall-bladder, or the latter is itself removed, or, if inclusion of the duct prevents the natural escape of bile into the intestine, an artificial

duct passage is established into a neighboring portion of the bowel. Wounds of the stomach and bowel are closed by sutures, malignant tumors of these organs are boldly cut away, and the continuity of the alimentary canal is re-established, sometimes after the removal of many inches or even several feet of intestine. Suppurative inflammation of the appendix vermiformis is now known to be the multiple process in many of the cases formerly known as typhoid, and is successfully dealt with by prompt excision of the diseased organ.

The triumphs of special surgery—ophthalmic, nasal, laryngeal, cysto-urethral, and gynecological—are no less brilliant than those which have been enumerated. The great success which attends surgical operations at present is to be attributed to a combination of causes, of which the discovery of anesthesia and the introduction of aseptic and antiseptic methods of wound-treatment are the most prominent; but great importance is to be attached also to the general diffusion among practitioners of surgery of sound physiological, pathological, and therapeutic knowledge, thus enabling the surgeon not only to operate with facility and protect the wound from injury, but also judiciously to treat the patient after the operation and thus promote speedy and permanent recovery. See *DIAGNOSIS*, *GYNECOLOGY*, *OPHTHALMOLOGY*, etc.

Revised by John Ammer, Jr.

Ku'rieste [from the Dutch (S. African) name, *K. P. suricate*], or **Zenick** [Anglicized form of native (S. African) name]: a carnivorous viverrid mammal of South Africa, the *Suricata suricatta* or *S. leucodactyla*. It is about 12 inches long, with a tail a little more than half that length, and closely resembling the lemming; of a grayish-brown color, tinged with yellow, and with faint darker bands across the back. Its habits are nocturnal, it dwells in burrows, and is often domesticated, being very useful as a destroyer of vermin.

Muriam': See *MIRIAM (Hebrew)*.

Murmellet: See *MURMEL*.

Surname: See *NAME*.

Surplice [from O. Fr. *surplis*, *surplis* < Late Lat. *superpellicion*; *super*, over + *pellis*, a fur garment, pellicie], a clerical garment worn in churches by priests and all clerics, and worn by acolytes and choir-boys. It is considered to be a clerical style or a modification of the alb, and dates back to the twelfth century. It is worn by clergymen of the Church of England during the celebration of service, and at the performance of all ecclesiastical offices, as also by clergymen of the Danish, Norwegian, and Swedish churches, but by them only during the celebration of the Lord's Supper. The use of the surplice, however, was strongly objected to by the Calvinistic and Zwinglian Reformers on the Continent and by the Puritans in England, who regarded this vestment as a relic of popery and made it the subject of vehement denunciations. Both in the Church of England and in the Protestant Episcopal Church in the U. S. its use has become general, and all connection in the popular mind of the surplice with Romanizing tendencies has passed away.

Revised by W. S. Pray.

Surrey: inland county of England, bordering N. on the Thames, which separates it from Middlesex; area, 359 sq. miles. It is intersected from E. to W. by a range of low hills (its highest point, Boxley Hill, being 889 feet), which slopes gently northward in the Thames, while to the S. the ground is more elevated and broken. In the northern part the soil is very fertile; in the southern it consists mostly of clay, chalk, and iron-sand; in the whole western part the land is heath. Wheat, hops, and vegetables are raised; hogs and poultry are extensively reared. Near London manufacturing industry is carried on. The county contains much wood, and the beauty of the scenery and the facility of communication with London have attracted many residents to Surrey, which is consequently studded with mansions and villas. Pop. (1891) 1,739,871.

Surrey, Henry Howard, Earl of; soldier and poet; b. about 1610; was the eldest son of Thomas Howard, Duke of Norfolk; passed his youth at the court of Henry VIII., and was one of the most accomplished noblemen of the time. In 1544 he commanded the English forces in France; was made field-marshal, and subsequently governor of Boulogne. In Jan., 1546, he suffered a reverse at St. Etienne, in consequence of which he was recalled and committed to the Tower, from which he was soon released, but in December was again arrested upon charge of treason for having

quartered the royal arms upon his escutcheon with the design of securing for his family the honor of the regency. Upon his trial he proved conclusively that he had a right to bear these arms together with his own, but was notwithstanding condemned, and beheaded upon Tower Hill, Jan. 21, 1547. His works consist of sonnets, amatory poems, elegies, paraphrases of the Bible, and translations of the second and fourth books of the *Æneid*. They present the earliest instances of the use of blank verse in English poetry, and have been several times republished, the latest edition being G. F. Nott's (1871). Revised by F. M. COLBY.

Surrogate [from Lat. *surrogatus*, perf. partic. of *surroga*, put in another's place, substitute; *sub*, under + *roga're*, ask]: one appointed as a substitute for another; and particularly an officer appointed to act in the place of a bishop, or of a judge, in matters relating to marriages and to probate jurisdiction. In England, since the abolition of the probate jurisdiction of ecclesiastical courts, and the establishment of a civil court of probate, the surrogate's principal function is dispensing licenses to marry without banns. He is prohibited by statute, unless "a qualified practitioner," from preparing for a fee any papers on which to found a grant of probate.

In some of the U. S. the term is employed to designate the officer upon whom probate jurisdiction is conferred. It is a survival from the colonial period, during which the governor of a colony was vested with full authority and jurisdiction over matters of probate, but exercised them through local delegates or appointees. The Supreme Court of Massachusetts declared in an early case that, before the Revolution, the judges of probate were considered as surrogates of the Governor and council, who derived from the royal charter the authority to prove wills and to grant administration. In New York the title of surrogate seems to have been first assumed by the Governor's delegate shortly after 1702. Later the Governor appointed a delegate in each county to act in his stead in probate affairs; and from that period to the present, with the exception of a few years, the county officer exercising probate jurisdiction has been known as surrogate. In New Jersey probate jurisdiction is vested in the orphan's court, of which the surrogate is a subordinate officer. In other States the courts exercising such jurisdiction bear various titles, such as probate courts, parish courts, county courts, or courts of the ordinary. As a rule, they are tribunals of limited jurisdiction, whose organization, procedure, and authority are prescribed by statutes, which should be carefully examined. It is generally declared that the surrogate, or corresponding officer, of the county in which the deceased had his legal residence at the time of his death shall have exclusive jurisdiction of administering his estate, although provision is made for granting letters of administration in foreign States, where such a course is necessary to the control of property in such States.

In some jurisdictions surrogates or probate courts have the power to appoint guardians for infants and imbeciles, to hear and determine disputes affecting estates before them for administration, to entertain and dispose of proceedings for the sale of real estate, and even to administer the estates of insolvent debtors. As a rule, these courts do not possess a general equity jurisdiction. In some States they are not allowed to exercise any equity powers, but in others it is held that where an estate is in settlement before a court of probate, and an equity arises between the persons interested in such estate, the court may exercise the fullest equity powers if necessary to do justice to all parties.

FRANCIS M. BURDICK.

Surveying [from Anglo-Fr. *surveier* : O. Fr. *surveoir* < Lat. *supervide're*, oversee, look over; *super*, over + *vide're*, see]: the art of measuring land for the purposes of determining areas, locating lines, and making maps. Surveying is supposed to have originated in Egypt, where property lines were annually obliterated by the inundation of the Nile, and its theory was then identical with geometry (Greek, *γῆ*, land + *μετρον*, a measure), which still furnishes the most important part of the theoretical principles.

Plane surveying is confined to areas so small that the surface of the earth may be regarded as plane, the curvature being inappreciable. It is divided into land-surveying, whose object is the determination of property lines and areas of fields; topographical surveying, which produces maps showing the undulations of the surface, the forests, swamps, and waters; hydrographic surveying, which locates

rocks, shoals, and all the features of bays and rivers; mining surveying, which locates the underground passages and shafts of mines; railway surveying, which establishes the best routes and grades for railway lines; and city surveying, which deals with streets, sewers, and water-supplies. Geological surveying notes the outcrops of rock formations, and lays them down on topographical maps, the field operations being usually of the nature of a rough reconnaissance.

Geodetic surveying extends over areas so large that it is necessary to take into account the curvature of the earth. For this branch of the subject, see the articles COAST AND GEODETIC SURVEY AND GEODESY.

Instruments.—The Gunter's chain of 66 feet, the engineer's chain of 100 feet, and tape-lines of various lengths are used for measuring distances, and it would be possible by these alone to obtain all the results required in ordinary plane surveying. By the use of the compass and transit, however, for measuring angles, many distances can be computed from a few measured ones, and the work thus greatly expedited and economized. The compass determines the bearings of lines with respect to the magnetic meridian, while the transit measures angles on a graduated limb. The theodolite, of which an illustration is given in the article HYPSOMETRY, is a form of the transit used in Great Britain. Leveling instruments and rods (see LEVELS AND LEVELING) are needed for determining elevations and differences of heights. In topographical work the plane-table and stadia-rods are used in connection with a triangulation, distances being measured by the spaces intercepted on the stadia-rods by wires in the telescope. See STADIA MEASUREMENT AND PLANE-TABLE.

Chain-surveying.—A few elementary problems in the determination of distances and areas by means of linear measurements alone may here be noted, but others in great variety will be found in treatises on surveying. Instead of using a chain the distances may be approximately found by pacing, or by walking over the lines, and counting the steps, the length of a step being first ascertained by going over a distance which is accurately known.

Two methods of finding the distance AX across a river are shown in Fig. 1. By the first method a parallelogram,

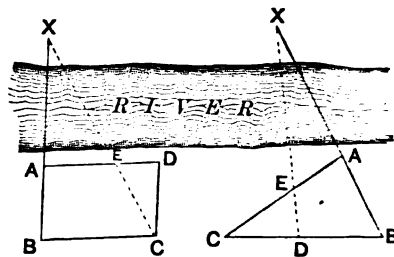


FIG. 1.

$ABCD$, is laid out, AB being a prolongation of AX ; then E is marked on AD at its intersection with CX . The distances AB , AE , DE being measured, the distance AX is computed by multiplying together AB and AE , and dividing the product by DE . By the second method XA is produced to B , and a stake, C , placed at any convenient point; then D and E are taken on BC and AC , so that they are in line with X . The distances AB , BD , DC , CE , and EA being measured, the distance AX is equal to

$$\frac{AB \times AE \times CD}{BD \times CE - AE \times CD}$$

which will be somewhat simplified if D be taken in the middle of BC .

A method of finding the length of an inaccessible line, XY , is shown in Fig. 2. A stake is first placed at any convenient point A , two stakes, B and C , at points on AX and AY , and a fourth stake, D , so as to make $ABDC$ a parallelogram. Then E and F are placed on BD and CD at their intersections with CX and BY respectively. The distances AB , BD , DF , and EF being measured, the distance XY is equal to

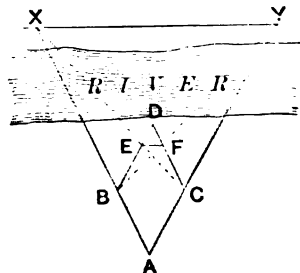


FIG. 2.

$$\frac{AB \times BD \times EF}{DE \times DF}$$

The area of a field, as *ABCDE* in Fig. 3, may be found by dividing it into triangles by either of the methods

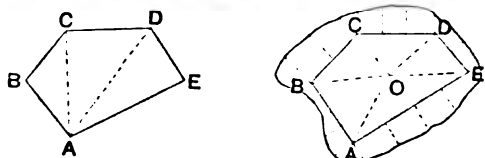


Fig. 3.

shown, measuring all the lines, and then computing the area of each triangle separately. To find the area of a triangle whose three sides are known, add the three sides together, and take half the sum; from the half sum subtract each side separately, multiply together the half sum and the three remainders, and the square root of the product will be the area.

A map of an island or irregular field, as in the second diagram of Fig. 3, may be made by staking out a polygonal area *ABCDE*, and measuring either its diagonals or the distances to a central point. Then perpendicular lines, called offsets, are set off from each side to the boundary and their lengths measured, thus giving all the data for mapping and computing the area.

Compass-surveying.—By means of the compass the angles or bearings which each line makes with the magnetic meridian are read, and thus a smaller number of linear measurements is required. For instance, in the case of Fig. 1, the line *AE* may be measured, and the bearings of *AX*, *AE*, and *EX* be read; then the angles *EAX* and *AEX* are known, and the distance *AX* can be computed by the rules of trigonometry.

The area of a field is determined in compass-surveying by measuring the lengths and bearings of the sides. For example, for the case shown in Fig. 4, the field-notes would be as follows:

LINE.	Bearing.	Distance.
<i>AB</i>	N. 52° E.	532 feet.
<i>BC</i>	S. 21° E.	214 "
<i>CD</i>	S. 31½° W.	389 "
<i>DA</i>	N. 61° W.	362 "

From these data the distances *Ab*, *Ac*, *Ad*, called latitudes, and the distances *Bb*, *Cc*, *Dd*, called departures, are computed, and from these, in turn, the areas included between each line and its projection on the meridian *NS*. Then the area of the field is the sum of the areas *BbC'c* and *CcDdD'*, diminished by the sum of the areas *BbA* and *DdA*.

The method of balancing the latitudes and departures so as to eliminate errors of observations, and the computations of areas by means of double-meridian distances, given in most text-books on surveying, was perfected by David Rittenhouse (1732-96), and was formerly called the Pennsylvania method.

On account of oscillations in the forces of magnetism and of local attractions the compass is not an accurate instrument, and should be used only for rough reconnaissance or for farm surveys, where precision is not important. In all town or city work, as also in the surveying of railways and mines, the transit is generally employed for the direct measurement of angles.

Topographical Surveying.—A topographical survey of a region embracing more than a few square miles should be based on a triangulation which locates the positions in latitude and longitude of a number of stations. Then, starting from these stations, lines are run in various directions, and the location of roads, houses, streams, and other features, is made by offsets or by stadia sights. Levels are also run by which the contours or lines of equal elevations are determined, and thus a picture of the relief of the surface may be obtained. Rough topographical work, much of which is sketching, may be done for \$5 per square mile, but good work will cost four or five times as much. Photography is an aid in this class of work, views being taken from different points which enable the contours of the surface to be sketched in the office. See also TOPOGRAPHY.

In the survey of a railway topographical work is done on each side of the line, and this is necessarily of a precise character so as to enable computations of excavation or comparative estimates of the cost of different locations.

Public-land Surveys.—The public lands consist of tracts of territory that belonged to the U. S. after the Revolution, together with all ceded by individual States soon after the formation of the Constitution, with the additions since made by treaty with Indians or by conquest. In 1802 Col. Mansfield, then surveyor of the Northwestern Territory, inaugurated a plan, which with slight alteration is still in use, for surveying and recording such portions as were offered for sale. Its general features are as follows: The entire public domain is first divided into parts called land districts, each of which is put in charge of a surveyor-general, who controls all the surveys in his particular district. In each district a meridian-line is run, extending through the entire district, and from some point of this meridian an E. and W. line is run, which also extends through the district. These lines are determined astronomically, and when located serve as axes to which the subdivisions of the district are referred. Parallel to the axes, and on each side of them, other lines are run 6 miles apart, dividing the whole territory into squares, each containing 36 sq. miles, and called townships. To take into account the obliquity of the meridians, suitable offsets are made in accordance with an established system. The townships lying between two consecutive meridians 6 miles apart constitute a range, and the ranges are numbered from the principal meridian, both E. and W. In each range the townships are numbered both N. and S. from the principal E. and W. line. Thus if a township lies 12 miles E. of the principal meridian and 18 miles N. of the principal E. and W. line, it is called township 3 N., range 2 E. Each township is divided by meridians and E. and W. lines into squares having (as near as may be) a mile on each side. These are called sections, and each contains approximately 640 acres. The sections of a township are numbered from the northeast corner, running along the northern tier of sections to No. 6, thence backward to section No. 12, which lies exactly S. of No. 1, and so on alternately, running from right to left and from left to right, to the southeasterly corner, which is No. 36. The four middle sections are numbered respectively 15, 16, 21, 22. In some of the Western States section No. 16 is set apart for school purposes.

LITERATURE.—Among the numerous text-books on surveying may be mentioned Bellows's and Hodgeman's *Manual of Land Surveying*, Gillespie's *Treatise on Surveying*, Johnson's *Theory and Practice of Surveying*; and on railway surveying, Searles's *Field Engineering* and Shunk's *Field Engineer*. A journal published by the German Association of Surveyors since 1872 is *Zeitschrift für Vermessungswesen*, which is mainly devoted to precise methods.

MANSFIELD MERRIMAN.

Surveys, Geological: 1, systematic investigations of the character, arrangement, and distribution of the rock formations of a district; 2, state organizations or bureaus for the conduct of such investigations. In 1823 the Legislature of North Carolina provided for the geological survey of the State by Prof. Denison Olmsted, appropriating the sum of \$250 a year for four years. In 1830 Massachusetts followed the example of North Carolina, making a somewhat larger appropriation, and placing Prof. Edward Hitchcock in charge of the work. Between 1830 and 1840 similar surveys were instituted in Tennessee, Virginia, Maryland, New Jersey, New York, Pennsylvania, Maine, Ohio, Michigan, Delaware, and Kentucky; and before 1895 all the States of the Union E. of the Great Plains, as well as California and Oregon on the Pacific coast, had made similar provision for the investigation of the rocks and minerals within their borders. Some States, after a few years of continuance, abandoned the work, or it was discontinued for a period. Others completed the investigations according to the original plan, and the results were communicated to the citizens in a series of final reports. Pennsylvania completed the survey first planned, and then after a lapse of years executed a second survey upon a more elaborate plan. New Jersey, Ohio, and Alabama maintain small permanent geological corps in the interest of the development of their mineral resources. New York, which early published systematic reports on the stratigraphy and structural geology of its territory, has since carried forward an elaborate study of its fossils, continuously maintaining therefor a small corps, and

publishing a series of paleontologic monographs, which have been of the utmost service to the geological corps of other States.

The U. S. early established the custom of attaching geologists to parties sent out for the exploration of little-known portions of its territory. Expeditions having geological inquiry for their primary purpose were instituted under Featherstonehaugh in 1834, Owen in 1839, Burt and Hubbard in 1845, Owen in 1847, Jackson in 1847, and Foster and Whitney in 1848. The work under Owen and Foster and Whitney should perhaps be classed as surveying rather than reconnaissance. In 1867 Ferdinand V. Hayden, who had previously been connected with exploratory parties, was authorized to make a geological survey of Nebraska, and his work was afterward continued in other Territories. In the same year provision was made for the survey of a belt of country, including the 40th parallel, under the direction of Clarence King. In 1871 John W. Powell, who had previously explored the Colorado cañons under Government authority, was authorized to begin the geological survey of a tract bordering the river, and this work also was continued. In the same year explorations under the direction of Lieut. George M. Wheeler assumed the character of a topographical and geological survey. In 1879 the U. S. Geological Survey was created, being made to replace the Hayden, Powell, and Wheeler surveys. Two years later its field of operations, which had originally included only the Territories, was enlarged so as to comprise the entire republic, and its corps was gradually enlarged until it came to be the most important of all governmental organizations for the prosecution of geological investigation.

Great Britain was the first European country to establish a geological survey, De la Beche being placed in charge of the work in 1832. Austria and Spain followed her example in 1849, and works of this character are now in progress in nearly all the countries of Europe as well as in the British colonies. The first reports of the surveys of New Brunswick and Newfoundland were published in 1839, and the official survey of Canada, which is (1895) still in progress, was begun in 1842.

Geological surveying, or the work of a geological corps, consists primarily in the preparation of maps showing the horizontal distribution of the various formations, and of sections showing their vertical arrangement. The facts exhibited by maps and sections are called respectively the areal geology and structural geology. For their compilation it is necessary that the rocks be classified, and the study of the formations for the purpose of classification involves the determination of their position and other physical characters, and also the determination of the fossils they contain. In extensive geological surveys it has been found advantageous to differentiate the work, employing specialists for the chemical analysis of rocks, for their petrographic determination, and for the study of fossils. In regions not previously provided with topographic maps on which to delineate the outcrops of the formations, the geological corps has performed topographical as well as geological work, and in large organizations the topographical work also is performed by a special corps. In Great Britain and most of the countries of continental Europe topographical map-work was well advanced before geological mapping was begun, and the geological corps have no topographical divisions. In the U. S. the State surveys have, as a rule, executed little or no topographic work, but have made use of such maps, usually inaccurate, as happened to be available. The national survey prepares its own topographical base-maps, employing for that purpose a large corps of engineers.

G. K. GILBERT.

Survival of the Fittest: See EVOLUTION (*Struggle for Existence*).

Survivorship: (1) the state of outliving another. Whether A outlives B is, as a rule, an easily determined question of fact. If they are the victims of a common disaster, however, no evidence as to survivorship may be obtainable. In such a case the Roman law, and some modern codes founded upon it, establish presumptions for its determination, which are based upon the assumption that survivorship depends upon the comparative physical strength of the victims. For example, if a father and son perish, the father is presumed to survive, if the son is under puberty, while if the latter is above that age he is presumed to survive. (See 4 Burge, *Colonial and Foreign Laws*, ch. 1, § 1; Code Civil, Des Successions, §§ 720-722; Code of La., §§ 936-939; Code

of Civ. Proc. of Cal., § 1963.) English law recognizes an artificial presumption on this subject. It will not balance "probabilities either that there was a survivor or who it was. We may guess, or imagine, or fancy, but the law of England requires evidence," and evidence which goes beyond that of the sexes, the relative ages and physical power of the persons who are victims of a common disaster. In the absence of other evidence than the above, the fact of survivorship is deemed unascertainable, and property rights are disposed of as if death occurred at the same time. *Newell vs. Nichols*, 75 New York 78; *Ehle's Estate*, 73 Wis. 445.

(2) The devolution of rights or obligations upon the survivor by the death of a joint owner or a joint obligor. The survivorship of rights is often termed *jus accrescendi*. "Because the right upon the death of one joint tenant accumulates and increases to the survivor." Such a doctrine was favored by the common law, for the reason that it tended to prevent a division of tenures, and to secure the continuance of the feudal system. It was not favored in equity, and was repudiated by mercantile law. Modern statutes have almost abolished it. This branch of the topic is discussed in the articles JOINT AND SEVERAL, JOINT OWNERSHIP, and PARTNERSHIP.

FRANCIS M. BURDICK.

Sus: See SUIDÆ.

Susa [= Lat. = Gr. *τὰ Σούσα*]: capital of the ancient kingdom of Elam, and afterward one of the residences of the kings of Persia; in lat. 32° N., lon. 48° E. It was taken by Assurbanipal (668-626 B. C.), and, as appears from Ezra iv. 9, 10, some of its inhabitants were sent to live in Palestine. When Alexander took the city, 331 B. C., he found great treasures of gold. Susa is the scene of several interesting biblical narratives: (1) The vision of Daniel (viii. 2); (2) Nehemiah's office as cupbearer to the king (i. 2, ii. 1); (3) the feast of Xerxes (Esther i. 2). One of the buildings at the place is revered by the natives as the tomb of Jonah. The site, which is marked by ruins, was excavated for the Louvre by Marcel A. Dieulafoy, 1884-86, who was aided in the work by his wife. (Cf. Jane Dieulafoy, *La Perse, la Chaldée et la Susiane* (Paris, 1887); Jane Dieulafoy, *À Susa. Journal des Fouilles 1884-86* (Paris, 1888); Marcel A. Dieulafoy, *L'Acropole de Susa d'après les Fouilles exécutées en 1884, 1885, 1886*, etc. (Paris, 1890-92); B. T. A. Everett, *New Light on the Bible and the Holy Land* (London, 1892, pp. 220-257).) The ruins are in the form of three large mounds. In one of these Dieulafoy excavated the palace which was built by Darius Hystaspes (521-485 B. C.), damaged by fire in the reign of Artaxerxes Longimanus (465-424), and restored by Artaxerxes Mnemon (405-362). The art treasures brought thence to the Louvre are most remarkable. Specially noteworthy are the capitals of the columns, the procession of the "immortals" (raised figures in enamel, of various colors, on the surface of the brick-work), and the figures of lions (also in enamel).

D. G. LYON.

Susa, or Sous: town of Northern Africa: 70 miles S. S. E. of Tunis; is surrounded with olive-groves, and has an extensive trade in oil and manufactures of woolen fabrics. Pop. estimated at 12,000, of whom 2,000 are Europeans and 2,000 Jews.

M. W. H.

Susan's na, History of: a short book, considered by the Roman Catholic Church to be canonical, and regarded as the thirteenth chapter of Daniel, but put among the Apocrypha in the English Bible. It relates the attempt on the virtue of Susanna, a beautiful Jewish matron, her false accusation, her final rescue from death, and the overthrow, by the judgment of young Daniel, of the wicked men who designed her ruin. It is probably a fiction of neo-Hebrew origin.

Revised by S. M. JACKSON.

Susemihl, soo'ze-mēl, FRANZ: Greek scholar; b. at Laage, Mecklenburg-Schwerin, Germany, Dec. 10, 1826; studied in Leipzig and Berlin; private docent at Greifswald 1852; Professor of Classical Philology at the same university since 1856. His works chiefly relate to Plato and Aristotle. Among them are *Genetische Entwickelung der Platonischen Philosophie* (2 vols., 1860); *Aristotle's Poetics*, with translation and notes (2d ed. 1874); text editions of the *Politics* and *Nicomachean Ethics*. In 1891 he published his profoundly learned *Geschichte der griechischen Literatur in der Alexandrinerzeit* (2 vols.), the standard work on the subject.

ALFRED GUDEMAN.

Suso, or Seuse, HEINRICH (otherwise known as St. Amadus and Heinrich von Berg): mystic; b. at Ueberlingen, in the present grand duchy of Baden, 8 miles N. of Constance,

June 23, 1220. His father was a rough soldier of the name of Jean Berg, but after his mother's death in his eighteenth year he took her name, Simon or Simeon. He studied first at Compiègne, then at Cologne, and became a Dominican monk at Compiègne 1260. He was greatly influenced by Eckhart. At first his religious life was in the dark, and he lived for several years a life of seclusion and the severest asceticism; but coming into the light, realizing as he believed with the Eternal Wisdom, he resorted in the newly found way and peace and became then an illustrious preacher, and wrote several religious works of a mystical character, which made a deep impression, and of which the chief is *Book of the Seven Wreaths* (*Horologium Sapientie Alberti*), which was partly translated into English at Douay, 1560. It is in the Dominican monastery at Ulm, Jan. 25, 1566. His collected works were translated into new High German by M. Dispenhirsch (Regensburg, 1822; 4th ed. 1864); but his writings have not as much interest as those of the other German mystics—Eckhart, Tauler, etc. F. H. S. DeWille has published selections in his *Das geistliche Leben* (Grita, 1878), 3d ed. 1879; also his works, 1878, seq.). For Simeon's biography, see his collected works, also his autobiography, *The Life of Blessed Henry Simon by Himself*, translated from the German by T. P. Knox (London, 1893); also F. Bayan, *Tristis Amici de Deo* (Lausanne, 1866), and T. Jaeger (Düsseldorf, 1866). Revised by S. M. Jackson.

Suspension (in music): See MUSIC.

Suspension Bridge (TOWN): See NIAGARA FALLS (CITY).

Suspension Bridges: See BRIDGES.

Susquehanna: borough: Susquehanna co., Pa.; on the Susquehanna river and the N. Y., Lake Erie and W. Railroad; 32 miles S. E. of Binghamton, N. Y., 59 miles N. of Carlisle (for location, see map of Pennsylvania, ref. 2-1). It is a manufacturing place, with steam-boat factory, chemical works, and locomotive and railway-car shops, and contains a public library, 2 national banks with combined capital of \$150,000, a private bank, and a daily, a tri-weekly, and a weekly paper. Pop. (1890) 3,467; (1896) 3,265.

Susquehanna River: a river formed by the union of its western and eastern branches at Northumberland, Pa. The western branch, the larger, rises in Otsego Lake, Otsego co., N. Y., at an elevation of about 1,300 feet. The western branch rises in Cambria co., Pa., and has a very tortuous and generally eastward course through a region abounding in timber and coal, but less celebrated for its fertility and beauty than the valley of the eastern branch, a portion of which, called the Wyoming valley, is renowned for the historic events of which it has been the scene, as well as for the mineral wealth which it contains. The main Susquehanna flows through a wide, open, exceedingly fertile, and very picturesque country of Devonian slates and limestones. It reaches the head of Chesapeake Bay at Fort Deposit, Md. It is a wide and stately stream, but is shallow, and is nowhere navigable to any extent, save in the spring, when the freshets bring down great rafts of logs and lumber and some loaded boats. The length of the main stream is 150 miles, of the western branch 200 miles, of the eastern (or northern) branch 220 miles. The branches afford great water-power. Canals have been built along the main stream and both branches, but have been rendered useless to a great extent by railways. Revised by ISRAEL C. ROSS-ELL.

SURREY: county of England; S. of Surrey and bordering on the English Channel. Area, 1,465 sq. miles. It is intersected from E. to W. by a range of low hills called the South Downs, consisting of chalk covered with fine turf and affording excellent pasturage, where the celebrated breed of sheep called the Southdowns is reared. To the N. of the range are extensive woods; to the S. the ground is wholly under tillage, and large crops of wheat, barley, beans, turnips, and hops are raised, and hogs, fowls, and rabbits are reared. Pop. (1891) 530,442.

SURREY: See SUMNER.

Sutcliffe, MATTHEW, LL. D., dignitary and author; b. in Devonshire about 1550; entered Trinity College, Cambridge; took holy orders, and became archdeacon of Taunton in 1576, dean of Exeter in 1598, and prebend of Wells in 1592. He founded a college at Chelsea, of which he was the first provost, the fellows of which were to devote themselves to writing the annals of their times and to combating popery and Paganism; but the institution fell into decay, became an asylum for invalid soldiers, and finally a part of Chelsea Hospital. He wrote many polemical works, chiefly

against Bellarmine and Robert Persons, among which are *A Treatise of Ecclesiastical Discipline* (London, 1604); *Disputation de Probatione* (1601); *De Caliditate et Invaliditate Christi. Breviter* (1602); *De Pontificis Romanis, et quibus Indulgentiis in Ecclesia dispensantur* (1599); *De Paganismo* (1600); *De Vera Christi Religione* (1597); *De Missa papistica* (1601); *The Unlawfulness of a Mass-sacrifice*, &c. in 1600. Revised by S. M. JACKSON.

Sutech: an Egyptian deity, usually regarded as the equivalent of Set (q. v.). He was adopted by the Hyksos (q. v.) as their special divinity, and afterward, apparently, was introduced into the East. It is somewhat doubtful whether the identification of Set and Sutech is justification in the earlier times, since as late as the eighteenth dynasty the name of Set appears as the principal part of the royal name of Seti (q. v.), which would scarcely have happened if the identification of Set with the foreign Sutech were then stamped or generally recognized. At a later period both Set and Sutech are regarded as identical, and as foreign gods as well as gods of foreigners. CHASLES R. GILLIARD.

Sutherland: a northern county of Scotland, bounded W. and N. by the Atlantic Ocean, E. by Caithness, and S. by the North Sea; area, 9,028 sq. miles, only 3 per cent. of which is under cultivation. The surface is elevated, mountainous, and rugged, especially toward the N. W., interspersed with large tracts of moorland or covered with extensive forests, where herds of red deer roam wild. Herring and salmon, and salmon, and herring fishing are the principal occupations. Pop. (1891) 21,596. Chief towns: Dunrobin (pop. 1891) 513. Sutherlandshire sends one member to Parliament.

Sutlej [Sansk. *Satadra*, or the "hundred-channelled," the *Sardara* of Ptolemy and *Satdra* or *Hasidra* of Piny]; the most eastern and southern of the "five rivers" of the Panjab, British India, and the one which receives the other four before it joins the Indus. It rises in Western Tibet, not far W. of the sources of the Hindukush and S. of those of the Indus proper, and takes a course first W., breaking through the Himalayas, thence S. W. to the Indus in lat. 29° N. The Tibetan valley of its upper course is highly picturesque and contains many hot springs. After passing the mountains it traverses the arid plains of Southern Panjab, where its waters are much used for irrigation. It has no large southern affluents. On the N. the Rias enters at the turn in its course, and 50 miles from the Indus it is joined by the mountain stream, Chibul, and Bavi, from which junction to its mouth it is called the Panjab. Its lower course is shifting. The annual floods occur in June, July, and August, and its volume of water is nearly equal to that of the Indus. Length about 970 miles, but the flow is intermittent from Hakra Tal, a lake 40 miles below its source. Boats of 40 tons burden ascend to Prosper, 970 miles from the mouth. MARK W. HARRINGTON.

Sutra, in Pali *Sutta* [Sansk. *sūtra*, a thread or string; deriv. of *year*, *sow*]; in Sanskrit literature, a short rule or aphorism, or a string of such aphorisms. Sūtras constitute an important part of Hindu literature, including all the ritual, grammatical, metrical, and philosophical works. They consist of brief sentences to be committed to memory, and were usually written separately on dried palm-leaves tied together by a string, whence the name. One of the three "baskets" or "collections" of the Buddhist Tripitaka is composed of sūtras, which profess to be the very words of the Buddha. Each sūtra or string of aphorisms begins with the words, "Thus have I heard."

Suttee (from Sansk. *sūt*, faithful wife, liter., female of *sūta*—pres. partic. of *sū*, he, being, existing, real, true, faithful); the voluntary burning of a widow on the funeral pile of her husband, a practice formerly prevalent among Hindus in India. In the event of the husband dying in a distant land, the widow would place her sandals on her breast and end herself alive into a fire. The practice is said to have been unknown to the primitive Aryans, but it is authorized by several passages in the *Puranas* (see *Cotterbrooke's Digest of Hindu Law*), although the custom is not sanctioned by the laws of Manu. For some time the custom was permitted in India under British rule, and between the years 1815 and 1826 more than 7,000 cases of suttee were reported in the province of Bengal alone. In 1829 suttee was suppressed by the British Government in India, and in 1847 the prohibition was extended to all native states under the protection of the Government. T. C. BRADSHAW.

Sutter, JOHN AUGUSTUS: pioneer; b. at Katern, Baden, Feb. 15, 1803, of Swiss parentage; was educated at the military college at Berne; entered the French service as an officer of the Swiss guard and served, 1823-24, through the Spanish campaign; emigrated to the U. S. 1834; carried on a trade with Indians and trappers at Santa Fé; crossed the Rocky Mountains 1838; traded in a vessel along the Pacific coast; founded 1839 a settlement on the site of Sacramento; received a grant of land from the Mexican Government, and was appointed governor of the northern frontier country; encouraged the annexation of California to the U. S.; was a delegate to the convention to form a State constitution; and after the admission of California as a State was elected first alcalde of his district. In Feb., 1848, gold was discovered on his estate in Coloma, his lands were invaded by gold-diggers, and the claim he had filed for 33 sq. leagues was decided against him on appeal to the Supreme Court. Being reduced to poverty, he was pensioned by the State Legislature; in 1873 removed to Litiz, Lancaster co., Pa. D. in Washington, D. C., June 17, 1880.

Sutter Creek: town; Amador co., Cal.; on Sutter creek; 4 miles N. W. of Jackson, the county-seat, 45 miles E. S. E. of Sacramento (for location, see map of California, ref. 6-D). It is in a gold-mining and agricultural region, and has a weekly newspaper. Pop. (1880) 1,324; (1890) 1,351.

Sutton: village; Brome co., Quebec, Canada; on the Canadian Pacific Railway, near the U. S. boundary (for location, see map of Quebec, ref. 6-C). Near the village is Sutton Mountain, over 1,000 feet high, the slopes of which are covered with magnificent maple groves. It is the center of the maple-sugar export trade. Pop. of parish (1891), 3,362.

Sutton: town (incorporated in 1714); Worcester co., Mass.; on the N. Y., N. H. and Hart. Railroad; 9 miles S. of Worcester (for location of county, see map of Massachusetts, ref. 3-G). It contains the villages of Sutton, West Sutton, South Sutton, Mauchaug, Wilkinsonville, Pleasant Valley, Woodbury, and Marbleville; has 5 churches, high school, 15 public schools, public library, and assessed valuation of \$1,296,578; and is principally engaged in agriculture and the manufacture of cotton goods. Pop. (1880) 3,105; (1890) 3,180.

Suture [from Lat. *sutūra*, seam, deriv. of *su'ere*, *su'tum*, sew; Eng. *sew*]: in anatomy, the line of union of two bones between which there is no motion. Where motion is intended, the union is a joint or diarthrosis. The general term for an immovable joint is synarthrosis; this includes the suture (*sutūra*), or linear articulation; the schindylesis, in which a thin lamina of bone is received between two laminae of another bone; and the gomphosis, in which a long process is inserted into a socket. A serrated suture is one between bones whose edges have projections and indentations fitting into each other; a squamous suture is between bones whose edges overlap. In surgery, suture is either the uniting of the edges of a wound by means of stitches, or it is one such stitch. The most common materials for sutures are prepared catgut, silk, and silver wire.

Suwa'row, or Suvo'roff, ALEXEI VASILIEVITCH: soldier; b. in Moscow, Nov. 24, 1729; entered early the Russian army, and was made a colonel after the battle of Kunersdorf, 1759, and a general in 1783, after the campaign against the Lezhians on the Kuban. In the second Turkish war he defeated the Turks in several important battles, and in 1790 captured the fortress of Ismail. In 1794 he commanded in Poland, and took Praga Sept. 24, 1794, after which Catherine II. made him field-marshal. His most brilliant exploit was his Italian campaign in 1799. He had fallen into disgrace under Paul I., and had even been deprived of his rank, but on the demand of the Emperor of Austria he was, nevertheless, made commander-in-chief of the Russian army which was sent to Italy to co-operate with the Austrians against France. He defeated the French on the Trebbia and at Novi, and then crossed the Alps to join Korsakoff and the Austrians under Hotz. Both the generals had been defeated, however, and Suwarow was compelled to retreat. Shortly after the Russian-Austrian alliance was dissolved, and the Russian army withdrawn from the theater of war. He died a few days after his return to St. Petersburg, May 18, 1800. His *Autobiography*, written in French, was edited by Glinka in 2 vols. (Moscow, 1819). See biographies by Polevoi (1853) and Spalding (1890). F. M. COLBY.

Svarabhakti [Sansk., vowel-fragment; *svara*-, tone, vowel + *bhakti*-, division, deriv. of *bhaj*-, to allot, divide]: a tech-

nical term of Indian grammar (*Prātiśākhya*) applied to a subsidiary vowel-sound inserted between *r* or *l* and a following consonant. This term has been adopted into modern grammar to denote the vowel appearing in the various familiar forms of anaptyxis with *r* or *l*; as in Lat. *familia* for **famlia*; *saeculum* for *saecum*: O. H. Germ. *miluh* to *melchan*, to milk; Eng. *elm* for *elm*. B. L. W.

Sveaborg: See SWEABORG.

Svend: See SWEYN.

Sven Tröst: pseudonym of SNOILSKY (*q. v.*).

Svĕtlá, KAROLINA (pseudonym of JOHANA MUŽÁKOVÁ, wife of Prof. Peter Mužák, of Prague): a Czech writer of novels of considerable fame; b. at Prague, Feb. 24, 1836. She published in 1858 her first novel, *Double Awakening*, in the Czech almanac *Máj*, and continued to enrich Bohemian literature with some fifty novels and tales. Her material is mostly drawn from the popular life and the modern society of her native country; her popular types, framed after French models, are very delicate and artistic. She also wrote many essays on education and literature, and memoirs which are widely read. Among her best novels are *Láska k básníkovi, román z časů novějších* (Poet's Love, Novel of the Present Time, Prague, 1860); *První Češka* (Prague, 1861; also published in the collection of novels *Slovanské besedy*); *Vesnický román* (The Village Romance, 1869); *Frantína* (1870); *Kříž a potoka* (The Cross near the Brook, 1871); *The Atheist* (1873). Karolina Světlá is, besides Eliška Krásnohorská (pseudonym for Henriette Pech), the author of the cycle of epic songs *To the Slavic South*, the foremost woman representative of modern Czech literature. Many of her novels have been translated into Russian, German, Polish, and French. HERMANN SCHOENFELD.

Svir: a river in the government of Olonetz, Russia. It issues from the southwestern extremity of Lake Onega, and enters, after a course of 130 miles, the eastern part of Lake Ladoga. It is navigable throughout its whole course, and forms part of the great system of rivers and canals which connects the Baltic with the Caspian and White Sea.

Swabia, or Suabia (Germ. *Schwaben*, Mod. Lat. *Sue'via*): a former territory of Southwestern Germany, corresponding nearly to the present Würtemberg and Baden, and bounded S. and W. by the Rhine, which separated it from Switzerland and France, and N. and E. by the Palatinate, Franconia, and Bavaria. Its original name was *Alemannia*, but when, in 496, the Alemanni were conquered by Clovis, the country received the name of Swabia after the Suevi, who inhabited large parts of it. In 1080 the Emperor Henry IV. made it a duchy, and bestowed it as an hereditary fief on Frederick of Hohenstaufen. Under this family Swabia prospered and became the seat of a flourishing civilization; but when the family became extinct with Conradin, who, as the head of the Ghibelline party, was executed at Naples in 1268, Swabia was broken up into many small dominions and free cities. From 1563 to 1806 Swabia was one of the ten circles into which the German empire was divided.

Revised by M. W. HARRINGTON.

Swain, GEORGE FILLMORE, B. S.: civil engineer and educator; b. in San Francisco, Cal., Mar. 2, 1857; graduated at the Massachusetts Institute of Technology in 1877, and then spent three years in study in Germany. Since 1883 he has been Professor of Civil Engineering in the Massachusetts Institute of Technology, and has also served as expert on the tenth census and as engineer of the railway commission of Massachusetts. He is the author of valuable articles in technical journals, of papers on the water-power of the U. S. in the *Reports of the Tenth Census*, and of discussions in the *Reports of the Massachusetts Railroad Commission*.

MANSFIELD MERRINAN.

Swainson, WILLIAM: naturalist; b. in Liverpool, Oct. 8, 1789; served in the commissary department of the British army 1807-15; accompanied the German naturalist Köster in his travels in South America 1815, after which he settled in London, and began in 1820 the issue of his works on natural history. In 1841 he emigrated to New Zealand, where he was attorney-general, and subsequently published several works on the natural history and social and political condition of that colony and Tasmania. Among his works are *Zoological Illustrations* (1st series, with 318 colored plates, 1820-23; 2d series, with 136 plates, 1829-33); *Exotic Conchology* (1821-22; new ed., 1841); *The Naturalist's Guide for Collecting and Preserving all Subjects of Natural History and Botany, particularly Shells* (1840); 11 vols. on zoology.

etc., in Lardner's *Cabinet Cyclopaedia* (1834-40); *Birds of Western Africa and The Natural Arrangement and History of Flycatchers* (in Jardine's *Naturalist's Library*, 1837-38); *Ornithological Drawings*, of birds from Brazil and Mexico (1834-41); *Observations on the Climate of New Zealand* (1840). He assisted Sir John Richardson in the ornithological portion of *Fauna Boreali-Americana*. Few of his day knew more about birds and no one excelled him as a delineator of them. D. in New Zealand in 1855.

Swallow [O. Eng. *swalewe*, *swealwe*; O. H. Germ. *swalawa* (> Mod. Germ. *schealbe*); Icel. *swala*]; any bird belonging to the family *Hirundinidae*, distinguished by the wide deep gape, allusion to which is evidently conveyed in the name. They have the neck rather short; the head full; the bill short, but comparatively broad and depressed; the gape very deep, and continued backward nearly as far as, or quite under, the eyes. There are no distinct rictal bristles; the wings are very long and pointed, and have only nine primaries, of which the second is generally longest, but the first is nearly or quite equal to it; the tail is forked or emarginated, and normally consists of twelve feathers; the legs are weak and small, the toes are long and slender, and with the normal number of joints; the claws curved and acute, but slender. The anatomical features demonstrate the close relationship of the family with the ordinary singing birds (such as the sparrows, thrushes, etc.), and the great differences from the swifts, which resemble them so much as formerly to have been generally united with them. There are over 125 species, and representatives are found in almost every land and every zone save the extreme polar regions. The several genera have been differentiated into two sub-families—*Hirundininae*, in which the outer edge of the wing is smooth-feathered, containing almost all of the species; and *Psittidoproceninae*, in which it is serrated or armed with stiff recurved hooks, represented by the African genus *Psittidoprocne* and the American *Stelgidopteryx*. The species are among the most active and graceful of birds, and their circling and sweeping flight is well known to observers. They feed almost exclusively on insects, which they take on the wing. Their mode of nesting is various (for the nest of the barn-swallow, see NESTS OF BIRDS), the eggs five or six. The most common North American species are the purple martin (*Progne subis*); the cliff-swallow (*Petrochelidon lunifrons*); the barn-swallow (*Chelidon erythrogaster*); and the bank-swallow or sand-martin (*Cotyle riparia*). The so-called chimney-swallow is a swift. See SWIFT and MARTIN.

Revised by F. A. LUCAS.

Swamp'scott: town; Essex co., Mass.; on Massachusetts Bay, and the Boston and Maine Railroad; 2 miles N. E. of Lynn, and 13 miles N. E. of Boston (for location, see map of Massachusetts, ref. 1-1). It is a noted watering-place with an excellent beach and large accommodations for season and transient guests; contains the villages of Swampscott, Beach Bluff, Phillips Beach, and Mountain Park; and has a high school, 14 district schools, public library, 3 hotels, and 5 churches. In 1894 the assessed valuation was \$5,000,000. Pop. (1880) 2,500; (1890) 3,198.

Swan [O. Eng. *swan*; O. H. Germ. *swan* (> Mod. Germ. *schwan*); Icel. *svanr*]; any one of those swimming birds of the family *Anatidae*, sub-family *Cygninae*, which have a bill nearly equally broad throughout and as long as the head; the cere soft and extending to the eye; neck long and slender, consisting of twenty-two to twenty-six vertebrae; the front toes with a large web; the hind toe without a lobe; the tail short and rounded; the second and third wing-quills the longest. They are the largest species of the family, and among the largest of birds. Some authorities place all swans in one genus, *Cygnus*; others admit four genera, *Cygnus*, *Olor*, *Chenopsis*, and *Sthenelus*. Omitting the Coscoroba swan (*Coscoroba coscoroba*), which probably belongs with the ducks, there are nine species, all but two inhabitants of the northern hemisphere. The exceptions are the black-necked swan (*Sthenelus melancorypha*) of Chili and the black swan (*Chenopsis atrata*) of Australia. The North American swans, whistling swan (*Olor columbianus*) and trumpeter swan (*O. buccinator*), are fine birds, both white. The tame swans are of two European species—red-billed swan (*Cygnus olor*) and Polish swan (*C. immutabilis*). The former is found in a wild state throughout a great part of Europe, while comparatively little is known of the second species, some authors considering it to be a mere variety of the first. *Cygnus immutabilis* is so named from the fact that the young—or cygnets—are white, while those of other species are gray. Though once

held in considerable esteem for the table, domestic swans are now bred merely for ornament.

F. A. LUCAS.

Swan, JAMES: soldier and author; b. in Fifeshire, Scotland, in 1754; went to Massachusetts at an early age; was a clerk in Boston; published a *Dissuasion to Great Britain and the Colonies from the Slave Trade to Africa* (1772); became captain of artillery, secretary to the Massachusetts board of war, member of the Legislature in 1778, and afterward adjutant-general of the State. In 1787 he went to Paris; wrote *Causes qui sont opposées au Progrès du Commerce entre la France et les États-Unis de l'Amérique* (1790); acquired a large fortune; returned to the U. S. in 1795; returned to Europe in 1798; in 1815, upon the suit of a German with whom he had transactions, he was arrested and thrown into a prison in Paris, where he remained fifteen years. He also published *On the Fisheries* (1784); *Fisheries of Massachusetts* (1786); *National Arithmetick* (1786); and an *Address on Agriculture, Manufactures, and Commerce* (1817). D. in Paris, Mar. 18, 1831.

Swan-pan: See ABACUS.

Swan'sea (Welsh, *Abertawe*): seaport in Glamorganshire, South Wales; at the mouth of the Tawe; 216 miles W. of London (see map of England, ref. 12-E). Owing to the rich coal-fields in the vicinity, and its position on a bay affording safe anchorage, Swansea has developed into one of the most important manufacturing towns in Great Britain. Nearly half the entire exports are tin-plates, the rest being coal, coke, iron, steel, zinc, copper, alkali, etc. The imports include copper, zinc, lead, silver, tin, iron, and their ores; also sulphur, grain, timber, etc. The total tonnage of vessels entered and cleared in 1893, exclusive of that coastwise, was 1,320,144. The parliamentary borough returns two members. Pop. of municipal borough (1894) 95,399.

Swansea: town (incorporated in 1668); Bristol co., Mass.; on Mt. Hope Bay, and the N. Y., N. H. and Hart. Railroad; 4 miles N. W. of Fall River (for location, see map of Massachusetts, ref. 5-1). It contains the villages of Swansea, North Swansea, South Swansea, Center Swansea, and Hortonville; has ten public schools, a public library, and a Protestant Episcopal church; and is principally engaged in agriculture and in bleaching and dyeing. Pop. (1880) 1,355; (1890) 1,456.

Swanton: town; Franklin co., Vt.; on the Missisquoi river, near the north end of Lake Champlain, and on the Cent. Vt. and St. Johns and Lake Cham. railways; 9 miles N. of St. Albans, the county-seat (for location, see map of Vermont, ref. 2-B). It contains a union public school, a national bank with capital of \$50,000, a weekly paper, quarries of white and variegated marble, and spring-bed and other factories. Pop. (1880) 3,079; (1890) 3,231.

Swarga, or **Svarga** [Sansk.]: in Hindu mythology, the heaven over which Indra presides. It is the residence of beatified mortals and of the inferior gods, and is supposed to be situated on Mt. Meru. See INDRA and MERU.

Swarthmore College: a coeducational institution at Swarthmore, Delaware co., Pa., opened in 1869. It was founded by the Society of Friends belonging to the Yearly Meetings of Philadelphia, New York, and Baltimore, for the purpose of furnishing opportunities for higher education to its own members and to persons of other denominations. Women as well as men are members of its faculty and of the board of managers. It offers four courses of study—arts, letters, science, and engineering—for the completion of each of which a separate degree is given. In 1894 it had twenty instructors, 185 students, and 15,800 volumes in its library. The presidents have been Edward Parrish, Edward H. Magill, William Hyde Appleton, and Charles De Garmo. Besides the main college building, in which are the dormitories, libraries, the biological laboratory and museum, and class-rooms for the departments of ancient and modern languages, mathematics, history, and economics, there is a spacious science building containing the chemical laboratory, the physical laboratory for teaching electrical engineering, the draughting-room, and shops of the engineering department. There is also an astronomical observatory and two gymnasiums, one for the young men and one for the young women.

CHARLES DE GARMO.

Swatow: a port of China, opened to foreign trade by the treaty made at Tientsin in 1858. It is situated on the north or left bank of the river Han, about 5 miles within its mouth, in the province of Kwangtung but near the borders of Fuh-kien; lat. 23° 20' 43" N., lon. 116° 39' E. (see map

of China, ref. 8-J). It is the shipping-port of the city of Ch'ao-chow-foo, 35 miles inland, and of San-ho-pa, 40 miles farther up the Han. The site of the native town is but little raised above the level of the river, which is here about a mile wide. The southern bank, on which the foreign settlement is located, is bold, and lined with hills of an average height of 400 to 500 feet. The foreign community is small. The natives, who in both features and language resemble the people of Fuh-kien rather than those of Kwangtung, are noted for their turbulence and their hostility to foreigners. Their dialect, which is unintelligible to natives of Canton, approximates closely to that of Amoy. Sugar-making is the great industry of the neighborhood. The trade of Swatow, which is considerable, is mostly in the hands of natives, and is chiefly with Hongkong (180 miles distant), Shanghai, and Niuchwang. In 1893 917 vessels, with a tonnage of 883,695 tons, entered, and the same number cleared. The net foreign imports for that year amounted to 8,238,721 Haikwan or custom-house taels, and the net native imports to 9,512,749 taels. Of the foreign goods imported, 7,486,902 taels came from Hongkong, 383,617 taels from Cochin-China, Tonquin, and Annam, 96,975 taels from Russia, and 40,320 taels from the U. S. The chief imports were opium, value 2,888,740 taels; rice, 3,473,247 taels; bean-cake (used for manure in the sugar-plantations), 253,786 taels; raw cotton, cotton and woolen goods, metals, matches, and kerosene oil. The exports included tea (about 7,000 piculs), sugar (valued at 3,125,009 taels), grass-cloth, liquid indigo, prepared tobacco, joss-sticks, and joss-paper, and amounted to 6,445,682 taels, or about \$676,966 U. S. gold. In the same year 93,095 native passengers left the port, but only 56,217 entered. More than half of the native emigration, for which the port is noted, is directed to the Straits Settlements. Pop. 22,500.

R. LILLEY.

Swayne, JOHN WAGER: soldier and lawyer; son of Noah H. Swayne; b. at Columbus, O., Nov. 10, 1834; graduated at Yale College in 1856; studied law and practiced at Columbus; major of the Forty-third Ohio Volunteers 1861; became colonel; served through the Atlanta campaign; lost a leg at Salkahatchie, S. C.; breveted brigadier-general U. S. Vols. Feb. 5, 1865, promoted brigadier-general Mar. 8, 1865, and major-general June 20, 1865; mustered out of the volunteer service Sept. 1, 1867. He was a commissioner of the Freedmen's Bureau in Alabama, where he commanded the U. S. forces and administered the reconstruction acts; retired July 1, 1870. In 1880 he removed to New York.

Swayne, NOAH HAYNES, LL. D.: jurist; b. in Culpeper co., Va., Dec. 7, 1804; was clerk in an apothecary's shop in Alexandria; studied law; was admitted to the bar in 1823, and began practice at Coshocton, O.; in 1826-29 was prosecuting attorney of Coshocton County; in 1829 was elected to the State Legislature; removed to Columbus, O.; was U. S. district attorney 1831-41; was chosen judge of the court of common pleas in 1833, but declined the office; was again elected to the Legislature in 1836, and was prominent in organizing asylums and institutions for the deaf and dumb, the blind, and the insane; joined the Republican party on its formation; in 1861 was appointed a justice of the U. S. Supreme Court; resigned 1881. D. in New York, June 8, 1884.

Swaziland: See SOUTH AFRICAN REPUBLIC.

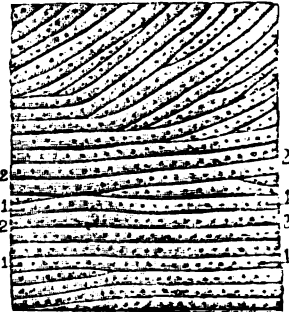
Sweaborg, or Sveaborg, svä-ää-borg: a fortress of Russia, on the northern coast of the Gulf of Finland (see map of Russia, ref. 5-C). The place was originally fortified by Sweden. When Finland became a province of Russia (1809), the latter made it a military and naval dépôt. The isle of Vargoe is the central or principal fortress: the isle of Great Oester-Svartoe the principal naval dépôt and dockyard. See HELSINGFORS.

Revised by M. W. HARRINGTON.

Sweat, or Perspiration [*sweat* is deriv. of *sweat* (verb) < M. Eng. *sweten* < O. Eng. *swētan*, deriv. of *swāt*, sweat; O. H. Germ. *swēiz* (> Mod. Germ. *schweiss*): Icel. *svið*; cf. Lat. *suda're*, to sweat; Gr. *ὑψω*, sweat; Sanskr. *svid-*, to sweat]: the fluid exuded through the pores of the skin, consisting of water with numerous solids in solution. The amount of water excreted from the skin either in the form of the insensible perspiration, which maintains its softness and moisture, or in perceptible sweat, is but little less than the volume of the urine or the equivalent in water of the moisture exhaled from the lungs in breathing. It varies with the seasons and climate, sweat being most profuse in summer and the warmer regions. The action of the skin is complementary to that of the kidneys, chilling of the integu-

ment producing renal hyperæmia. The amount of solid excretory matter and carbonic acid gas eliminated by the skin is small, but can not be suppressed without danger to life.

Experiments of closing the pores by a coating of varnish or tin-foil, both in man and lower animals, have induced alarming depression and death. Conversely, the artificial stimulation of the perspiration is a valuable channel for eliminating morbid matter in impaired health or disease. Bathing, friction, and clean clothing, by favoring activity of the sweat-glands and open pores, are means of preserving health. The sweat is secreted by the sudoriparous or sweat-glands, coiled tubular masses beneath the skin, with excretory tubules terminating on the surface. (See HISTOLOGY, *The Skin and its Appendages*.) The tube is about $\frac{1}{16}$ th of an inch in diameter, the coils or glands vary from $\frac{1}{16}$ th to $\frac{1}{4}$ th of an inch in diameter. The number of sweat-openings varies on different surfaces; thus, as enumerated by Krause, the palm of the hand (see figure) has 2,736 to the square inch, the back of the hand 1,490, sole of the foot 2,685, top of the foot 924, forehead 1,258, cheek 548. The number of sweat-glands in the body is estimated at 381,248, and the aggregate length of tubules as 24 miles.



Surface of the palm of the hand: a portion of the skin about half an inch square, magnified four diameters (Sappey): 1, 1, 1, 1, openings of the sweat-ducts; 2, 2, 2, 2, grooves between the papillae of the skin.

Revised by W. PEPPER.

Sweating Sickness: one of the prevalent and fatal epidemics which occurred during the fifteenth, sixteenth, and early part of the seventeenth centuries. It was also known as pestilent sweat and as the English ephemera, as the English people both at home and abroad were chiefly attacked. In Germany, Holland, Sweden, and Denmark it prevailed more mildly. It first appeared in England in 1485. It was of brief period, both in individual cases and in duration of single epidemics. Fully half of the population in infected towns had the disease, and the mortality was great, but where death did not result all danger was past in twenty-four or forty-eight hours, and epidemics rarely lasted a month. The other great English epidemics were in 1506, 1517, 1528, and 1551. In the last two the disease for the first time left English soil, appearing in various parts of Western Europe. After 1551 no further epidemics were met with till the beginning of the eighteenth century, since which numerous outbreaks of the disease, now generally known as *miliary fever*, have occurred. Miliary fever is of common occurrence to the present day, scarcely a year passing without an epidemic in some part of the world; but it is mild in character and very rarely spreads to any considerable distance. The attack consisted of a febrile and sweating period. It began with pains in the back, shoulders, and limbs, flushes of heat, oppression at the liver and stomach, pain in the head, delirium, palpitation, followed by heaviness and desire to sleep, which in fatal cases tended to become profound coma or stupor. Profuse sweating then set in, in favorable cases leading to speedy convalescence. Often there was an eruption in the skin, which afterward desquamated in cases which recovered. The patient was liable to one or many relapses. The disease spared the aged and young, attacking chiefly middle-aged, plethoric men of all classes and of every rank. Both in England and on the Continent the greater prevalence of this disease among Englishmen was attributed to their peculiarly gluttonous, excessive diet. By Hecker, Guy, and others the several epidemics of this disease are ascribed to preceding periods of atmospheric and telluric insalubrity, the influence of gathered armies, and to the absence of house and street drainage in the larger cities and towns. Its period of incubation, rapid progress, and speedy convalescence disconnect it from epidemics of the typhus class. The nature of sweating sickness has been the subject of much conjecture. Doubtless it is some special infection and not influenza, malaria, or rheumatism, as older writers were disposed to think. Probably various diseases have been described under this name. The treatment consists mainly in rest and tonics.

WILLIAM PEPPER.

Sweating System: In popular usage, a term applied to the practice followed in certain trades of sub-contracting for a low class of work, which is done sometimes on the premises of the laborer, sometimes on the premises of the sub-contractor, and often under unsanitary surroundings and with excessive hours of labor. This use of the term, however, is erroneous, for sub-contracting may be, and often is, practiced without the injurious results popularly associated with it. The system of sub-contracting obtains largely in iron and steel rolling, in which trades labor is as highly paid as in any others. The practice is consistent with but not inseparable from what is meant by sweating. An accurate definition of this term can not be given. The House of Lords select committee in their report accepted several, but none is satisfactory. Indeed, the chairman, Lord Derby, said later: "We endeavored . . . for some years to ascertain what meaning attached to the word 'sweating,' and we never could find any." The reason is that, while the evils which the term sweating has been selected to describe undoubtedly exist, there can properly be no such thing as a sweating system. The so-called system is characterized by the absence of system, by the lack of those very features which denote the factory system or general industrial organization. Hence it must be regarded as an excrescence, an abnormal phase of industrial development, which when properly understood may be regulated, and, so far as environment is concerned, rectified. The term "sweating" is in this connection a term of reproach, and was first applied to tailors who took home work that their wives and children might assist them. Later, as Charles Booth pointed out, they found it profitable to do all their work at home. Then they began employing others, thus becoming sweaters instead of being sweated. Among boot-makers the "sweater" is known as the "chamber" or "garret" master. Among other trades it is the sub-contractor or middleman who has been his nickname.

Extent of the Practice.—Sweating is an effect of the survival of domestic industry. Factory labor is not subject to it. One must not understand that it can exist only with domestic industry. Before the introduction of organization and protective legislation, factory employees were subject to most of the evils associated with sweating; while to-day, in much of the "house industry" of Germany, whether the workman is his own master or comes in direct relations with the employer-in-chief, there is no complaint. Sweating is common in certain trades—in Europe in tailoring, boot-making, furriery, needlework of all kinds, nail and chain making, and dock labor; in the U. S. the practice is almost exclusively confined to tailoring and other kinds of needlework, the preparation of feathers, the manufacture of cigars, artificial flowers, and fancy leather goods.

The tailoring trade is the employment in which sweating is chiefly practiced. To describe the process will be of most service. The wholesale clothier supplies the cloth, which in many cases also is cut and trimmed in his own workshops. The goods are then farmed out to contractors, for the most part Jews, to be made up and returned at a fixed price per garment. The contractor is generally the lessee of a small room, usually attached to his own lodgings in a tenement-house. In this room two or three "frames" of workers are employed—a machine-man, a baster, and a finisher constituting a "set." Wages are fixed on a piece basis. Where, for example, \$7 is allowed for making up two dozen coats, \$3 goes to the machine-man, \$2.50 to the baster, and \$1.50 to the finisher. The laborer must frequently work sixteen or eighteen hours in order to earn a nominal day's pay. The sweater works with his hirelings, overseeing them and often, doubtless, driving them to do their utmost. Sometimes his own margin of profit is so small that he is compelled to do this for protection against loss; but he is not always a pitiless taskmaster, and is besides on a footing of fair equality with his employees. Larger sweaters receive the cloth from wholesale clothiers, and cut and trim it in shops of their own, making up part of it on the premises and distributing the remainder among families working in their homes.

The essential features are as follows:

1. **Sub-contracting.**—The profits of the middleman are dependent upon the service he employs. Sub-contracting applied to unskilled or poorly skilled work makes competition painfully acute, and immediately reduces both contract and piece prices to the lowest possible minimum. Sub-contracting has developed particularly in the clothing business because the trade centers to a large extent in domestic in-

dustry, and can be pursued by women with tolerable domestic occupations, because this method enables the wholesaler to save the cost of rent and superintendence, and to hold back his capital from investment in goods till the last moment, because it permits him to meet seasonal requirements by letting a large or small number of contracts as his experience demands, and because a very few dollars is all a middleman needs to start business. There is a tendency to do away with the middleman altogether, as is shown by large houses in London establishing workshops in the East End, and by New York dealers opening shops in outlying country districts, where rentals to home-workers will be less than in the tenements.

2. **Irregularity of Employment.**—This is common to all domestic industries. Large and well-organized establishments find it cheaper to run continuously than to stop during the dull seasons. No such condition exists in the sweated trades. Coupled with this is the evil of abnormally long hours of labor, which follow partly as a consequence of the above and partly because the small master works with his employees.

3. **Low Wages.**—These are due in several causes, among which are competition among sub-contractors, remuneration made to depend upon profits, the presence of a surplus of unskilled labor in cities, and the fact that much of the work can be performed by women who are only auxiliary supporters of the family. In certain cities of the U. S. there is the additional factor of an immense immigrant population, many of them Jews, and all having a relatively low standard of existence as well as endowed with patience and subservience. It must be borne in mind that all persons working under the sweating system are not paid starvation wages. The skilled contingent commands fair remuneration. Because so much of the work is bad, and need only be so, is one reason why it is cheap. The proportion being large, the number of laborers in receipt of meager earnings is naturally also large. Failure to discern this fact has led to confused notions in reference to sweated trades. Low wages accompany inferior efficiency. The sweating system furnishes aggravated cases.

4. **Unsanitary Conditions.**—These naturally result from using the dwelling as a workshop, particularly if lodgers are taken to make up the required "set." The evil is probably augmented in cities where this class of people live in tenement-houses.

What are the remedies, and how shall they be applied?

1. The most important is reorganization of the sweated trades. The main features of such reorganization are the development of large shops, substitution of superintendents remunerated by fixed salary for middlemen contracting by the job, and trade-union organization among workers. The second feature is especially important, and will probably come about as the first one grows. Large sweat-shops, which are uncommonly severely condemned, are in reality not only better conducted than "gang-sweating" or "home-working," but are performing a useful step in the evolution of the industry from house to factory. Labor organization among unskilled and over-crowded occupations is a difficult matter, but the London dockers and the boot and shoe operatives in Massachusetts furnish evidence that it is feasible, and that much may be thereby accomplished.

2. Licensing by municipal authority, under stringent regulations as to cleanliness, use of sleeping apartments for work-rooms, employment of persons outside the family, and precautions against infectious diseases. Tagging tenement-made garments under penalty of a good-sized fine is also an effective provision.

3. Adequate inspection service for sweat-shops, large and small. Only in this way can health and morality be served.

There are no reliable statistics showing the extent to which sweating is practiced. The evils associated with the system are concomitants rather than products. Most of them are incident to lack of skill, physical inefficiency, moral weakness, and other factors which make for poverty.

E. K. L. GUNN.

Sweden [*Swedish, of Sweden; Fr. Suède (Suh'de); Germ. Schweden; Af. Swed, Swene; Lat. Suetor; O. Eng. Sæcon, Seodas*]; one of the confederated kingdoms of Sweden and Norway, comprising the eastern slope and southern end of the Scandinavian Peninsula, with Öland and Gotland islands (see map of Norway and Sweden). Area, including lakes, 172,870 sq. miles (pop. (1900) 4,794,991, or 28 per sq.

mile; (1893) 4,824,150. The most of the boundary with Norway is formed by the watershed of the Kiölen Mountains, and that with Finland by the Torneå river and its branches.

Topography.—The coast is 4,740 miles long, of which 4,100 are on the Baltic and Gulf of Bothnia, the remainder on the Cattegat and Skager Rack. The floods are few, and the adjoining seas generally shallow, with gentle slope. The coast is bordered by a narrow ribbon of islets called the *skärgård*, rocky and bare on the west coast, but green and fertile on the east. The Sound, 2½ miles wide at its narrowest part, separates Sweden from the nearest point of Denmark. The islands are most numerous about Stockholm.

The Baltic slope of the peninsula is gentler than the Atlantic one, and in Norrland (the northern part of Sweden) it descends in a series of terraces, giving its rivers alternately gentle courses, when they expand into lakes, and rapids, or cataracts. The southern part of Sweden or Gothland has a good development of rocky hills, and is separated from the central part, or Svealand (Sweden proper), by a broad low land filled with great lakes. The extreme south is ancient Skania, and is very fertile. Northern Gothland is relatively arid. Beyond Stockholm is Upland, the classic ground of Sweden, consecrated to ancient traditions. Dalecarlia, N. W. of Stockholm, and on the Norwegian frontier, is a beautiful and picturesque land with gay, hardy, and independent inhabitants; here Gustavus Vasa found the support necessary to overthrow the tyrannical Christian.

The highest mountains are in or near the Norwegian frontier, from 66° to 68° N. lat. The highest known is Kebnekaise, or Ivanstenen, in lat. 68° N.—more than 7,000 feet high. Sulitelma, 2° farther S., and long considered the highest mountain in Sweden, is 6,154 feet high. The culminating points of Norway are considerably higher. Sweden is not properly mountainous; it only descends a long and relatively gentle slope. Glaciers are very numerous in the north, covering a total area of 150 sq. miles. The largest are about Sarjektjokko (6,825 feet high, and between the two mountains above named), where on a surface of 460 sq. miles they cover 70. The glaciers are reported as growing.

Rivers and Lakes.—A score or more of rivers descend the slopes, form lakes in their course, have a length of 150 to 250 miles, and empty into the Bothnia or Baltic. The quantity of water they pour into the Bothnia keeps it almost fresh. The innumerable lakes occupy one-twelfth of the entire surface. They are generally small, but about thirty have an area of 40 sq. miles or more. The largest is the Wener, between Gothland and Svealand; area, 2,150 sq. miles; 144 feet above the sea; greatest depth, 295 feet. The second in size is Lake Wetter, a few miles S. E. of the preceding; area, 733 sq. miles; 290 feet above the sea; greatest depth, 410 feet. It is celebrated for the beauty of its shores, the clearness of its waters, its fogs, and its sudden storms. Lake Mälär, the third in size, and penetrating Stockholm, fiord-like in form, is only a few inches above the Baltic, and is divided into a series of levels but a few inches apart. It is said to have 1,200 islands.

Climate.—The climate is very mild for the latitude, and storms pass usually W. or S. The annual precipitation is from 10 to 40 inches, and is greatest on the southwest coast. It is said that the harvests are fifteen days later than in the eighteenth century.

Geology and Mineral Products.—Primitive crystalline and azoic rocks cover the most of the country, and the chief metalliferous beds are in the upper layers of these. Cambrian and Silurian rocks are not rare, and some Triassic and Cretaceous exposures are found. The Glacial period was an important one in Sweden, and has left traces everywhere. Mining is an important industry, and the production of iron is large. The chief districts are the Gellivara, within the Arctic Circle, and the Dannemora, in Upsala. In 1892 the chief mineral products were as follows: Pig iron, 478,696 tons, and bar iron, 273,510 tons (320,071 out of the total 1,291,933 tons of iron ore was exported); coal, 199,380 tons; gold, 1,907 oz.; silver, 113,430 oz.; lead, 1,760,721 lb.; copper, 1,641,598 lb. Zinc and manganese are also produced, and cobalt and nickel are found.

Fauna and Flora.—The fauna and flora must have migrated into Sweden after the Glacial period, and are more Finnish than German. The forests are very extensive, covering two-fifths of the area, and are characterized by spruces and birches to the north, pines and oaks in the center, and beeches in the south. The reindeer are nearly all domesticated, but the large pasturage area they require and their

tendency to epizootic diseases greatly limit their usefulness. The bear, wolf, lynx, and glutton are disappearing, while the fox and elk appear to be increasing, and the roe-deer is extending its range farther N. The swan is a common visitant of the lakes.

Food-fish are very abundant, and include, in fresh water, the salmon (by far the most important), the eel, pike, perch, and turbot; in salt water, the herring (by far the most important), flatfish, cod, mackerel, and sprats. The herring of the east coast are much smaller than those of the west.

Products.—The climate and soil are not very favorable for agriculture, but this is made up by the care given to the art. Only one-fifteenth of the area is cultivated; one part in ninety-two in Norrbotten, but one-third in Malmöhus. Barley and potatoes reach 68° N. lat.; rye passes N. of Haparanda, at the north end of Bothnia; wheat, formerly cultivated only S. of Stockholm, reaches the Dal river, 75 miles farther N. The farms are generally small, but they give occupation to about half of the population. The largest area is in oats, but the largest agricultural crop is potatoes. Horses are relatively numerous (one to every ten persons), due to the character of the roads. The stock generally is of poor native races, but the dairy industry is growing rapidly, as London is an accessible and profitable market.

Divisions.—The country is divided into twenty-four governments besides the city of Stockholm, as follows:

GOVERNMENTS (LÄN).	Area, square miles.	Pop. Dec. 31, 1892.
Stockholm (city).....	13	257,037
Stockholm (rural district).....	3,015	154,634
Upsala.....	2,051	122,008
Södermanland.....	2,631	156,051
Oster Gothland.....	4,267	266,892
Jönköping.....	4,447	193,268
Kronoberg.....	8,825	158,304
Kalmar.....	4,443	228,577
Gothland.....	1,219	51,141
Blekinge.....	1,164	141,925
Christianstad.....	2,486	218,752
Malmöhus.....	1,866	374,621
Halland.....	1,900	187,002
Goteborg and Bohus.....	1,948	304,625
Elfsborg.....	4,938	272,079
Skaraborg.....	3,290	243,227
Vernmland.....	7,435	250,935
Örebro.....	3,498	184,708
Westmanland.....	2,625	140,154
Kopparberg.....	11,522	301,674
Gefleborg.....	7,614	211,832
Westernorrland.....	9,837	212,660
Jemtland.....	19,712	101,324
Westerbotten.....	22,754	128,617
Norrbottn.....	40,870	110,193
Lakes Wener, Wetter, Mälär, Hjelmar.....	3,516	.....
Totals.....	172,876	4,824,150

Population.—The population has shown for 150 years a considerable surplus of females (1,065 to 1,000 males); it has also shown a steady growth of nearly 1 per cent. per annum. The last is in spite of a considerable emigration to America, and is due to the high birth-rate, and not to immigration, which is very small. About 10 per cent. of the births are illegitimate, due not to immorality but to thrift and narrow circumstances; the parents usually marry later. The Finns number about 17,000; Lapps, 6,500; Jews, 3,000; other foreigners, 15,000. Aside from these, the Swedish type is pure and unmixed, and the ancient division into Göta (Goths) and Svea (Swedes) has about disappeared. The Lutheran is the state church, and other religions, though tolerated, are few. Education is compulsory, schools of all grades are numerous (including two ancient and highly esteemed universities, at Upsala and Lund respectively), and the percentage of illiteracy is evanescent. Serious crimes are relatively rare, but pauperism is large and increasing.

Imports and Exports.—The value of the annual imports is about \$100,000,000, chiefly textiles, colonial wares, and coal; the annual exports are valued at \$90,000,000, chiefly timber, animals and their products, and ores. Germany is the chief importer, Great Britain the chief buyer. The merchant navy consists of about 1,500 craft of over 100 tons burden, one-third steamers. Gothenburg is the most frequented port, Stockholm next, and 22,000 vessels visit Swedish ports annually.

Railways.—The railways have a length of 5,454 miles (1894), of which 1,851 miles belong to the state. The most noteworthy railway is that which connects Stockholm and Trondhjem in Norway, and the most northern railway in

this weight is the one which extends from the head of Bothnia northward to Gällivare and beyond, and is in process of construction to Ofoten Fjord, on the Norwegian Polar Sea.

Government.—Sweden has her own constitution, and governs herself, except for foreign affairs. Her system of government is the outgrowth of centuries of history, like that of Great Britain. The king is intimated with the executive, and is aided by a council of sixteen ministers. Taxation and legislation (the latter subject in the king's veto) are entrusted to the two elective houses of a parliament, one of 148 elected members holding for nine years, the other 228 paid members holding for three years. The government of the twenty-four provinces is in the hands of prefects appointed by the king, but local affairs are administered by communal and municipal councils. The municipalities are limited to cities of over 25,000 inhabitants, and are at present Stockholm, Gottenburg, Malmö, Norrköping, and Galle. The total revenue is about \$27,000,000, collected chiefly from customs (\$10,000,000), from land taxes and state property (\$5,000,000), internal revenue (tax stamps, spirit licenses, income tax), from the post-offices, and from the profits of the national (Svenska) bank. One-third is expended on the army and navy; one-fourth only on the royal household. The public debt is \$22,000,000 (1904), contracted for state railways. The army is small, and the navy is intended only for coast defense. See ARMED SERVICES OF WAR.

History.—The early mythical history of Sweden is dignified and attractive, and the gods of the Northmen displayed their chief activity in Njardar. The Goths, who played so important a part in the downfall of the Roman empire and the reformation of Europe, seem to have come from Gothland. Authentic history begins about 1000 A.D., when Olof became a Christian. The people did not accept Christianity for 100 years, and pagan ideas and customs lingered long after. The discussions between Goths and Swedes were heated about 1000, and their amalgamation has continued since without serious interruption. The early history was terminated in 1289 by the battle of Årslöv, when Queen Margaret of Denmark and Norway, a striking historical figure, took the Swedish king Albert prisoner, and the union of the three Scandinavian countries was confirmed in 1397 by the so-called the Union of Kalmar.

Sweden was very restless under the union, and tried repeatedly to break away, but without permanent success, until led by Gustavus Vasa (1523). With this king began the brilliant period of history which made Sweden one of the first powers of Europe, gave her extensive lands to the S. and E., and made her at one time the leader and defender of Protestantism. During this period appeared his grandson, Gustavus Adolphus, one of the most brilliant figures in all history, and by far the greatest of Swedish kings, and the period ended with the resignation of his daughter Christina in 1654. Then follow 100 years of decline, during which Sweden was robbed both of her influence and her foreign possessions, until Gustavus IV. (1792-1809) proved so impotent and perverse that he was dethroned and his posterity repudiated.

Charles XIII. was then elected (1809-19), but was childless, and Marshal Bernadotte was invited to become crown prince. He accepted and founded the present line, under which Sweden's material and constitutional progress has been steady and secure.

See also SWEDEN AND NORWAY; also NORWAY AND DENMARK. See also WARD'S *Sweden and Norway* (1892) and LARSEN'S *Swedish Statistics for the World's Columbian Exposition* (1893).

MARK W. HARRINGTON.

Sweden and Norway: a federated kingdom occupying the Scandinavian Peninsula. The mainland area is 207,221 sq. miles, and the population at the beginning of 1891 was 6,285,287; Sweden has nearly three-fifths of the area and three-fourths of the population. For details, see the articles NORWAY AND SWEDEN. The federation was formed in 1814, and goes little further than allegiance to a common king and a common interest in foreign affairs. The king is Oscar II. of the house of Ptolemy Corro founded by Bernadotte. The law of succession is the same in the two countries. The common affairs are decided upon by a council of state composed of Swedes and Norwegians. The federation is not without political friction, and is less satisfactory to Norwegians than to Swedes.

MARK W. HARRINGTON.

Swedishborg, KARLSTAD: (Helsingborg) is in Stockholm, Sweden, Jan. 20, 1899. His father, Jasper Swedishborg was Bishop of Skara in West Gothland, and was charged with

the care of the Swedish churches in England and in the North American colonies. His family was connected by blood with the Swedish nobility. He was educated at Uppsala and then traveled widely through Europe. He attained to great eminence by the writings upon mathematics and mechanics, and later on the natural sciences and on history. In 1719 he was made member of the board of mines by Charles XII. He assisted the king at the siege of Frederikshall in 1719 by transporting some vessels over 14 miles of land by machines he invented.

He had always been a thoroughly religious man, but for a few years before 1745 his diaries and manuscripts (which have been published to the extent of twelve or more volumes) show that he was changing the direction of his studies from the physical and natural to the physical and spiritual. In that year, he tells us, he "was called to a new and holy office by the Lord himself, who manifested himself to him in person, and opened his eyes to a new of the spiritual world, and granted him the privilege of conversing with spirits and angels." In 1747 he resigned his office of assessor, which he had held for thirty years, requesting that half of his salary might be continued to him. The king accepted his resignation, and granted him a pension for life equal to his full salary. He wrote to a friend: "My sole view in this resignation was, that I might devote myself to that new function to which the Lord had called me. On resigning my office a higher degree of rank was offered me, but this I declined, lest it should be the occasion of inspiring me with pride." From 1749 to 1756 he published the *Arctica Caelum* in eight 4to vols.; in 1759, *An Account of the Last Judgment and the Destruction of Babylon*; in 1760, *On the White Horse mentioned in the Revelation, Heaven and Hell*; in 1761, *On the Planets in our Solar System and in the Starry Heavens*; in 1762, *On the New Jerusalem and its Heavenly Inhabitants*; in 1763, *The Doctrine of the New Jerusalem concerning our Lord, some Concerning the Sacred Scriptures, some Concerning Faith, some Concerning Life, a Continuation concerning the Last Judgment and the Destruction of Babylon*, and *Angelic Wisdom concerning the Divine Love and Wisdom*; in 1764, *Angelic Wisdom concerning the Divine Providence*; in 1766, *The Apocryphal Revelations*. He had written a much larger work, *The Apocryphal Revelations*, as far as the tenth verse of the nineteenth chapter, which he did not publish, nor, as far as is known, finish—it has been published since his death; in 1768, *The Delights of Wisdom concerning Conjugal Love*; in 1769, *A Brief Exposition of the Doctrine of the New Church*, and a small work entitled *The Intermixture between the Good and the Evil*, which is called in the English translation *A Treatise on Lust*. In 1770 he published his last work, *The True Christian Religion, containing the Universal Theology of the New Church*. He also left voluminous manuscripts, of which Dr. J. F. S. Tafel, professor and librarian in the University of Tübingen, published many. After the publication of the *True Christian Religion* he went to London, and while there, on Christmas Eve in 1771, he was struck with hemiplegia. After a few weeks he recovered his speech, and his faculties were close to the last. His strength gradually declined, and he died Mar. 29, 1772.

He has never been charged with imposture, and they who think he was insane must rest that opinion on the fact that for more than twenty-five years, with brief interruptions, he claimed that he was in the spiritual world whenever he wished to be there, and published what would fill volumes of things there seen and heard. The best edition of his works is by H. L. Tafel (10 vols. 8vo, Stockholm, 1892-70); many are published in English translation by the New Church publishing societies (e.g. New York). See his *Life*, by D. Worcester (Boston, 1883). For an abstract of his doctrines, see NEW JERUSALEM, CHURCH OF.

Revised by S. M. JARVIS.

Swedish Green: See SCHEER'S GREEN.

Swedish Language: generally, a member of the Indo-European division of the Teutonic group of languages. With Danish it forms the minor group East Norse, as distinguished from West Norse, made up of Icelandic and the modern popular dialects of Norway. Its present territory is the kingdom of Sweden, together with neighboring parts of Russian Finland and Estonia. Chronologically, two main periods are recognized in the history of the language, viz. Old Swedish, from the end of the Viking age to the Reformation, in round numbers from 1050 to 1540; and Modern Swedish, from the Reformation to the present time.

The linguistic separation of the Scandinavian north falls within the Viking age (700-1050). Down to the year 1000, however, although local differences are visible even early in the period, the language is still, to all purposes, homogeneous, and only after the introduction of Christianity, at the middle of the eleventh century, do distinct dialects arise; namely, Swedish-Danish and Norwegian-Icelandic. The latter was not strictly differentiated until the beginning of the thirteenth century, the former not until its end. The material for the history of the earliest period of Swedish is contained in runic inscriptions, in all nearly 2,000, most of them from the eleventh and twelfth centuries. The oldest extant MS. is from the end of the thirteenth century (1281), after which time a native literature began to appear. The linguistic territory of Old Swedish comprised modern Sweden, with the exception of parts of the west which were Norwegian, and the southern provinces of Skaane, Halland, and Blekinge, which were Danish, besides, and to a greater extent than at present, coast regions of Finland, Esthonia, and Livland. The language of the period shows numerous local differences, but only in one case, the dialect of the island of Gothland, which is frequently described in contradistinction to Old Swedish as Old Gutnic, are they sharply defined. A common national language, a movement toward which is distinctly visible after 1350, gradually developed itself in the main out of the middle Swedish dialect of Södermanland.

Modern Swedish is the continuation, in direct descent, of the Old Swedish dialect of the midland provinces of Södermanland and Östergötland, which even in Old Swedish shows few local differences. Its beginning is coincident with the Reformation, and its first important literary monument is the translation of the Bible, the so-called Gustavus I. Bible of 1541. The language may be said to have assumed its present appearance early in the eighteenth century. The important external modifications from Old Swedish down were first the introduction of a multitude of Low German words into the vocabulary during the fourteenth and fifteenth centuries, principally as a consequence of commercial connection with the Hanseatic League. A Danish influence, the result of political conditions under the Danish sovereigns from the end of the fourteenth century to the beginning of the sixteenth, made itself widely felt, not only in the vocabulary by the introduction of Danish words, but in phonology and inflections. A second influx of German words came in with the Reformation. A reactionary tendency which looked toward the displacement of foreign elements and the rehabilitation of older words and forms has several times shown itself. This movement was directed at the beginning of Modern Swedish in the sixteenth century against Danicisms. In the latter half of the seventeenth century many words were introduced from Old Swedish and Old Icelandic, a process repeated in the nineteenth century by the further reinstatement of Old Swedish forms and the adoption of words from the spoken dialects.

Internally, the general tendency of the language from the fourteenth century down has been toward weaker phonetic conditions and simpler inflectional forms. At the beginning of the eighteenth century the Old Swedish system of inflections had to a great extent disappeared, and present conditions already prevailed. Some of the changes then observable date, however, from an earlier period. In the fifteenth century, for instance, falls the use of the ending *-s* for all genitives, and the displacement of the first plural of verbs by the third. In the sixteenth and seventeenth centuries all case-declension was lost in adjectives, and nominative, dative, and accusative in substantives were merged in a single form.

Swedish and Scandinavian language is distinctively characterized by the use of the suffixed definite article with substantives, and the formation of a passive voice of verbs by the addition of the reflexive pronoun, Swedish *-s*, to the corresponding active form. As an East Norse dialect it has, in common with Danish, as important characteristics the change of the diphthongs *ei*, *au*, and *ey* to the long vowels *e* and *ö*, respectively; the almost total absence of *u*-umlaut, and the passive form in *-s* (Icel. *-st*). In contradistinction, however, to Danish, which has throughout weakened the vowel of the inflectional ending to a voiceless *e*, Swedish has, in many instances, retained *a* and *o*; final *k*, *t*, *p* remain in Swedish after a vowel where they are weakened to *g*, *d*, *b* in Danish. Swedish has, in point of fact, on the whole much better preserved archaic phonetic conditions, although it has gone almost as far as Danish in

the simplification of its grammar. As in Danish, but a single case-ending, genitive *-s*, occurs with substantives; neither the strong nor the weak adjective has inflection for case. Unlike Danish, where there is throughout no distinction of person in the verbal conjugation, Swedish has a distinctive form in the second person plural, and the threefold gender of substantives has been retained.

Swedish is still spoken in a number of dialects, some of which, like forms in Dalecarlia and the island of Gothland, notably deviate from the literary language. Generically, they may be arranged in a northern, middle, southern, and Gothland group. The northern or Norrland group includes, besides North Swedish proper, the dialects of Finland and Esthonia. The southern group is spoken in language territory once Danish, to which it is morphologically akin. Middle Swedish, out of which the literary language proceeded, shows the least dialectic differentiation, and now, as always, most nearly approximates the literary form.

For the pronunciation of Swedish, see Henry Sweet, *A Handbook of Phonetics* (Oxford, 1877). An exhaustive scientific treatment of the older language is contained in the chapter by Adolf Noreen, *Geschichte der nordischen Sprachen*, in Paul's *Grundriss der Germanischen Philologie* (vol. i., Strassburg, 1891); E. C. Otté, *A Simplified Grammar of the Swedish Language* (London, 1884). See also S. E. Rydquist, *Svenska språkets lagar* (4 vols., Stockholm, 1850-70), an historical grammar of the Swedish language, in Swedish.

WILLIAM H. CARPENTER.

Swedish Literature: the literature of the Swedish people.

Heathen Age.—Although few fragments remain, it may be assumed that Sweden produced various literary works before the introduction of Christianity. The laws, which were given a written form in the following period, were composed much earlier, several runic inscriptions and figures, notably those of *Röksten* and *Ramsundsborg*, point to poetical works similar in character to the poetry of Iceland-Norway, and finally in the preface to *Þidreks saga* a *Bern* reference is made to the existence of a great body of lays in Denmark and Sweden.

Medieval Period.—The influence of Christianity on the literature of Sweden made itself felt even later than on that of Denmark. Not until the middle of the thirteenth century did any Christian writings appear, but from that time great activity was displayed in the cloisters. The earliest theological writer of importance is Magister Matthias (d. about 1350), canon of Linköping and St. Birgitta's teacher, who is supposed to have made the first translation, or rather paraphrase, of a portion of the Old Testament (before 1340). During this century and the two following centuries other books, both of the Old and the New Testament, were put into Swedish. (See G. E. Klemming, *Svenska Medeltidens Bibeldarbeten* 1848-55.) Matthias was also the author of commentaries on the Bible, originally written in Latin but afterward translated into Swedish. The only other religious prose work from this period that deserves special mention is *Heliga Birgittas Uppenbarelser* (The Revelations of St. Birgitta), "the first Swedish work that entered into the world's literature." (See BIRGITTA, SAINT.) It is full of warmth and originality and abounds in bold images. Of far greater importance is the influence exerted by Birgitta throughout the North, both on religion and literature. In the cloisters of her order a great mass of native writings was preserved and produced. The efforts of her followers were directed mainly toward translating continental mystical writings into Swedish. She encouraged the use of the Swedish language in the pulpit, and consequently a great mass of sermons, both in Danish and Swedish, must have been produced during this period, comparatively few of which, however, have been preserved. Of these only one, the Danish *Postille*, was printed before the Reformation. For specimens of Swedish sermons, see Klemming's *Svenska Medeltids-Postillor* (1879).

Swedish literature is remarkably rich, as compared with Danish, in legendary compositions. The most important collections are the so-called *Fornsvenskt Legendarium*, a translation of the *Legenda aurea* of Jacobus de Voragine, made shortly after the appearance of the original, but preserved in a MS. from 1350 (ed. by George Stephens, 1847-74), and *Vitas Patrium*, in a MS. from 1385 (ed. by Klemming). Somewhat similar in character to these legends are the collections of miracles, of which a great number existed, both in Denmark and Sweden. Here may also be mentioned the

romances *Barbaris och Joseph* and *Siu sin valdare* (The Swartt Wierd Man). These last two and many other medieval prose works are contained in Klemming's *Prosalitter från Medeltiden* (1892).

Of secular prose literature the most important work is *Den Ryske Kungens af Håfslings* (Concerning the Government of Kings and Princes), ed. with Latin translation and notes, Copenhagen, 1668), an adaptation in part of Egidius Romanus's *De Regimine principum*, written about the middle of the fourteenth century. See K. F. Söderwall, *Anteckn. öfver Kungens-Rysken* (1896).

In historical writings Sweden must yield the palm to Denmark. The earliest prose history is the *Chronica Gothorum* (1470) of Erikus Olai (d. 1496), a dry sound writing, like all the works of this class, in Latin, but later translated into Swedish. Of far greater interest are the rhymed chronicles in which Sweden anticipated her sister kingdom of Denmark by a century. The oldest of these is the *Krikoberättelse*, which treats of the strife between King Birger and his brothers Erik and Waldemar. It is undoubtedly the work of one who lived at the time the events described occurred. These close with the year 1382. Others are *Nya Krönika* and *Lilla Riksräkning*, all written in Swedish. See Klemming's *Swenska Medeltidens Rikshistorier* (1866-69).

In addition to the *Raflesia* (see DAYTON LITERATURE), Swedish translations of a number of other romantic works exist from the Middle Ages. The first of these, following shortly after the *Raflesia* (see *ibid.*), is *Abraham*, made in 1390 under the direction of Dr. Jonsson (Grip from the Latin prose tale *Historia de Præfata*). All have been edited by Klemming.

The principal original poetical production of this period in Swedish is found in the popular ballads (*Folklåtar*). It may be assumed that at least some of them were composed as early as the twelfth or thirteenth century in Denmark or Saxon models, and from there carried into Sweden. The later development of the ballads is practically the same in Sweden as in Denmark. The best collections of Swedish ballads are Oeljer and Afzelius's *Swenska Folklåtar* (2 vols., 1814-16). Later edition by Bergström and Höjer (1889) and A. L. Arwidsson's *Nordiska Färdslåtar* (2 vols., 1814-42).

The oldest Swedish works in the vernacular are the provincial laws, which are derived in their original form from the heathen period, although they were not reduced to writing until much later. (See SCULPTURE). The earliest of these and the oldest Swedish MS. in existence is the *Västgötalag*, codified at the beginning of the thirteenth century, and preserved in a MS. from the end of that century. Besides the provincial there were also town laws, guild laws, and court laws.

From the Reformation to 1640.—Although the new doctrines were officially introduced into Sweden at the parliament of Vesterås (1527), they met with much opposition from all classes, and were not finally accepted by the people until 1593. Their influence upon the literature, however, was immediate and far-reaching. As in Denmark, this showed itself in the beginning chiefly in theology. In 1526 the New Testament was translated into Swedish by Laurentius Andreeus (1482-1552), the earliest leader in the movement, and in 1540-41 the whole Bible was given a native dress under the direction and largely by the actual labor of Laurentius Petri (1499-1573). Olaf Petri (1497-1572), a brother of Laurentius, rendered good service to the language as well as to religion by *Den första psaltaren* (A Short Sermon) and *Den svenska massan* (The Swedish Mass, 1531), the foundation of the present Swedish Church service. He is the author of the first Swedish hymnal, *Några gudhelige Wisor, utdragne af den Heliga Skrifft* (1530), which was followed by two other collections, partly original, partly translated from the German. His brother also composed a number of hymns; with these exceptions the period is extremely bare in religious poetry. A similar poverty is shown in secular poetry, the only works of any importance being the rhymed chronicles, of which may be mentioned the later edition of *Lilla riksräkning* (1529), Daniel Hansson Hufv's (d. 1611) *Könung Ericus den XIV:s Krönika*, etc., and Karl IX's *Riksräkning*. The separation from Denmark and the triumph of Gustavus Vasa served to arouse the national enthusiasm, which found expression in numerous histories and chronicles, both in Latin and the vernacular. Olaf Petri's *Swenska krönika* is the first attempt to bring into discredit the claims of earlier writers for the antiquity of Swedish history. Although extremely uncritical, it may be

regarded as the precursor of later historical methods. Its effects, however, were not immediately apparent, and Johannes Magnus (1490-1544) in his *Historia de omnibus Gotharum Sueonumque Regibus* (Helsing, 1644) traces the royal line back to the Flood. The most prominent historian is Johan Messenius (1579 or 1581 to 1667), author of *Swenske illustrata* (14 vols., written in Latin verse and prose). Minor historians are Peder Sparf (d. 1602), Erik Tegel (d. 1606), Agnitus Gise (about 1599-1639), and Axel Oxenstierna (d. 1624). The only prominent name in the first half of the seventeenth century is that of Johan Hare, or Huron (1628-1652), the founder of the study of northern antiquities in Sweden. His influence upon the following period, especially through his connection with Stjernhjelm, was very great.

The only known specimen of dramatic literature in Sweden before the seventeenth century is a translation of the Latin *De omni peccatoris, qui peccaverit morietur*. The earliest original school-drama presented is *Johans Comedien* (1590), attributed to Olafus Petri (ed. by Mandersström, Stockholm, 1849). This was followed by a number of others, all in the vernacular, the subjects being taken from the Old Testament. The best of these is *Hatfjerris och Juditha Comedien*, by an unknown author. Gradually the original didactic element gives place to the æsthetic, the subjects being taken from profane history and from legends. A still further advance is marked by the treatment of national history. In this latter respect the Swedish drama is in strong contrast to the Danish, which with one exception shows no choice of national subjects until the middle of the eighteenth century. The earliest profane drama is *En festligh Comedien vid namn Tribe* (A Merry Comedy by the Name of Tribe), probably by Magnus Olaf Astorplörens (d. 1647), produced in 1610 (ed. by P. Kihlström, Upsala, 1892). In this play the moralizing of the school drama is for the first time wholly absent. The most original dramatic author of the period is Johan Momenius. He planned to represent Swedish history in fifty plays, only six of which were completed. The first of these, *Isac* (1611), marks the beginning of the Swedish national drama. The national character of the plays is increased by the introduction of ballads, many of them original with the author, and the representation of peasant types (ed., with the exception of *Gustavus I.*, by H. Schölk, Upsala, 1896-98; see also G. Ljunggren, *Johans Momenius som dramatisk författare*, Nord. Univ. Föreläs., 1902). Andreas Johannis Prytz (1596-1655) wrote two religious historical plays, *Oluf Skuttlung* (1630) and *Comedien om konung Gustaf I.* (1631), which display considerable satirical power. The school-dramas continued to be written and performed until the end of the seventeenth century.

Period of Sovereignty (Stormakt), 1640-1719.—The political brilliancy of Sweden during the seventeenth century was reflected in education, literature, and science. Gustavus Adolphus was not only a great soldier and statesman, he was also a patron of letters and a writer of decided ability. Through his efforts elementary and high schools and gymnasia were established, the University of Upsala was given new dignity and importance, and the intellectual formation of the Reformation was replaced by a real culture. His example was nobly followed by his successors, Queen Christina, Charles XI, and Charles XII. The University of Lund was founded (1628), several scientific institutions were established, foreign scholars, among others Descartes and Hugo Grotius, were invited to Sweden, and many of the leading men of the country both encouraged learning and made contributions of their own. As a result of the newly acquired national pride, great interest was displayed in history, especially that of Sweden, but with the exception of Oluf Rudbeck, the principal historical writers of this period were foreigners—Chemnitz, Puffendorf, and others. Attention was also directed toward the study of archaeology, linguistics, and similar subjects. Olaf Verelius (1615-82) translated many of the Icelandic sagas, and Johan Peringskiöld (1654-1726) translated the *Heimskringla*. The investigation of Sweden's legal system was begun in this period under the direction of Johan Sparfvech (1596-1675), called the father of Swedish jurisprudence. Philosophy was almost wholly under the influence of Descartes, but Bishop Anders Rydellius (1671-1709), the first great Swedish philosopher, displays considerable originality. In anatomy and botany Rudbeck made many important discoveries. Urian Hjärne (1641-1734) did good service in attacking the superstitions of his time, especially the belief in witchcraft. The great mystic Eusebius Swensonius (q. v.) was in early

life distinguished for his studies in mathematics and mineralogy. The most marked feature of the literary and scientific production of this period is originality.

The interval between 1640 and 1740 is often called the Stjernhjelm period, partly from the fact that Georg Stjernhjelm (1598-1672) was its greatest poet, but far more because the influences introduced by him continued to prevail long after his death. He has with sufficient accuracy been called the father of Swedish poetry; he might more properly be called the creator of modern Swedish literary expression, for it is due chiefly to his efforts that Swedish has become the most melodious of the Scandinavian tongues. It was not until after he had reached middle life that Stjernhjelm discovered his poetical genius in the long didactic poem *Herkules*. Filled with an enthusiasm for classic literature and his native tongue, he introduced his countrymen to the teachings of the Renaissance and showed them how this foreign element could be welded with the national language and character. He was the first in Sweden to make use of the hexameter, the alexandrine, the sonnet, the epigram, and the humorous lyric. The latter, in the hands of Bellman, was destined to become one of the distinguishing marks of modern Swedish poetry. His successors, while continuing his efforts to refine and expand the language, contributed but little of real poetic worth. Among them may be mentioned Samuel Columbus (1642-79), a pupil of Stjernhjelm, called the Swedish Flaccus from his *Odis Sue-thicæ*; Peter Lagerlöf (1648-99), author of a number of graceful songs and hymns; Johan Runius (1679-1713), whose collection of poems *Dudaim* was the most popular of his time; and Lasse Johansson (circa 1640-74), called from his pseudonym *Lucidor* *den olycklige*. By the side of this classical school appears a pseudo-romantic, largely influenced by the second Silesian school and by the later Italian poets, which sought to oppose the formalism of Stjernhjelm's successors. In spite of this, however, the poetry of its first prominent representative, Gustaf Rosenhane (1619-84), owes its value to the form rather than to the content. He resembles Stjernhjelm, furthermore, in his warm love of country and in his attempts to introduce new verse-forms, among others the French variety of the sonnet. Gunno Eurlius Dahlstjerna (1658-1709) was possessed of far greater originality, but his talents were hampered by their foreign influence. He also introduced a new verse form, the *ottava rima* with Alexandrines, exemplified in his principal poem *Kungaskald* (The King's Skald). The best hymnists of this period are Håkon Spegel (1645-1714), called the Wallin of the seventeenth century, and Jesper Svedberg (1653-1735). The most interesting prose work of that period is Rudbeck's *Atlantica*.

Period of Freedom, 1719-72.—In this period the activity of the preceding time was continued; a number of academies and learned societies were founded, the royal theater was opened, and scientific investigation was carried still further. Among the many scientists were the naturalist Karl von Linné (1707-78), the chemists Torbern Olof Bergman (1735-84) and Karl Vilhelm Scheele (1742-86), the physicist Anders Celsius (d. 1744), and the medical writer Nils Rosén von Rosenstein (1706-73), called the father of Swedish medical science. The most prominent linguist was Johan Ihre (1707-80).

The prevailing foreign influence during this period was the French. This was due to many causes, but its advance was hastened by the marriage of Louisa Ulrika, sister of Frederick the Great, to the Swedish king Adolphus Frederick III. The French influence made itself felt not only on the literature, but also on the whole culture of the period. The dominating figure is Olof von Dalin (1708-63), after whom the latter part of it, from 1740, is frequently named. In spite of his French prejudices Dalin rendered a real service to Swedish prose through the publication of *Den Svenska Argus* (1732-34), modeled on *The Spectator*, the first serious attempt at periodical literature in Sweden. His poetical productiveness was forced by the requirements of his position as court poet. Of Dalin's contemporaries may be mentioned Karl Gustaf Tessin (1695-1770), Anders Johan von Höpken (1712-89), both famous for their eloquence; Jakob Henrik Mörk (1714-63), author of the first Swedish novel, *Adalrik och Göthilda*; Jakob Wallenberg (1746-78), whose *Min son på galejan* (My Son on the Galeley) is influenced by Swift and Holberg; Karl Gyllenborg (1679-1746), author of the first modern Swedish comedy; Fru Hedvig Charlotta Nordenflycht (1718-83), who received the title of the Swedish Sappho. Of special interest as illus-

trating the taste of this period is Gustaf Philip Creutz (1731-85), whose pastoral *Atis och Camilla* was for a long time the most popular Swedish poem. Belonging as much to the following period as to this is Karl Mikael Bellman (1740-95), the first great humorous poet of Sweden. In his treatment of subjects he stood entirely alone, and the moral undertone of his apparently reckless songs fell on deaf ears. His genius did not receive full recognition until after his death, when the frivolous spirit of the French school had given place to the earnestness of the romanticists. He is the only Swedish poet of the eighteenth century who enjoys general popularity.

Gustavian Period, 1772-1809.—The pseudo-classic style continued to be cultivated. The Swedish Academy, founded in 1786, was a French Academy in miniature, while the national theater, revived by the king, was as conventional as the Théâtre Français. Opposed to this French movement was a group of writers who sought to develop the national spirit. The leading spirit among the academicians was Johan Henrik Kellgren (1751-95), poet and critic, who deserves the title of the literary dictator of his time. His literary criticisms were published in *Stockholmsposten*, of which he was editor from 1788. After Kellgren's death his place was taken by Karl Gustaf af Leopold (1756-1829), who had the misfortune to outlive his time. He excelled in didactic poetry, his *Predikaren* (The Preacher) being his most popular effort in this direction. Among other poets of this group are Johan Gabriel Oxenstjerna (1750-1818), who translated *Paradise Lost*, and Anna Maria Lenngren (1755-1817), the foremost Swedish poetess. In opposition to the Academy and the principle it represents are Thorild, Bellman, Bengt Lidner (1757-93), a poet of feeling, and Karl August Ehrensvärd (1745-1800). The Finnish poet Frans Mikael Franzén (1772-1847) belongs in part to this period.

1809-30.—After the revolution of 1809 and the restoration of the freedom of the press, the revolt against the academic school took definite shape, and went to the furthest extreme of romanticism. The first leaders in the movement were the two young poets Per Daniel Atterbom (1790-1835) and Vilhelm Fredrik Palmblad (1788-1852), who in 1807 formed a literary society called *Auroraförbundet*, among the other members of which were Samuel Johan Hedborn (1783-1849), P. A. Söndén (d. 1837), and Karl Fredrik Dahlgren (1791-1844). The main principles of this society were those of the new romantic school in Germany. In philosophy they followed blindly the system of Schelling. Their literary discussions and original works were published in the periodicals *Polyfem* (Stockholm, 1809-12) and *Phosphorus* (Upsala, 1810-13), from the latter of which they were called Phosphorists. In spite of the many absurd features of their poetry and criticisms, the Phosphorists rendered a real service to Swedish literature by preparing the way for a sounder conception of the nature of poetry. Their faults are those of their German models. The discussion between the Academy and the Phosphorists was conducted with fierceness and brutality. The leading disputants were Per Adam Wallmark (d. 1858), the representative of the Academy, and the members of the Aurora Society already mentioned. The discussion continued until about 1825. In many respects it resembles the contemporary Baggesen-Oehlenschläger feud. (See DANISH LITERATURE.) In opposition to the Phosphorists, though also representing a romantic movement, are Göterna (The Goths), who sought inspiration in the culture of their Scandinavian ancestors. They differed from the Phosphorists, too, in avoiding a quarrel with the Academy. The representatives of the school formed a society in 1811 called *Götiska förbundet*, with *Iduna* (1811-24) as its organ. Among the charter members were Jakob Adlerbeth (d. 1844), Erik Gustaf Geijer (1783-1847), and Leonard Fredrik Rååf (1786-1872). The most valuable service rendered by the society was in arousing public interest in early Scandinavian literature and culture, especially through the publication by Geijer and Arvid August Afzelius (1785-1871) of the first collection of Swedish ballads. The absurd side of the movement is displayed in the epics and tragedies of Per Henrik Ling (1776-1839). Standing apart, as its name implies, is still another school, Neutrer (Neutrals), who represented the principles of Goethe, Schiller, and Herder. Its organ was *Lycæum*, and its leading writers were Johan Olof Wallin (1779-1839), the greatest Swedish hymnist, Franzén, and Benjamin Högjer (1767-1812).

Esais Tegnér (1782-1846), the Swedish Oehlenschläger, is sometimes regarded as a Goth, sometimes as a Neutral. In reality he was neither. For the exquisite form of his prose

and even he is indebted to his academic training; in his love for the Northern poet he resembles the Greek in the early edict of his genius he is a Northerner, in the last scene of the world. Of one thing only was he indignant. His clear, logical mind could not endure the obscurity of the Platonists, and he opposed them fiercely as long as they continued to assert themselves as an independent school. Again, more by the example of his writings than by the force of his arguments, succeeded in establishing modern Swedish poetry on a firm basis, and through his *Frithiofs Saga* his name was carried beyond the bounds of the North. The three epic poets Erik Johan Stagnelius (1738-1803), Erik Axel Wallin (1791-1829), and Karl August Nordin (1789-1825), though at first influenced by the Platonists, accepted an independent position.

NARRATIVE.—The field of literary parties having ceased, Swedish literature began a more powerful development, which has been continuous. The most distinguished writers by the beginning were Karl Jonas Ludvig Adolph (1798-1868), author of poems, plays, novels, and critical essays; the Finn Johan Ludvig Runeberg (1804-77), whose poetry is characterized by a healthy realism; Karl Vilhelm Böttger (1803-79), poet, translator, and biographer; Bernhard Elze Malinström (1810-62), poet and critic. Of later writers may be mentioned the poets Karl Vilhelm August Strandberg (Tala Qualla 1818-77), Gunnar Wennerberg (b. 1817), an imitator of Bellman, and Oskar Patrick Sturzenbecker (Örvar Dill, 1811-69), who was also a critic. Of the Swedish novelists of the nineteenth century the most popular is undoubtedly Fredrika Bremer (1801-65), at one time almost as much read in the U. S. as in Sweden. Other novelists are Magnus Jakob Cronquist (1795-1865), Karl Anton Wetterberg (Örvar Adam, b. 1804), Emilie Carlen (1807-192), Karl Fredrik Hildebrandt (1807-50), Zacharias Topelius (b. 1816), and Maria Sofia Schwart (1819-94). Of the newest authors may be mentioned Viktor Rydberg (b. 1829), the leading living Swedish prose-writer, Karl Johan Gustaf Sjöström, the most original living Swedish poet, and Karl David af Wirsén (b. 1842), an aesthetician. The leading realist is August Strindberg (b. 1849), the Swedish Zola.

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SWIFT, HENRY: philologist; b. in 1845; graduated at Oxford in 1870. He has edited a number of Old English texts for the Early English Text Society; *King Alfred's West Saxon Version of Gregory's Pastoral Care* (1871-75); *King Alfred's Orosius* (1880); *The Literal Glossary* (1885), etc.; has published *A History of English Sounds* (1874, 2d ed., 1886); *A Handbook of Phonetics* (1877); *New English Grammar, Spoken English*, etc., an original and very ingenious system of shorthand, *Current Shorthand, Orthography and Phonetics* (1882); and several readers and primers of Anglo-Saxon, Middle English, and Icelandic. He received honours Ph. D. from Heidelberg. H. A. Rams.

SWIFT, JOHN EASON: inventor, mechanic, and engineer; b. at Pampsey, Cheshire, en., N. Y., Oct. 21, 1862. After working at carpentry and joinery for a time, he practiced

mechanism until 1891, when he gave his attention to the designing of machinery. In 1893 he became the manager of the workshop of the mechanical arts department of Sibley College, Cornell University, and remained there until 1899. Amongst his best designs are the "straight-line engine," and hot bulb, with the aid of his pupils in the Sibley College shops, the first engine of that type, which has as its characteristic feature a straight-line frame, provisions for the reduction of engine friction, and a simple and efficient governor. He has written for the technical journals, principally for *The American Machinist*. He is a past president of the American Society of Mechanical Engineers.

H. U. Ferguson.

Sweet Bay: See BAY.

Sweetbread: the pancreas of *Trachurus* (pp. 67) of an animal, used as food. The former is usually called stomach-sweetbread and the latter throat-sweetbread.

Sweetbrier: See KILARYN.

Sweet-flag: See *AMARIS CALLITA*.

Sweet-gale: See GALE.

Sweet-gum: See GUM-ROSE.

Sweet Potato: a trailing vine (*Ipomoea batatas*, formerly called *Batatas edulis*) of the morning-glory family, producing large thickened edible roots. The plant is widely cultivated for food in the tropics and the warmer portions of temperate countries. Its native country is unknown, but the evidence points strongly to an American origin. Its aboriginal American name was *tuberos*, whence comes the word *potato*, later applied to the Irish or round potato (*Solanum tuberosum*). The sweet potato is a staple crop in the southern parts of the U. S. where it thrives in the sandy or loam soils. It is propagated by suckers or sprouts which spring from the tubers. It very rarely flowers. There are many diseases of the sweet potato, for an account of which the reader should consult the bulletins of the New Jersey experiment station. *Plt's Sweet Potato Culture* is the only guided manual devoted to the plant in the U. S.

L. H. Bailey.

Sweet-sap: the soft, sweet, and aromatic fruit of a small tree, the *Annona squamosa* of tropical America, indigenous not only in Brazil and the West Indies, but also in Hindustan and the East Indies. The fruit is greenish and resembles an artichoke in size, in form, and in the scaly covering. The pulp is soft, somewhat fleshy, sweet, and mucous, though with a musky, aromatic odor and flavor. It is extensively used as an article of food, and it has proved the staff of life to the people of Hindustan, in seasons of famine. Its seeds have an acrid, perhaps a poisonous, quality, shared by the leaves, which have also a disagreeable smell. In India it is called mustard-apple, though the true mustard-apple is *A. reticulata*.

Revised by L. H. Bailey.

Sweet Springs (formerly Rameyville); city; Saline co., Mo.; on the Blackwater river, and the Mo. Pac. Railway; 24 miles N. W. of Sedalia (for location, see map of Missouri, ref. 3-E). It is the center of an agricultural and stock-raising region, and contains several sweet medicinal springs, 2 State banks with combined capital of \$125,000, and a weekly newspaper. Pop. (1880) 1,152; (1890) 1,187.

SWENSON, CARL AARNE, Ph. D.; clergyman; b. at Sugar Grove, Pa., June 25, 1857; educated at Augustana College and Theological Seminary, Illinois; pastor of the Swedish Lutheran church at Lindsborg, Kan., since 1879, and founder (1881) and president of Bethany College at the same place. He was a member of the Kansas Legislature (1888-90), and has been editor of several Swedish journals. In 1885 he was elected English secretary, and in 1890 president of the General Council. H. K. J.

Sweyn, wæn, Swegen, or Svend: King of Denmark and father of Canute the Great; invaded England to avenge the massacre of the Danes by the English in 1002, and ravaged a great part of the country. In 1014 he made another invasion and this time reduced the Anglo-Saxon kingdom, forcing Ethelred to flee. He proclaimed himself king, but died (1014) before he had fully established his power, leaving Canute as his successor. P. M. C.

SWIFT: a common name for the birds of the family *Myiropodidae* (or *Cypselidae*), probably first bestowed on the European species from its rapid flight. In external appearance the swifts much resemble the swallows, but the bill is decidedly smaller, and the tail is not soaly, but simply covered with skin. The primaries are ten in number, the

first and second being of equal length; the tail is variable in shape, deeply forked in some, almost square in others, but always composed of ten feathers. The first toe is directed more or less forward, and in the more typical swifts (*Cypselinae*) the second, third, and fourth digits have but three joints each, owing to a fusion of the basal phalanges. Anatomically the swifts are very different from the swallows, and do not belong to the same order. There are about fifty species distributed over the greater portion of the globe; with the exception of the East Indian tree-swifts (*Macropteryx*), which are prettily clad, they are mostly of somber plumage. They are insect-eaters and pass the greater portion of their time on the wing, and some, like the chimney-swift or chimney-swallow (*Chaetura pelagica*) of the U. S., even gather the materials for their nests in full flight. They build in caves, crevices of the rock, nooks of old buildings, hollow trees, or adapt themselves to civilization in chimneys, while an African swift suspends its nest to the fronds of a palm. The nests are gummed together with saliva, and the famous edible birds'-nests, built by the little swifts of the genus *Collocalia*, consist entirely of a peculiar salivary secretion. The eggs are white, two in number in many species, four or five in others, while the tree-swifts (*Macropteryx*) lay but one egg. One species of typical swift (*Micropus melanoleucus*) is found in the western parts of the U. S., while the common chimney-swift abounds in the Eastern States. The common species of Europe (*Micropus apus*) ranges from Great Britain to India, occurring also in Northern Africa. The swifts are usually divided into two sub-families, according to the number of phalanges, but the tree-swifts (*Macropteryx*) are by their numerous peculiarities entitled to rank as a separate family (*Macropterygidae*). In the western parts of the U. S. the name swift is applied to a small fox (*Vulpes velox*), and in the southern parts to a small lizard (*Sceloporus undulatus*). F. A. LUCAS.

Swift, JONATHAN: satirist and divine; b. in Dublin, Ireland, Nov. 30, 1667. He was the posthumous son of Jonathan Swift, an Irish official, and of his wife Abigail Erick, of Leicester. Of his birth in Dublin, the dean remarked in after-life, "I happened by a perfect accident to be born here, and thus I am a Teague, or an Irishman, or what people please," but his descent was purely English. He was kidnaped, as an infant, by his nurse, who carried him to Whitehaven, in Cumberland, where he remained nearly three years, when his mother took him away to Leicester. At the age of six he went to Kilkenny School, and on Apr. 24, 1682, entered Trinity College, Dublin. He was an idle scholar, often censured, and in 1688, on his twenty-first birthday, he quitted the university in disgrace. He went to his mother at Leicester, and was presently glad to accept the position of amanuensis in the family of his eminent kinsman, Sir William Temple, at Moor Park. There Swift remained, with two intermissions, until Temple's death in 1699. His health was bad, and after a surfeit of golden pippins in 1689, he began to suffer from the mysterious complaint of his lifetime, which, as is now conjectured, must have been a labyrinthine vertigo. In 1692 he received the degree of M. A. from Oxford, and to the same date belong his earliest existing compositions, his awkward and prosaic *Pindaric Odes*. In 1694 he left Temple and returned to Ireland; early in 1695 he took priests' orders and the small Ulster living of Kilroot. The solitude weighed upon him, and in the spring of 1696 he went back to Temple's service. In 1696 he began *A Tale of a Tub*, and in 1697 he wrote *The Battle of the Books*, which was first published in a joint volume in 1704, although prepared for the press in 1698. At the death of his patron Swift applied to William III., whose favorable attention he had attracted, but the petition failed to reach the king. He therefore was glad to accept the post of secretary to Lord Berkeley, but was dismissed in Dublin. In Feb., 1700, the living of Laracor, to which were presently appended two other small incumbencies and a prebend, secured for him a scanty competence. He was now invited by an old flame, Miss Waring, "Varina," to marry her, but he refused to do so in a strangely violent letter. He was more interested in "Stella," Sir William Temple's orphan ward, Esther Johnson; in 1701 she and her friend Mrs. Dingley came over to Ireland to be near Swift. When he was absent from Dublin, and his visits to England were frequent and lengthy, these ladies occupied his chambers. In 1701 Swift made his first appearance as an author, by the publication of the anonymous pamphlet *Contests and Dissensions in Athens and Rome*.

This was successful, and the *Tale of a Tub* volume, in 1704, raised a storm of notoriety, but Swift took little part as yet in literary or political life. In 1708 he became suddenly a great power in the Whig party, and published a succession of vigorous and brilliant tracts. These, and other anonymous publications in prose and verse, were collected in a volume of *Miscellanies* in 1711, in which *Baucis and Philemon*, written in 1706, and the *City Shower* are to be found. Meanwhile Swift had risen to the highest level of London society. In 1705 Addison had addressed him as "the most agreeable companion, the truest friend, and the greatest genius of his age," and Swift was accepted on these terms by most of the leading wits and statesmen of the court of Anne. His influence on behalf of others was boundless, and most generously exercised, but he could secure no preferment for himself. A very clear light upon all his movements and his sentiments is presently thrown by the famous *Journal to Stella*, a correspondence kept up with Esther Johnson and Mrs. Dingley from Sept., 1710, to Apr., 1713. Of his profusion of political pamphlets poured out at this time, the best known is *The Conduct of the Allies*, which, published in Nov., 1711, went through four editions in one week. This gives, however, a very poor idea of Swift's importance in English politics during the administration of Harley. When he returned to London from a temporary retirement at Laracor in Sept., 1710, he was received by the Whigs with enthusiasm; but they had failed him before, and he repulsed their advances and rejected their "clumsy apologies." He threw in his lot with the Tories, and was received into the innermost councils of the new ministry. A satire, *Sid Hamel's Rod*, on the fallen Godolphin, enjoyed a prodigious success, and in Nov., 1710, Swift took the editorship of the Whig newspaper *The Examiner*, and made it the organ of the new Tory party. He proved himself a journalist of the very first order. His success culminated in the ministerial crisis of Dec., 1711, and he found himself one of the most powerful men in England. His health, indeed, began to trouble him, but throughout 1712 "Dr. Swift was the principal man of talk and business" in London. He was able to secure for his friends and protégés all the places and the favors they required; yet in the midst of his greatness his old ill luck assailed him, and in spite of his authority with the ministry he was refused the bishopric of Hereford. This was a blow to him, but he recovered from it; the death of Queen Anne in 1714 annihilated his hopes. As Arbuthnot said, Swift was "like a man knocked down," and in wrath and bewilderment he retired to Dublin. His fall was broken by his having been appointed in the previous summer to the deanery of St. Patrick's. His spirits languished in this enforced retirement, and his relations with Stella and with Vanessa (Miss Vanhomrigh) became closer and more mysterious. In 1716, so it has been alleged, Swift secretly married the former, and the latter died in 1723, in consequence of the furious resentment showed by Swift at her having endeavored to force the secret from Stella. Meanwhile Swift interested himself in the local politics of Ireland, and, having outlived the dislike which he originally inspired, became the most idolized of patriots. His political writing culminated in 1724 with the publication of the *Drapier's Letters*, in which he attacked the currency scheme for allowing a William Wood to supply Ireland with a copper coinage. The vogue of these *Letters* was so great, and the indignation they aroused in Ireland so vociferous, that the Government withdrew Wood's patent, and failed in an attempt to prosecute the author. Swift's popularity in Dublin knew no bounds, and when George II. came to the throne it was hoped by his English friends that the dean would recover his influence; but a visit to London in 1727 had no result, and Swift went back for good to "wretched Dublin in miserable Ireland." Two years later his foiled ambition made him describe himself to Bolingbroke as ready to "die here in a rage, like a poisoned rat in a hole." Meanwhile he had been more fortunately engaged in certain literary labors. As early as 1722, at least, he had received Pope's encouragement in the outline of a satire on society, which was to take the form of "very extraordinary voyages into very extraordinary nations," and to "manifest the most distinguishing marks of a philosopher, a politician, and a legislator." He brought the completed MS. of this work, the famous *Gulliver's Travels*, to England with him in 1726, and it appeared anonymously during the succeeding winter. With the exception of Defoe's *Robinson Crusoe*, which had been issued seven years earlier, no romance had been written in English

which approached this wonderful book in originality or vigor. The first hint of the design has been traced to Pope's *Monodies of Scotland*, while the legend of Archibuteus has been detected in the speculations of the third party; it is plain that the whole scheme had been discussed in the literary salons of men of letters with whom Swift took to associate in London, and from whom he derived still so tellingly the names. It has been conjectured with probability that the voyage to the Country of the Hairyman was written during the last illness of Stella, and that the mental anguish of the author gave force to this appalling satire; but although after the summer of 1729, Stella ceased to be capable of companionship, she lingered until Jan., 1738, Swift then hated Dublin more than ever; he described it as his "crucible, dirty dog-hole, and prison," and could give the despatch of St. Patrick's no higher praise than that it was "a place good enough to die in." He adopted of set purpose a contemptuous attitude toward literature and politics. Yet he continued to write some of the most highly finished and forceful of his compositions, especially in verse. Of the latter class are *The Journal of a Modern Lady*, which dates from 1729; *The Lady's Dressing-room* (1730); the admirable and extraordinary tale on the death of Dr. Swift, finished in 1731; *The Beasts' Confession* (1732); and, best of all, the vigorous "rapody" *On Poetry* (1733). It is believed that about 1729 he wrote what has been called the "extraordinary passage of willfully insane chatter," *The Polite Conversation*, which was published by Mrs. Barber in 1728, soon after the version, which had so long distressed him, combined with the distress of deafness and melancholy to cloud his reason. An accident which, Mrs. Whiteway, finding him at the mercy of servants, came to take care of him, but he became hopelessly insane. From 1744 to 1748 Swift was a raving maniac, under restraint; he then sank into a sort of stupor, the rigor of his constitution long supporting his frame and lengthening the struggle. At last on Oct. 19, 1745, he died in Dublin. He was privately buried in St. Patrick's, and when his will, drawn up in 1740, was opened it was found that he had left his fortune to endow a lunatic asylum for Ireland, wishing to

show by one satire-truth
No lunatic needed it so much.

The personal character of Swift deeply impressed the age, and innumerable anecdotes preserve the tradition of his wild humor, his tumultuous bursts of arrogance, his admirable perspicuity, and his curious inconsistencies of conduct and temper. His person was athletic and commanding; his eyes of the clearest blue, and all his life he was endeavoring by violent exercise to subdue his mysterious physical malady. History has dwelt to excess on his ferocity, and has said too little about his prevailing charm of address, his occasional but exquisite outbursts of sympathy. In literature, although he scarcely produced anything that was not more or less of an occasional nature, his is the greatest figure between Dryden and Johnson. The earliest life of Swift was that published in 1751 by Lord Ormsby. This book contained valuable documents, but was prejudiced and inaccurate, and it was supplemented by a very important volume of *Observations*, by Dr. Delany, in 1754. Hawkesworth first collected the works in 1764. In 1785 Thomas Sheridan, the son of one of Swift's most intimate friends, published a life, although his personal knowledge of the dean had been very slight. Sir Walter Scott founded upon these and other materials his entertaining *Life of Swift* in 1814, and published a very full and excellent edition of the works, which he still further improved in 1824. John Foster published a fragment of a yet more minute biography in 1875, and among later writers on Swift, Leslie Stephen (1882) and Henry Craik have been the most competent. In 1893-94 a new issue of Sir Walter Scott's large edition of the works was published.

ELIZABETH GREEN.

Swift, Lewis: astronomer; b. at Clarkston, N. Y., Feb. 20, 1820. He was first a business man, began studying astronomy in 1850, and constructed a telescope; gave special attention to comets, and discovered comets in 1862, 1869, 1874, etc. For these discoveries he received in 1882 the Lalande prize from the French Academy of Sciences. He also received three gold medals from the Imperial Academy of Sciences at Vienna. He removed to Rochester, N. Y., in 1879, and became director of the observatory there, specially fitted up for him by the citizens. In 1894 he removed his instruments to Echo Mountain, Cal., in order to get the advantage of the purest air of the Pacific coast.

S. S.

Swift, William Henry: engineer; b. at Taunton, Mass., Nov. 6, 1800; was a cadet at the U. S. Military Academy from 1818 to 1819. He was assigned when a cadet to Maj. Long's Rocky Mountain expedition, with which he served until 1821, having meanwhile (1840) received his commission as second lieutenant of artillery; from 1821 to 1829 served on topographical duty in making surveys of military defenses of the Atlantic coast, of the Chesapeake and Ohio Canal, of the Florida Canal and rivers and harbors of the Gulf of Mexico; in constructing a map of the post-offices and postroads of the U. S.; and surveyed several railways. In 1832 was appointed brevet captain and assistant topographical engineer, and for ten years was employed as assistant in the U. S. coast survey upon the Atlantic coast, being in charge of river and harbor improvements from Maine to Connecticut 1847-48; from 1848 to 1849 was also resident and constructing engineer of the Massachusetts Western Railroad, from Worcester to the western boundary of Massachusetts, becoming captain topographical engineer, July, 1852; was assistant to the chief of topographical engineers 1848-49; was engaged 1847-49 in constructing the lighthouse at Minot's Lodge, Massachusetts Bay, which was destroyed by a great gale in Apr., 1851. In 1845 he resigned from the army. D. in New York, Apr. 7, 1879.

Swift, Zephaniah, J. D.: jurist; b. at Wareham, Mass., in Feb., 1759; graduated at Yale College in 1778; studied law, and practiced at Wareham, Conn.; was Representative in Congress (1794-97); appointed judge of the Supreme Court of Connecticut in 1801; was chief justice 1800-19, was several times elected to the State Legislature, a delegate to the Hartford convention, and a member of the commission to revise the laws of the State. He published an outline on *Domestic Slavery* (Hartford, 1791); *System of the Laws of Connecticut* (1795-96); *Digest of the Law of Evidence in Civil and Criminal Cases and a Treatise on Bills of Exchange and Promissory Notes* (Hartford, 1810); and *Digest of the Laws of Connecticut* (1822-23; new ed. 1845-53), which last work is the standard treatise on that subject, and is often called the Connecticut lawyer's Blackstone. D. at Warren, O., Sept. 27, 1823. Revised by F. SIMMONS ALLEN.

Swimming (O. Eng. *swimman*, swiia; O. H. Germ. *swimman* (> Mod. Germ. *schwimmen*), float, swim; Lat. *swimmus*); the act of progressing in the water by means of strokes with the hands and feet. As the specific gravity of the human body is only slightly greater than that of water, swimming is easily learned, with or without an instructor. The density of salt water being greater than that of fresh, it is much easier to swim in it. Indeed, if the saturation is very great, as in the Dead Sea or the Great Salt Lake, the specific gravity is greater than that of the human body and a man can not sink in it.

A great variety of mechanical devices have been in use both to assist in acquiring the art and for making swimming safer, easier, or more rapid; but the presence in the water of a competent instructor to give the necessary support will give better results in the beginner than any attachment of floats or other supports which buoy the body too high in the water, and teach the swimmer to place his dependence on something other than his own buoyancy. One of the best methods in beginning is to wade out until breast-deep in the water, turn toward the shore, and throw a white pebble or any other object easily discernible a short distance before him and plunge after it. The resistance offered by the water to this effort will buoy him up, and the moment he has acquired sufficient confidence and command of his limbs to strike out regularly, he has learned to swim. The common forms of stroke are the broad, dog-paddle, and side, or Indian. The first two are much the more natural and easy to acquire. In the broad stroke after bringing the body nearly horizontal, the arms and legs are drawn slowly toward the body and then extended alternately, with a quick and strong impulse. The hands should be kept flat and the fingers closed, the legs should be well apart at the beginning, and at the conclusion of the act of kicking brought together. In the tread the body is kept perpendicular and hands and feet beat downward. In the dog-paddle the body lies nearer horizontal, and hands and feet are moved rapidly and alternately with a paddling movement. The side-stroke is found represented in mosaic in Pompeii, and was popularized in England by Tredgden. It is the stroke commonly used in racing, and consists, briefly, in turning the body on one side and reaching far ahead with the under hand while the other sweeps by the chest and belly.

Swimming races, especially in Great Britain, have become carefully regulated athletic events. Prior to 1869 there were few clubs to manage these contests, but on Jan. 7 of that year a swimming congress met at the German Gymnasium, King's Cross, London, where was formed an amalgamation called the Associated Metropolitan Swimming Clubs. The name was changed shortly after to the London Swimming Association, and again changed in 1874 to the Swimming Association of Great Britain. The Amateur Swimming Association of Great Britain was formed Mar. 3, 1886. It has a membership of over 300 clubs, and is the largest organization of the kind. New Zealand and New South Wales both have flourishing amateur swimming associations, the former being formed in 1890.

Both Oxford and Cambridge have clubs with intercollegiate and inter-varsity matches, and official recognition of swimming as a subject of instruction was secured in the elementary board schools in England in 1891.

This art is not so general in the U. S. as in Great Britain, nor is club organization at all thorough.

SWIMMING RECORDS.

100 feet,*	W. C. Johnson,	New York, Feb. 4, 1891,	20 seconds.
100 yards,*	T. Meadham,	Australia, Dec. 4, 1892,	1 minute.
220 "	J. Nuttall,	London, Sept. 2, 1893,	2 min. 41½ sec.
440 "	"	"	5 min. 49½ sec.
880 "	"	"	12 min. 7 sec.
1 mile,	"	England, Aug. 19, 1893,	26 min. 8 sec.

* Indicates an amateur performance.

E. HITCHCOCK, Jr.

Swinburne, ALGERNON CHARLES: poet; b. in London, Apr. 5, 1837; son of Admiral Swinburne; received his education partly at Eton, partly in France, and in 1857 entered Balliol College, Oxford, where he remained only a short time. His life has been mainly spent in London. He has published *Rosamond* and *The Queen Mother*, two dramas (1861); *Atalanta in Calydon*, a tragedy constructed after the Greek model, in which he first manifested his peculiar powers (1864); *Chastelard, a Tragedy* (1865); *Poems and Ballads*, which were so severely criticised for their erotic character that the English publisher endeavored to suppress them, and which were put forth in New York under the title *Laus Veneris* (1866); *A Song of Italy* (1867); *Ode on the Proclamation of the French Republic* (1870); *Songs before Sunrise* (1871); *Bothwell* (1874), a dramatic sequel to *Chastelard*; *Essays and Studies* (1875); *Studies in Song* (1881); *A Century of Roundels* (1883); *Life of Victor Hugo* (1886); *Lochner, a Tragedy* (1887); *The Sisters*, a tragedy (1892), and other works. See ENGLISH LITERATURE.

Revised by H. A. BEERS.

Swine: any artiodactyl mammal of the family Suidæ (*q. v.*). The wild species of *Sus* are variously enumerated by zoölogists. Of these, the wild boar (*Sus scrofa*) of Europe, North Africa, and Asia Minor is the best known, and is generally regarded as the original of the common domestic forms. The validity of many of the other species, which are found mostly in the East Indies, is open to question, as they may be feral descendants of introduced domestic specimens. A small species (*Sus salvianus*) of Nepal, the Terai, and Bhutan has been separated generically as *Porcula*. The river-hogs of the genus *Potamochoerus*, the babirusa, and the wart-hogs are other swine. The chief seat of the world's swine-rearing industry is in the more northerly States of the Mississippi valley, where favoring conditions of soil and climate encourage the production in enormous quantities of Indian corn, which is chiefly relied on to feed the swine during both their growing and fattening periods. In the U. S. swine, when very young, are designated as pigs, when partly grown as shotes, and later as hogs. In Jan., 1895, the number of swine in the U. S., as given by the Department of Agriculture, was 44,165,716, worth \$219,501,267; of these, Iowa alone had 5,516,485, or 50 per cent. more than the United Kingdom, which in its numbers does not vary widely from Missouri. In the U. S. the number doubled in seventeen years following 1876. Prior to 1850 swine had little uniformity except that they were white and slow in maturing; there were innumerable varying breeds, each a favorite in some county or section of a State, and those growing to the largest size were esteemed best, regardless of excessive offal or cost of production. At present nine-tenths of the hogs in the U. S. are black, with small markings of white on the face, feet, and tail, and sometimes elsewhere. These are of the Poland-China and Berkshire breed, or a mixture of the two; the next most

prominent breed is the Chester White. Other breeds, equally distinct, but reared in limited numbers, are the Essex, black; Duroc-Jersey or Jersey, red, sandy, or reddish; Victorias and Suffolks or Small Yorkshires, white. The Essex and Yorkshires are from England, the Duroc-Jerseys are of uncertain origin, and the Victorias originated since 1860 in Indiana. The predominant breed, the Poland-China, originated in Butler and Warren cos., O., between 1838 and 1840 in the crossing of various families there known as Big China, Russia, Byfield, Bedford, and Irish Grazer, and the offspring was a large black and white spotted kind called by many names, from which a national convention of swine-breeders in 1872 selected that of Poland-China. These were crossed with imported Berkshires to give refinement and propensity to earlier fattening, and incidentally they acquired the Berkshire's black color and white markings. The Berkshire in its improved form originated (as did the Essex) in England—Italian and Spanish swine being crossed with the coarser native stock—between 1780 and 1800, but although first introduced into North America about 1830 it did not obtain general favor until 1870-80. Chester Whites are the result of mating some large white stock from Bedfordshire, England, with the white hogs common in Chester co., Pa., about 1818-30; the descendants being swine that gradually improved by selection, and have maintained their popularity in North America better than any other of their color. Hogs of a dark color are most largely reared because of a belief that they are harder and less susceptible to affections of the skin incident to sudden changes of temperature and the muddy quarters, severe winds, and burning suns to which they are too often continuously subjected. Poland-Chinas, Berkshires, Chester Whites, and Duroc-Jerseys are classed as large breeds, weighing, when properly reared, from 300 to 450 lb. at twelve months, and from 500 to 600 and even more at eighteen months, and they have been bred to a degree of fineness in bone, smallness of offal, compactness of form, and early maturity which makes them well-nigh perfect. Essex, Victorias, and Suffolks or Small Yorkshires are termed small breeds, and, although of excellent quality, do not grow to such weights as others, and mature more quickly.

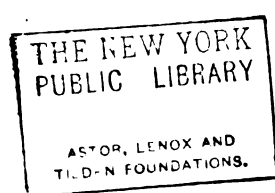
Preparation of Hog Products.—The two principal markets, slaughtering and packing points, for swine are Chicago, Ill., and Kansas City, Kan. There were marketed in the former city in 1894 7,483,228 head, and in the latter 2,547,077. Chicago packed in the year ending Mar. 1, 1895, 5,293,202, and Kansas City, 2,105,333; these numbers have been largely exceeded in some previous years when the supply was more plentiful. The average live weight of 16,003,645 hogs packed in the U. S. in the year ending Mar. 1, 1895, was 231.22 lb.; average weight of their lard, 33.31 lb.; and average cost alive, \$4.67 per 100 lb. Careful calculation of the per capita rate of domestic consumption in recent years indicates 55 to 57 lb. of pork and about 8 lb. of lard. Next to cotton and wheat the swine interests furnish the largest values in exports from the U. S., which for the year ending June 30, 1894, were as follows:

Bacon and hams.....	503,628,148 lb.
Pork.....	64,744,528 lb.
Lard.....	447,666,867 lb.
Total.....	1,015,939,543 lb.
Value.....	\$93,433,532
Average per pound.....	9 19 cents.

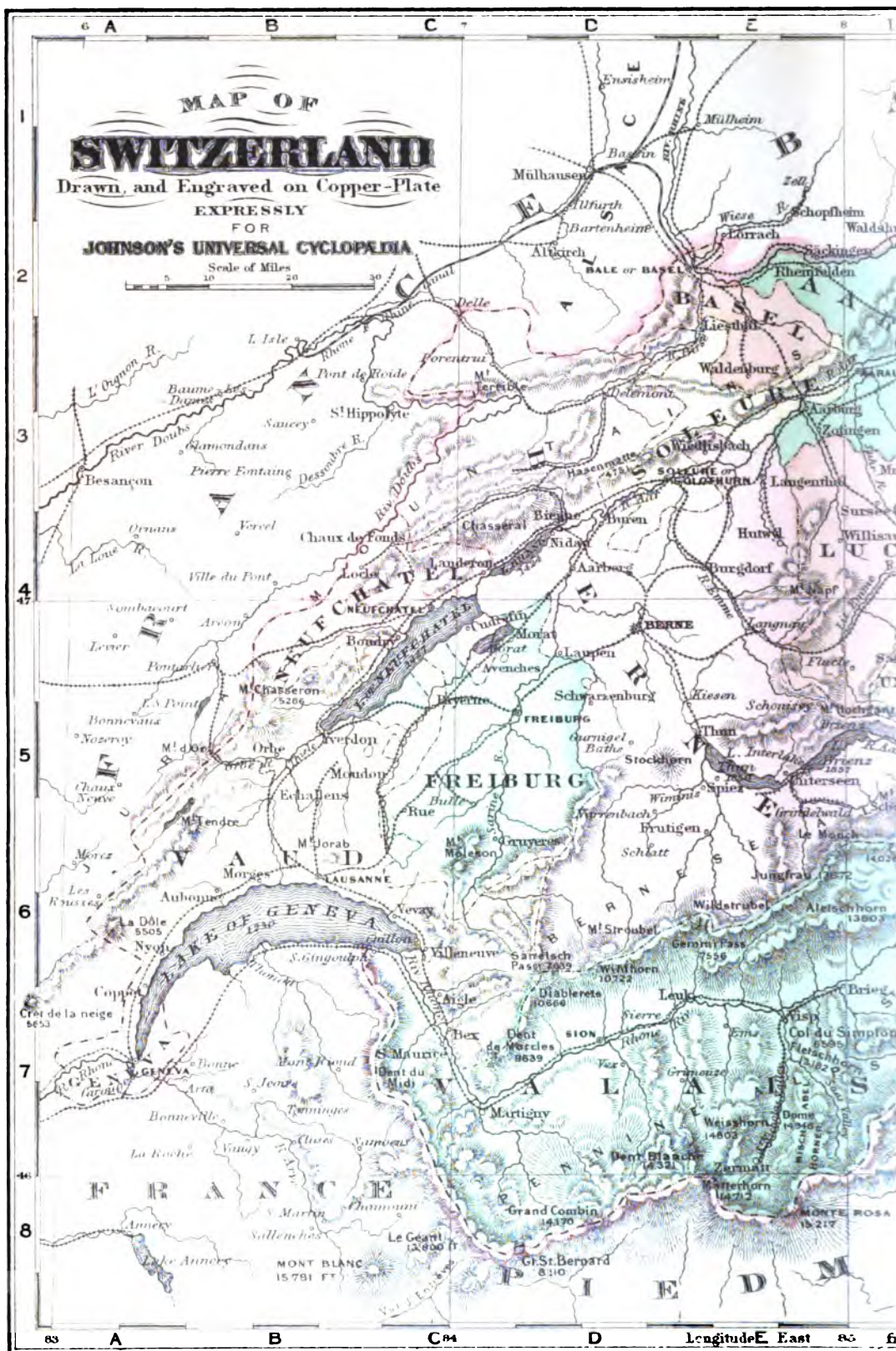
Counting on the customary basis of 175 lb. of product to equal one hog, the exported product for the year mentioned was equivalent to 5,805,369 hogs. Of the total exports for the twelve months indicated the United Kingdom purchased the following quantities:

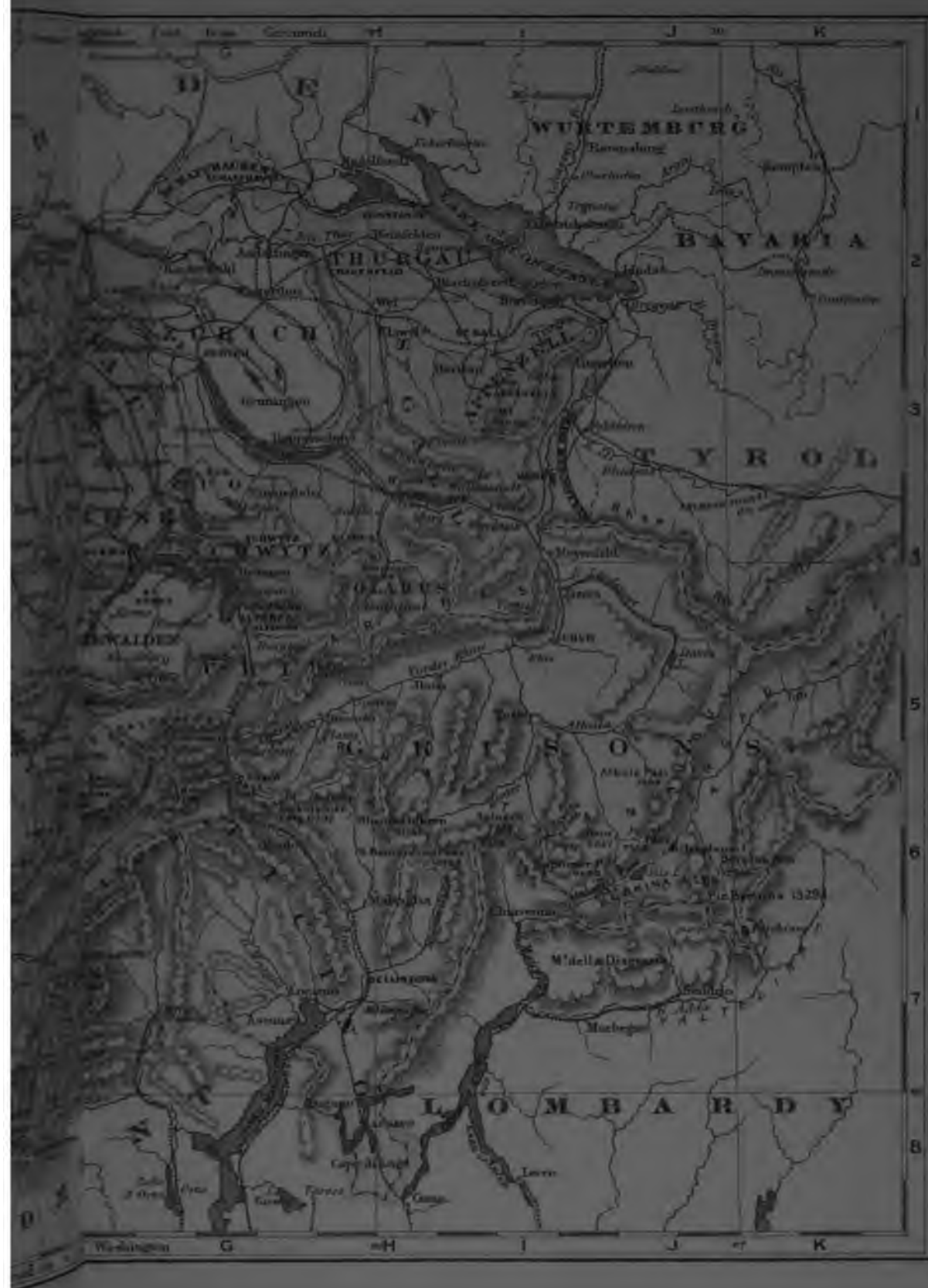
Bacon and hams.....	408,979,637 lb.
Pork.....	14,273,057 lb.
Lard.....	149,691,950 lb.
Total.....	572,944,653 lb.

The British provinces of North America pack annually from 350,000 to 500,000 hogs, and import from the U. S. from 30,000,000 to 65,000,000 lb. of product. All other countries of the world produce from 40,000,000 to 45,000,000 swine, of which Russia has one-fourth, followed by Germany, Austria-Hungary, France, and Spain respectively, which have from 7,000,000 to 4,000,000 in the order named. They give but little attention to breed, quality, or pedigree. In the five years ending with 1840 the U. S. sold in Europe hog products to the value of \$1,533,522 annually, or the equivalent of 92,154 hogs at \$16.65 per head. Forty years later the



A horizontal scale bar labeled "Scale of Miles" with markings at 0, 5, 10, 20, and 30 miles.





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swine for a single year equalled 7,049,000 head, worth \$104,000,000, or \$14.95 per head. In 1900 hog products exports had increased 700 per cent., and in 1900 nearly 7,000 per cent. Since 1901 all swine products imported for export have been inspected at the point of slaughter as to genuineness—and especially freedom from trichinae—by veterinarians and inspectors appointed by and under supervision of the U. S. Department of Agriculture. The chief scourge among swine is a contagious fever little understood as to cause or treatment, popularly called chills, which each year rages in various localities, destroying entire herds, including those supposed to be in the best condition, amounting to millions of dollars in value. Feeding sanitary and hygienic surroundings, and insufficient variety of food leading to an unbalanced constitution, are regarded as encouraging its development. Its incubation is from one to two weeks in mild weather and three or four days in warm. It is fatal in from one to six days, or, in a few, uncertain, or unsatisfactory recovery. P. D. Cameron.

Swilag, David, clergyman; b. in Cloonagh, U. Aug. 29, 1829; graduated at Miami University, Oxford, O., 1859; studied theology, taught Greek and Latin, and became principal of the classical school of Miami University; became pastor of the Fourth Presbyterian church in Chicago 1869; was called for heresy in 1874, and acquitted by the presbytery, but became an independent minister, and pastor of Central church, Chicago. He was an editor of *The Alliance*, and published *Old Essays* (1899) and other works. D. in Chicago, Oct. 8, 1894.

Swinton, John, journalist; b. at Salton, Scotland, Dec. 12, 1820; brother of William Swinton. Emigrated to Canada and then to the U. S. in 1841; was educated at Williamstown Seminary, Massachusetts; removed to New York in 1857, where he was connected editorially with the *Times*, and afterward with *The Sun*. In 1862-67 he published *John Swinton's Paper*, a weekly journal in the interest of labor reform. He has written and lectured much on various aspects of the labor question, and has published among other pamphlets: *New Issue: the Chinese-American Question* (New York, 1870); also *A History on Henry J. Raymond* (1870); *John Swinton's Travels* (1880); and *A History on John Brown* (1881). H. A. Barker.

Swinton, William, A. M., author; b. at Mallan, Radnorshire, Scotland, Apr. 23, 1822; removed to the U. S. in 1843; studied at Knox College, Toronto, and at Auburn College; in 1854 taught in a female seminary at Greensboro, N. C., and subsequently in a private school in New York; during a considerable part of the civil war was the correspondent, mainly with the Army of the Potomac, of *The New York Times*; in 1869 received the degree of A. M. from Amherst College, and in 1869 was appointed Professor of Belles-Lettres in the University of California. In 1874 he resigned and went to Brooklyn, N. Y., where he prepared text books. For three he was awarded a gold medal at the Paris Exposition of 1867. He published *Rambles among Words* (New York, 1859; London, 1861); *Campaigns of the Army of the Potomac* (1864; revised ed. 1866); *The Pocket Dictator: Battles of the War* (1867); *The History of the New York Seventh Regiment during the War of the Rebellion* (Boston, 1870); *Word Analysis* (1872), and other works. D. in New York, Oct. 24, 1892.

Swiss Guards: bodies of mercenary Swiss troops employed as body-guards and for duty about courts. Swiss mercenaries have frequently been hired by foreign powers since the time of the Swiss struggle for independence, which brought the valor and hardihood of that people into notice. The term Swiss Guards, however, especially refers to the royal body-guard of the kings of France. This force, which was organized in 1616, showed remarkable courage and loyalty in the service of the Bourbons. In 1793 they were courageously handled by a mob, and Aug. 10, 1793, almost every man was killed in the heroic defense of the Tuilleries. They numbered about 2,000. Their heroism is commemorated by Thierwalden's *Lion of Lucerne*, carved from the living rock in a cliff near one of the gates of Lucerne. Louis XVIII. reorganized the Swiss Guard in 1815. In the Revolution of 1830 they were defeated and dispersed. P. M. Uxley.

Swiss Stone-plant. See *GERANIUM PIVET*.

Swithin, Swithun, or Swithum, SAINT: bishop and patron of Winchester; is of noble parentage; became a monk in the Old Monastery in Winchester; later proved a pious disciplinarian to Egbert, King of the West Saxons; his

services and tales to the king's son Ethelwold and later his services also; Bishop of Winchester 852. He was remarkable for piety and great activity in building churches. D. at Winchester, July 2, 892. "His body was buried, according to his order, in the churchyard, where his grave might be visited on by passengers" (*Boetes*). In 871 his relics were transferred to the church. On this translation "such a number of miraculous cures of all kinds were wrought as was never in the memory of man known to have been in any other place." One of his arms was "kept in the abbey of Peterborough." His day in the Roman calendar is July 2—his feast-day—in the English calendar July 15, the day of the translation of his relics, and it is commonly said in England that if it rains on St. Swithin's day it will rain for forty days thereafter, a saying which is supposed to have originated in the alleged fact that the translation of Swithin's remains was delayed by heavy rains. See John Earle, *Illustrated Fragments* (London, 1861) and Butler's *Lives of the Saints* under July 15. August MacCarthy, London.

Switzerland or Helvetic Confederation [*Suetio*—from *Suetis*, *Solvetis*, a Swiss, derivative of *Schwiz*, Switzerland; of *ty*, *le Suisse*, Ital. *Svizzera*, Switzerland]; a confederated republic of twenty-two cantons, occupying the Alps, between Germany, Austria, Italy, and France; of oval form, 221 miles long E. and W., and 140 miles broad N. and S.; boundary irregular and only in part inland. Area, 15,920 sq. miles.

Physical Features.—It occupies the Central and Northern Alps; the Western are in France, the Southern in Italy, and the Eastern in Austria. The highest point is Mont Blanc (15,781 feet), at the angle of France, Italy, and Switzerland. The proper central mountain is Monte Rosa (15,217 feet), 45 miles E. on the Italian boundary. The hydrographic center where arise the Rhone flowing through the Po to the Adriatic, the Rhine flowing to the Gulf of Lyons, the Rhine flowing to the North Sea, and the Inn flowing through the Danube to the Black Sea is St. Gotthard, 60 miles farther N. E. The chief range is the Pennine Alps, making the western part of the southern boundary; N. of it and nearly parallel is the range of the Bernese Alps with the Rhine valley between them, and containing peaks somewhat lower (Piz, 14,046 feet, and Jungfrau, 13,678 feet). To the E. the main ranges are in the Rhetic Alps with culminating point at Mt. Bernina (13,991) on the Italian frontier. (See Alps.) The plain of Switzerland lies on the N. W., between the Jura Mountains and the Alps, and between Lake Geneva and Lake Constance; average elevation, 1,200 to 1,500 feet, between it and the Bernese Alps is the higher plateau called the Bernese Oberland. The remainder of the inhabitable part of the republic consists of mountain valleys and lake margins, sometimes with small alluvial plains, but often narrow, wild, and inaccessible.

The chief river is the Rhine, which winds around the northern side of Switzerland and penetrates to St. Gotthard from the E. With its tributaries it drains over 70 per cent. of the area and most of the lakes of the country; length in Switzerland, 216 miles. The Rhine leaves at the W., is 71 miles long in Swiss territory, and drains 16 per cent. of the area. The Inn leaves at the E., has 54 miles in the confederation, and drains 9 per cent. of the area; and the Po sends the Thimo 44 miles into Swiss territory and drains 3 per cent. A small part of the southeast is drained by the Adige.

Many beautiful lakes are situated in whole or part within Swiss territory. Some details as to the largest of these are tabulated below:

NAME.	From Lake.	Area in sq. miles.	Mean depth of surface, feet.	Greatest depth, feet.
Genève	Alpine	220	1,384	1,537
Constance	Alpine	220	1,300	1,430
St. Gallen	Alpine	10	1,407	475
Lake Maggiore	Alpine	40	666	1,400
Lucerne	Alpine	44	1,354	865
Uri	Alpine	11	1,341	405
Uri	Alpine	10	860	300
Uri	Alpine	10	1,407	718
Uri	Alpine	10	1,404	500
Uri	Alpine	10	1,385	1,021
Uri	Alpine	10	1,307	800

The lake area of Switzerland is 550 sq. miles, but the area of glaciers (perpetual ice and snow) is 710 sq. miles. This is confined to eleven cantons and principally to four—Uri, Valais (204 sq. miles), Uri (180), Bern (111), and Uri

(44). The Swiss glaciers number 471, and of these 138 are of the first rank (having a length of $4\frac{1}{2}$ miles or more). The largest is the Aletsch, on the southern slope of the Jungfrau, 15 miles long and covering 42 sq. miles. The Pennine Alps alone have 140 or more glaciers, and the Rhône, just N., is fed by 263. The lowest point reached by a glacier in Switzerland is 3,225 feet, in 1818 by the Grindelwald on the northern slope of the Jungfrau. The line of perpetual snow varies between 9,023 feet and 9,259 feet. The Aletsch begins at 9,820 feet and descends to 5,000 feet. The Eastern Alps have many glaciers, but they are generally of the second rank. See GLACIERS.

Geology.—Notwithstanding the mountainous character of Switzerland its geology is simple. Eruptive rocks are few and belong to very early geologic times. The core of the Central Alps is made up of primitive, azoic, crystalline rocks, and these make the ridge of this roof of Europe. To them are applied a series of schistose Carboniferous rocks semi-crystalline in character. The Triassic is found only at the east and west ends of this ridge. The whole was raised out of the sea in Jurassic times (named from the Jura Mountains on the N. W. of Switzerland), and the Jurassic rocks are applied next outside the Carboniferous composing some of the secondary ranges. In them are found some of the most interesting fossils ever discovered. Next in succession from the azoic ridge are found well-developed layers of Cretaceous and then extensive Tertiary beds, especially the Miocene. The Glacial period and the more recent glaciers have left their traces and remains over all Switzerland, and the alluvial work of the present age has been and is still active in filling up lakes and making plains.

Climate.—The Swiss climate has been studied with special care, and presents features of great interest. There are four meteorological stations at heights from 6,290 to 8,215 feet, and the Mont Blanc station is just beyond the boundary. The southern slope is remarkably mild, but the northern part has a rigorous continental climate. The mean temperatures run from 35° F. to 55° in the inhabited portions, about equal to the range from Winnipeg to Cape Charles in North America. The decrease of temperature with each 1,000 feet of increased altitude is 3·2° on the northern slopes and 2·8° on the southern. The contrast of the seasons is greatest in the valleys, where winter temperatures of -25° F. sometimes occur. The precipitation is large (40 to 60 inches), and is greatest at an elevation of about 6,500 feet. The run-off is particularly large, and causes rapid and sometimes destructive accumulation of sediment and wash. The most noteworthy wind is the foehn, which, coming from southerly directions, descends on the leeward side so dry and warm that the snow disappears as if by magic, and the parching greatly increases the danger of fires.

Like the temperature, the population decreases with the height. There are no villages beyond 5,000 feet, except the little hamlet of Juf at 7,000 feet, the highest in Europe. On the Great St. Bernard the hospice is at 8,110 feet, and the Alpine Club has some retreats, the highest of which (on the Matterhorn) is at 12,800 feet. The inhabitants of the high valleys have larger bodies and feet than those below, and are more free from several maladies, notably phthisis. Pneumonia and pleurisy are more common and more dangerous than below, as are also asthma, scrofula, and rheumatism. In the deep, moist valleys, with little sunshine, goiter and cretinism occur in large ratio, but increasing attention to cleanliness and general comfort diminishes this.

Natural Productions.—Switzerland is not productive in metals. There are several mines of anthracite, lignite, ordinary coal and salt, and one of graphite. Quarries of building-stone are more numerous and important. The flora falls easily into five zones, defined by the elevation; the zone of the vine goes up to 2,000 feet; that of cereals to 3,000 feet, and includes most of the plain; that of the forests to 6,000 feet; the sub-Alpine to 8,000 feet; and the Alpine above 8,000 feet. The arable land is chiefly confined to the first two. The forests occupy 3,032 sq. miles of area, and include the oak, beech, and spruce. They are valuable not only for the ordinary uses of trees, but also to protect the lower levels from destructive overflows; forestry is carefully practiced. Peat exists in large quantities, and forms an important resource for fuel. The sub-Alpine zone is rich botanically; in the Alpine region a species of violet and the much-praised edelweiss reach the very margin of perpetual snow.

The fauna is not rich, and animals suitable for hunting are protected by stringent game-laws. Wolves and deer are

very rare; a few bears still remain in the wilder recesses of Valais and the Grisons; the wild boar survives in the Jura; the chamois can be hunted only twenty days in the year, and is increasing in number; the fox is common. The best-known bird is the lammergeier. Fish are very abundant, and fish-culture is much practiced.

Agriculture.—Of the total area 72 per cent. is classed as productive, and of the productive part 36 per cent. is in grass and meadow, 29 in forests, 19 in fruit, and 16 in crops and gardens. There are about 300,000 peasant proprietors, representing 2,000,000 of the population. Rye, oats, and potatoes are the chief crops, but the importation of foods is large. Cheese and condensed milk are manufactured in large quantities for export. About 22,000,000 gal. of wine are produced annually. In 1886 there were 98,333 horses, 1,211,713 cattle, 341,632 sheep, 415,619 goats, and 394,451 swine; and in 1893 there were imported 10,198 horses, 65,199 cattle, 51,386 swine, and 92,461 sheep.

Industry.—The soil does not yield sufficient for the support of the population, and a large percentage finds employment in industries, very generally small, occupying only the family. The larger ones subject to the factory law only are enumerated. Of these on Jan. 1, 1893, there were 4,606 devoted to the manufactures of textiles, leather, articles of food, chemical, metal and wood products, paper and printing, pottery, glass, watches, etc.

Switzerland has over 1,000 hotels, employing 16,000 people, representing a capital of \$64,000,000, and giving a gross annual income of \$10,500,000.

Population.—The population from 1880 to 1888 increased at the annual rate of 0·4 per cent. In 1888 it was 2,917,514; and there were 1,041 females for every 1,000 males. The density of population was least in the Grisons (34 per sq. mile), Uri (41·5), and Valais (50·3); greatest in the canton of Geneva (977), of Basel (674), and of Zurich (506); all of the latter have cities of considerable size. German is spoken by the majority, and is hence the official language in sixteen cantons, French in five, and Italian in one. In the Grisons about 46 per cent. of the population use German, about 40 per cent. Romansh, and 14 per cent. Italian. Italian and Romansh are receding, French is growing in use, and German remains about stationary. The official French is full of Teutonisms. The birth-rate is high, and 5 per cent. of the births are illegitimate. The annual emigration amounts to about 8,000, but is decreasing; the emigrants are generally agriculturists and unmarried. They are chiefly from Bern, Zurich, St.-Gall, and Ticino, and nearly all go to the U. S. There is absolute freedom of conscience; about 60 per cent. of the population is Protestant, the remainder Roman Catholic. The Protestantism is Calvinistic in doctrine and Presbyterian in government. Education is compulsory, primary education is free, and the percentage of illiteracy nearly evanescent. There are 5,000 schools of all grades, with 13,000 teachers and 542,000 pupils; also five universities (at Basel, Zurich, Bern, Geneva, and Lausanne, the last since 1891), with 400 teachers and 25,000 pupils, of whom nearly a half are aliens. The principal towns (with the communal population for 1893) are Zurich (103,271, including suburbs); Geneva (78,777, including suburbs); Basel, Basle, or Bâle (75,114); Bern (47,620); Lausanne (35,623); St.-Gall (30,934); Chaux-de-Fonds (27,511); Luzern or Lucerne (21,778); and Neuchâtel (16,772).

Commerce.—The effective imports (not in bond) for 1893 were valued at \$168,200,000, and the exports at \$131,400,000. The chief imports were foodstuffs, tobacco and spirits, silk, wools, cottons, and other textiles, metals, minerals, and chemical colors, bullions, and coin. The chief exports were textiles, timepieces, and colors. Wheat and flour are largely imported. The trade is chiefly with Switzerland's immediate neighbors, Germany first, but a considerable proportion of the exports goes to Great Britain and the U. S.

There were 2,220 miles of railway in operation in 1893, with a total cost of \$210,000,000, and a gross income in 1892 of \$18,150,000, and expenses of \$12,075,000; also 4,515 miles of telegraph and 4,088 miles of telephone line. The number of post-offices was 1,491.

The unit of money is the franc of the same value (about 20 cents) as that of France. Swiss coin makes only about 5 per cent. of that circulated; the remainder is chiefly Italian and French. The *pfund* = 1·10 lb. avoirdupois; the *centner* = 100 pfund; the *arpent* of land = 8·9 acres.

Cantons.—Switzerland is composed of twenty-two cantons, although the splitting of each of three cantons into two demi-cantons makes the total number of federative units

Republic and lasted four years. To that form of government succeeded a sort of league based upon federal principles. Under this constitution Switzerland recovered an appearance of peace, but the mediator of that "mediation act" (Feb. 13, 1803) was a meddlesome neighbor and a despotic ruler. The mediation lasted ten years, and came to an end at the fall of the French empire. The European reaction against France took place, and Switzerland had to participate in it; her soil was invaded by the allies, as it had been so often and so long by the French armies. By the Congress of Vienna (1815) her independence and neutrality were acknowledged and guaranteed. The spirit of self-preservation and sense of dignity developed in Switzerland, and new efforts were made to give the country a stronger and more independent basis. Switzerland was led to it by new internal disturbances and external occurrences—notably the revolutions in France in 1830 and 1848. In the latter year a new constitution was adopted without foreign interference; this gave place on May 29, 1874, to that now in force.

F. M. COLBY.

Sword [O. Eng. *sweord* : O. Sax. *sweord* : O. H. Germ. *meert* (> Mod. Germ. *schwert*) : Icel. *sverð*] : a weapon of offense, consisting of a long blade and a handle large enough for the grasp of one hand or, rarely, of both hands. The characteristic of the weapon is that the blade is not mounted on a long handle or staff, while yet it is larger than the dagger or poniard.

Sword is the general term, and includes weapons as unlike one another as the cavalry saber and the slender triangular-bladed court sword worn by gentlemen at the close of the eighteenth century. It is, however, well to separate the saber in all its varieties from the sword proper.

The *saber* has one edge only and has a thick, broad back. Toward the point a few inches of the back may be sharpened, though this is uncommon. The edge invariably curves backward to meet the back in a sharp point, which is practically a triangular point; moreover, the whole blade usually curves backward, the back concave and the edge convex. Some cavalry sabers are straight. The cavalry and artillery sabers of the U. S. service are slightly curved, the curve being about one in twenty. The northern nations of Europe in the early Middle Ages used sabers as well as swords; that is, both their long and their short weapons of this kind often had but a single edge and a broad back. These weapons, really long and heavy knives, were called *scramasaxes*, and were probably the arms most constantly in use. The celebrated Japanese weapon is curved about as much as the U. S. saber, but is mounted very differently on its handle. The Eastern blade slopes backward from the handle at the very point of junction, but the Western one is set so that the blade slopes forward. The Japanese two-handed saber had a blade about 3 feet long; this, or a somewhat shorter weapon, formed the principal badge of the Samurai or military class, and was worn in the sash with a much shorter weapon of almost exactly the same general form. These Japanese sabers deserve their great reputation, as the blades are of extraordinary, perhaps unequalled, excellence. The scimitar of the Mohammedan nations is a light saber with the blade very much curved backward, the curve of a Persian scimitar of the eighteenth century and earlier being one in seven or one in eight. In these the blade is set almost exactly tangent to the straight line formed by the handle. Earlier scimitars seem to have had the blade made heavier and broader near the point than at the hilt, perhaps with the view of striking a heavier blow upon armor; but so little is known of the system of fencing or saber-practice in use among the Moslem nations that this is only offered as a suggestion. The drawing cut with the sword arm kept bent, which is supposed to be the favorite manner of attack, would not seem to require a heavy blade or one weighted toward the point. The steel of which the scimitar is made is or affects to be of the famous steel of Damascus, that is, of a steel wrought in such a way that the surface is covered with delicate waving lines in its substance. A weapon almost exactly like the Mohammedan scimitar was carried by officers of high rank in the French service during the first republic. Oriental blades and Oriental scimitars complete were worn indifferently in exchange with similar weapons of French make. English field-marshal are represented as late as 1885 carrying sabers of a like curvature. A modification of the saber used only in some parts of India has its sharpened edge concave and the back convex. One form of this, the deadly *koukri* of the Goorkhas, is weighted toward the point. The *yataghan* of

the Mohammedan nations on the Mediterranean Sea, from the Danube to Morocco, has also its sharp edge concave; the form varies greatly. The cutlass is the saber shortened and roughly and cheaply mounted, as for sailors, both in the navy and in private service. The *düsack* or *tesack* is nearly the same weapon, and especially one forged in a single piece, the handle being a mere hole in a plate. This simple weapon was used in Germany in the later Middle Ages and down to the seventeenth century.

The ordinary hunting-knife, of which the famous American bowie-knife is one form, is a shortened saber; these weapons are to the saber what the European dagger of the Middle Ages is to the sword proper.

Swords among Ancient Nations.—The special weapon of the ancient Roman infantry was, at least after the beginning of the second century B. C., straight, double-edged, sharp-pointed, and much longer and heavier than had been in use in earlier times or at any time among the Greeks. Little is known of its exact character, as the steel blades have been destroyed by rust, but the general shape is known from such sculptured representations as are found on the columns of Trajan and Marcus Aurelius at Rome. The length of the blade may be put at from 20 to 24 inches. It was used mainly for thrusting, but we are not to imagine a legionary thrusting like a modern fencer with the hand high and the fingers uppermost; a more common way of "giving point" was certainly with the hand very low and the point higher, the thrust being upward. The bronze swords of the northern nations were often what is called leaf-shaped, that is, they were broad toward the point and narrowest at a distance of 3 or 4 inches from the handle, and symmetrical in shape, that is, both of the edges had the same elongated S-curve, but reversed, the two meeting at a sharp point. The sword of the Gauls at the time of the Roman conquest seems to have been sometimes of bronze, sometimes of steel; it was long, very heavy, and often retained the leaf-shape of earlier times. Among Eastern nations, whether ancient or modern, the most important weapon which can be called a sword is the Malayan creese. This has a blade about 18 inches long, sometimes shorter, sharp-pointed, and having on each side a waved edge, the undulations being very decided, one in five or one in six of their length. Another important peculiarity is the setting of the blade, often not at all in the prolongation of the handle, but at a decided angle with it, the angle varying in different weapons. These blades form a great contrast with the smooth, close-grained, highly finished Japanese blades. The Malayan steel is, as it were, a carrying further of the Damascus waved or watered steel; it is extremely rough and with depressions between the lines of the waving nearly like the graining of wood which has been exposed to the weather. The straight sword used by the Hamran Arabs in hunting as well as war seems to be of European origin, perhaps a lingering on of the knightly sword described below.

In the Middle Ages.—With the appearance of what is known as chivalry, after the firm establishment of the feudal system, the sword of the knight was broad-bladed and straight, symmetrical in shape. From the beginning to the end of the age of heavy armor and knighthood the peculiar weapon of the knight was the sword with a thin, flat blade and both edges alike. The well-known sword of Childeric, found in his tomb and now in the Louvre, could not have had a blade more than 18 inches long, judging by the sheath, which is in good preservation. The sword of the ninth century had a blade nearly or quite 3 feet in length. That of the twelfth century was often shorter. Some swords of the thirteenth century had a blade 45 inches long; but the sword of the knight, intended to be wielded by one hand, could hardly exceed this length, and when heavy armor was to be broken or wrenched apart a mace or a horseman's axe was used. The two-handed swords of the later Middle Ages may have been used on occasion by mounted knights; thus the famous bronze statue of King Arthur in the Church of St. Francis in Innsbruck, which dates from about 1520, is furnished with a sword whose grip has two distinct holds for the two hands; but the two-handed sword was essentially a weapon of foot-soldiers, having a blade 4 feet or more in length and a handle about 16 inches long, weighted at the butt to partly counterpoise the blade. It is probable that but little delicate sword-play was used during the Middle Ages. Each combatant struck hard and caught his enemy's blows on his shield or trusted to his armor.

In Later Times.—With the gradual disappearance of armor the gentlemen of Europe introduced swords which,

through still heavier, were much lighter than those of the fifteenth century. The rapier was brought into use by the Spaniards and adopted by men of family toward the close of the sixteenth century, and was as long as the knightly sword of an earlier time, but much lighter. The broad, thin blade of the knight's sword gave place to a much narrower blade in which can be seen the beginning of the thrusting sword of the seventeenth century. These, however, were the arms of the nobles and their imitators; the private soldier still carried a blade for cutting as well as thrusting, and this passed into the heavy broadsword of the seventeenth century, such as became famous in the hands of Cromwell's soldiers. A similar weapon, carried by the second Highlanders under Montrose and Charles Edward Stuart, is often called a bayonet, but this is erroneous. The bayonet proper was a large two-handed sword, such as is described in Scott's romance *The Fair Maid of Perth*.

The rapier had always a straight, narrow blade, and when used for systematic and military fighting, as in the duel, was generally accompanied by the dagger, which was held in the left hand and parried the adversary's thrusts. As the science of fencing was developed the dagger was given up and the sword became lighter and shorter. A duel under Louis XV. was fought with swords whose blades did not exceed 3 feet in length, and were sometimes two-edged and flat, sometimes three-edged or bayonet-shaped.

One very curious form of the sword was the hunting-sword of the seventeenth century and later—a thin, two-edged blade curved about like a saber, one edge convex, one concave. Such blades were from 16 to 24 inches long.

In modern armies officers of certain ranks are supposed to wear a slender straight sword. Thus in the U. S. army in the civil war staff officers should have carried such weapons, but they generally preferred a saber.

As the sword has always been the weapon of ceremony and the typical badge of a soldier and commander of armies, so words of honor and sabers of honor are often presented to successful officers. Moreover, swords of more ceremony are carried before officials of high rank, or are held by them on certain occasions; thus among the regalia of Great Britain is the scepter, or "pointless" Sword of Mercy, and the "Sword of Justice." Somewhat in a ceremonial way the *edgewood* or *walking-sword* of the eighteenth century was considered the distinctive badge of a gentleman.

The Hilt.—The sword-hilt consists of grip, guard, and pommel. The long tang forged with the blade, straight, tapering, and of square-edged section, passes through a hole in the guard, is covered by the grip, and is held fast at the end by the pommel, or else is held fast in the grip by pins or the like, while the pommel is put on separate. The grip is a mere enlarging and rounding of the tang, sometimes by laying plates of bone or wood against its sides, sometimes by means of a tube of wood or of shark-skin, or even metal. Wire is sometimes wound around the grip to allow of a firmer hold. The guard is the part that varies most. In Roman swords it was small, a mere plate sufficient to stop the edge of another sword which might slide along its own blade, but no more. The Japanese saber has but a small guard, approximately oval in shape, a flat plate of iron or bronze. The medieval sword had a large and long cross-guard, each arm of it several inches long; those of the two-handed sword sometimes a foot across. The most elaborate of all sword-hilts is that of the sixteenth and seventeenth centuries, which was applied to broadswords and rapiers alike: this had a very elaborate protection for the fingers and knuckles, consisting of several curved bars or of a plate of steel. In connection with this was a complicated cross-guard; that is to say, a fine and carefully made sword of 1600 would have a long cross-guard, a secondary or upper guard 8 inches farther toward the point of the blade and composed of rings or flat plates or "shells" one on each side, and a "knuckle-box" curving from where the cross-guard meets the grip to the pommel. Sometimes the guard took the form of a cap, with the open part toward the hand. Sometimes the knuckle-hilt was a bowl so solid and impierced as to hold liquid. Modern sabers have generally a curved guard which protects the knuckles and sweeps around to meet the pommel, in which it is secured. This is a mere modification of the knuckle-hilt, as above described.

See *Duméril, Die Kriegswaffen* (Leipzig, 1867; trans. into French and English); *Egerton Castle, Swords and Masters of Fences* (London, 1886); *Lacombe, Les Armes et les Armures* (Paris; by Boutelle, *Armes and Armures*, London, 1874); *La Collection Spitzer*, vol. xi. HUBBELL SCOURGON.

Swordfish—any fish of the family *Xiphiidae*, remarkable for having the upper jaw prolonged forward in the shape of a long sword. The common swordfish (*Xiphioides gladius*) ranges from the Atlantic coast of North America eastward to the Mediterranean. It is often from 10 to 16 feet long, has very fine scales, no ventral fin, a long broken dorsal fin, and a large and deeply forked caudal. It is a very rapid swimmer, and is said to assail the largest whales with its sword. It sometimes strikes ships with such force as to penetrate several thicknesses of plank, and the sword is frequently broken off and left in situ, but the fish which most often assaults vessels is a smaller species of the genus *Tetrapturus*. The swordfish is generally esteemed as food, and is taken by the harpoon, thus affording an exciting and dangerous sport, but is too scarce to be of much commercial value. The use of the sword is not clearly understood, so all probability the fish employs it in gaining its sustenance, but the precise method is not known. The food of the swordfish consists of mollusks, especially the squid, and of small fishes. See *Pinnacles*. Revised by P. A. LORAN.

Syagrius, s-a grē-ry: the last Roman ruler in Gaul; was a son of Egidius, from whom he inherited what is known as the kingdom of Syagrius, embracing the country around Soissons, between the Seine, the Marne, and the Oise. The Franks encroached upon his domains, and finally, under their chief Clovis, gained a decisive victory over him at Soissons in 486, thereby destroying the last remnant of Roman power in that region. Syagrius fled to Toulon, but was afterward surrendered to Clovis, by whose command he was put to death. P. M. COLAY.

Syl'aris (in G. *Sil'aris*): city of Magna Græcia, in Lucania: founded by Achæus and Trophonius about 720 B. C., 8 miles from the Tarentine Gulf, between the rivers Crathis and Syllaris, the modern Crati and Cauda. It rose rapidly to a great prosperity, founded other colonies—Pezdonia, Latis, and Sidrion—covered a space of 8 miles in circumference, and was notorious for the luxury and effeminacy of its inhabitants. In 510 B. C. Syl'aris was completely destroyed by the Crotonians and never recovered, but in 448 B. C. the descendants of the conquerors and exiled Syllarians founded the city of Thurri in the immediate neighborhood of the old site of Syl'aris. Revised by J. R. S. STEWART.

Syl'el, Heryman, van: historian; b. at Dusseldorf, Prussia, Dec. 2, 1817; studied at Berlin and at Bonn; became Professor of History at Marburg in 1844, and director of the Royal Prussian Archives in 1878. He has taken an active part in politics, having been a member of the Prussian Legislature and of the Prussian Landtag. Among his writings are *Geschichte des ersten Kreuzzugs* (1841); *Die Entstehung des deutschen Königtums* (1844); *Geschichte der Revolutionen* (1859-74; lang. trans.); *Die deutsche Nation und das Kaiserreich* (1892); and *Die Herrschaft des deutschen Reichs durch Wilhelm I.* (1895-96; lang. trans. 1897). P. M. COLAY.

Sycamore [by analogy of *sycomore* from G. Fr. *sycomore* (< Lat. *sycomorus* = Gr. *sykambos*, mulberry-tree; *akos*, fig + *akos*, black mulberry)] a tree (*Platanus sycamore*, or *Sycamoreus antiquorum*) which is a near relative of the fig. It is a widespread, shady tree, much planted in the Levant for its shade. Its light, fragile wood is reputed to be indestructible. Its fruit is inferior in quality to that of the fig, but is abundant and palatable. In some parts of the U. S. the buttonwood or plane-tree is improperly called sycamore, and in Great Britain that name is applied to a maple (*Acer pseudoplatanus*). Revised by L. H. BAILEY.

Sycamore: city (founded in 1866): capital of DeKalb co., Ill.; on the Chi. and N. W. and the Chi. and West. railroads, 56 miles W. of Chicago (for location, see map of Illinois, ref. 2-E). It is in an agricultural, dairying, and stock-raising region; has manufactures of agricultural implements, flour, water-motors, insulated wire, brick, tile, varnishes, furniture, carriages and wagons, and soap, works for preserving fruit and vegetables, and breweries; also 11 churches, 3 graded public schools, a seminary for young ladies, high-pressure water-works, electric lights, a national bank (capital \$50,000), a private bank, and a semi-weekly and a weekly paper. Pop. (1880) 6,028; (1890) 8,067; (1895) estimated, 9,400. EDITOR OF "THE SYCAMORE."

Syd'nam, THOMAS: physician; b. at Winford, Engln., Dorsetshire, England, in 1624; educated at Oxford, and in 1648 became a fellow of All Souls' College, having meanwhile served as an officer in the parliamentary army; studied

medicine at the college of Montpellier, France; took his degree of M. D. at Cambridge, and established himself about 1660 as a physician in London, where he soon attained the foremost place. He abandoned the mere routine system of practice then prevalent, basing his own upon the theory that there is in nature a recuperative power which it is the province of the physician to aid. He was especially acute in observing and describing the symptoms of diseases, and carefully studied the relations between epidemics and the conditions of the atmosphere. Among the services which he rendered to medical practice were the treatment of intermittent fever by cinchona and the administration of cooling remedies in smallpox. His works, which are not numerous, were written in Latin, but have been frequently translated. Among them is *Methodus Curandi Febres* (1666; 3d ed., *Observationes Medicae*, 1676). In 1843 was founded the Sydenham Society, for the purpose of printing important medical works in English and other languages. Its first issue was the complete works of Sydenham, in Latin (1846; English trans. by Dr. Greenhill, with a memoir by Dr. Latham, 1848). D. in London, Dec. 29, 1689.

Sydney [named after Thomas Townshend, first Viscount Sydney]: capital and chief port and railway center of New South Wales, Australia, and the oldest city of Australasia; on the southern side of Port Jackson, in lat. 33° 52' S., lon. 151° 12' E. (see map of Australia, ref. 7-J). The climate is temperate and generally healthful. The mean temperature is 62° F., ranging from a minimum of 35° to a maximum of 106°. The mean annual rainfall is 52 inches. Port Jackson is a long, slender inlet on the east coast, of irregular form, with numerous bays and coves, forming a magnificent harbor with a water front of more than 100 miles. The entrance is only a mile wide, but just inside is a bar with only 20 feet of water at low tide, increased by dredging to a few feet more. At the opposite end of the port enters George's river, navigable to Liverpool, a distance of 14 miles.

The city proper is about 4 miles from the heads, on a peninsula between Rushcutter Bay on the E., and Blackwattle Bay on the W. It has a water front of 8 miles, of which 6 are available for the use of commerce. The surface is undulating, with a maximum height of 230 feet. The streets are often crooked and steep, but this gives the city an old-fashioned appearance unique in Australia, and affords frequent and charming vistas over the waters of the bay and to the opposite shores. There are many public parks, including the Domain (130 acres), extending to the water front along the most densely populated and busiest part of the city, and Moore Park (500 acres), to the S. E. of the city. The suburbs are numerous and contain a large population. The more fashionable suburbs are toward the E., while the business portion is extending westward. The entire distance to Parramatta, about 15 miles, is practically suburban along the railway. The manufactories are more on the southern side, and population is rapidly extending toward Botany Bay, 6 miles to the S. There are also considerable suburbs on the north shore of the bay, which are connected with the city by steam-ferries and by rail.

The water-supply was first obtained from the small Tank stream flowing into Sydney Cove, along which the nucleus of the town was first formed. Later it was derived from a stream flowing into Botany Bay, brought to the city by a long tunnel. As this proves insufficient, a plan is under way to bring water from the Nepean river, taken at a point 63 miles distant and conducted to a large storage reservoir near Parramatta. The sewage is conducted to the water front, but as the size of the city renders this unsanitary, a large sewer is under construction to a headland on the ocean shore, where the sewage will be delivered into deep water and carried away by the current from the N.

The public and many private buildings are of fine style and good aspect, and are generally made of a fine sandstone found in the vicinity. The university is the most important edifice in Australia, the principal façade being 500 feet in length. Together with the affiliated colleges of St. Paul's and St. John's, it lies in a domain of 150 acres. With regard to its degrees it has the status of the English universities. The metropolitan cathedral of St. Andrew's and the Roman Catholic Cathedral of St. Mary are two of the finest structures in Australia. The royal branch mint at Sydney issues nearly £3,000,000 worth of coin annually, mostly gold, but with a little silver and bronze. The city is in the center of a large coal-basin, and the beds probably pass under the city itself. Coal is cheap and abundant, and the

commercial advantages are great. The manufactures include all the products of the pastoral industry, and especially boot and shoe making, railway manufactures, carriage and wagon making, manufactures of glass, pottery, furniture, stoves, tobacco, etc., and distilling and brewing. In 1893 1,323 vessels cleared from Sydney, as compared with 1,593 from the other ports of the colony.

The city was founded in 1788 by Capt. Phillip as a penal station, and long remained a humble village. In 1861 it had 56,845 inhabitants, 93,685 with the suburbs. In 1891 the census gave the city and suburbs 383,386 inhabitants, which was 34 per cent. of that of the entire colony. At the end of 1893 the estimated population was 421,030, bringing this city to a point not far behind Melbourne.

MARK W. HARRINGTON.

Sydney: chief port of Cape Breton, Nova Scotia, and capital of Cape Breton County, formerly capital of the province of Cape Breton; on the east side of Sydney Harbor, lat. 46° 18' N., lon. 60° 12' W. (see map of Quebec, etc., ref. 1-D); station on the Intercolonial Railway, 275 miles N. E. of Halifax. The harbor is one of the best in the provinces, but it is ice-bound during the long winter. It is the principal port for the coal-mining district northeast, with which it is connected by rail. The harbor was originally the rendezvous of the Spanish fishing-fleet, and was then called Spanish Bay. Later it was a center for British military activity, and so remained until the Crimean war. France has, by treaty, coaling privileges here, and utilizes them to make this the station of her naval squadron on the North Atlantic. Regular connection is kept up with Newfoundland by steamer in summer. Pop. 4,000.

MARK W. HARRINGTON.

Sydney: See SIDNEY.

Syene: See ASSOUAN.

Syenite: granular crystalline rock, consisting of alkali-feldspars (mostly orthoclase) with some lime-soda-feldspar, one or more ferromagnesian silicate: biotite, amphibole, or pyroxene; and little or no quartz, besides other minerals. According to the kinds of minerals accompanying the alkali-feldspars varieties are distinguished as quartz-syenite, augite-syenite, mica-syenite, hornblende-syenite (syenite proper), zircon-syenite, sodalite-syenite, etc. Its texture varies from coarse-granular to fine-granular, often exhibiting lath-shaped feldspars on the surface of fracture. Occasionally porphyritic, passing into syenite-porphyry and orthoclase-porphyry. With increasing quartz it grades into granite, and with more lime-soda-feldspar it grades into diorite. Varieties low in silica carry nephilite and sodalite, and grade into eleolite-(nephelite)syenite, which properly constitute a separate rock-group. (See Rocks.) This variety is relatively high in soda and potash, which characterize the feldspars and feldspathic minerals, and enter into the ferromagnesian minerals, producing arvedsonite, barkevikite, acmite, ægerite. This rock usually carries rare minerals, containing the rarer elements cerium, lanthanum, thorium, yttrium, etc.

The name syenite was first used by Pliny for the rock from Syene (Assouan) in Egypt. It was subsequently applied by Werner to the rock from the Plauensche Grund, near Dresden, from which it has grown into its present significance. It has been found that the rock from Syene is rich in quartz, and therefore a granite. Until recently the name syenite has been applied to hornblende-granite to distinguish it from mica-granite.

Syenite proper is much less common than granite, and has been identified in comparatively few localities in the U. S. outside of New Hampshire. Eleolite-syenite is somewhat better known, occurring in Arkansas, New Jersey, Maine, and Canada. It is known in Brazil, and especially in Norway, where numerous rare minerals associated with it have been described by Brøgger. See GRANITE.

J. P. IDINGS.

Sykes, GEORGE: soldier; b. at Dover, Del., Oct. 9, 1822; graduated at the U. S. Military Academy in 1842; served in the war with Mexico; was on frontier and garrison duty 1848-61; was in May, 1861, appointed major of the Fourteenth Infantry; commanded the regular troops in the battle of Bull Run; commanded as brigadier-general the regular infantry in the defenses of Washington during the winter of 1861-62, and in the Virginia Peninsular campaign of 1862 the division of regulars (Porter's corps) which so stubbornly maintained its position on the right at the battle of Gaines's Mill. He commanded this division at the second battle of Bull Run; also at Antietam, Fredericksburg, and

Chancellorville, having been promoted major-general of volunteers Nov. 1862, and on the appointment of Gen. Meade to the command of the Army of the Potomac (June, 1863) Sylla succeeded to that of the Fifth Corps, which a week later was engaged at Gettysburg, and at the head of which he continued during the ensuing operations of the Army of the Potomac until Dec., 1863, when ordered to duty in the department of Kansas. He was brevetted colonel for gallantry at Indian's Mill; brigadier-general for Hollysburg, and major-general for gallant services. Mustered out of the volunteer service in Jan., 1866, he returned to duty with the Fifth Infantry, of which regiment he had been appointed lieutenant-colonel in Oct., 1864. In Jan., 1868, he became colonel of the Twentieth Infantry. D. at Fort Brown, Tex., Feb. 9, 1880.

Sylla: See SYLLA.

Syllabus [= *Syllo* Lat., from Gr. συλλαβή, *syllabē*, take together; *syllō*, together + *syllō*, take]; a list of eighty propositions condemned by Pius IX. in his encyclical, *Unigenitus*, and other official utterances. It is annexed to the bull "Quanta Cura," and was published by Cardinal Antonelli Dec. 8, 1864. The errors are grouped under ten heads, and concern pantheism, naturalism, and absolute rationalism; moderate rationalism; religious indifference and latitudinarianism; the unqualified condemnation of socialism, communism, Hindu societies, secret societies, and clerical liberal unions in Italy; the rights of the Church; the rights of the state; natural and supernatural ethics; Christian marriage; the temporal power of the pope; and modern liberalism.

The document is purely negative in form, and states only the propositions to be rejected, but it is very well understood that the contradictory of the condemned propositions is to be held, and not the contrary. Failing to grasp this distinction many have given false and absurd interpretations to the syllabus. So understood, it is evident that the syllabus does not claim for the Church "supreme control" over public education, science, and literature, but merely desires such control to the state (Proposition 45). Among Roman Catholic theologians the specific character and doctrinal value of the syllabus are still a matter of dispute. Some contend that it is infallible, but not *de fide*; others that it is also *de fide*; others that it is simply a list of errors drawn up for convenience of reference for bishops, theologians, etc., each proposition having only that specific kind of assent to it in the syllabus which was put upon it in the original document from which it was drawn. When in 1871 Dr. Schullis, professor at the University of Prague, contended that the syllabus is *de fide*, Dr. Feiler, Bishop of Pilsen in Austria, wrote in refutation a work for which he received a letter of congratulation from Pope Pius. The Church has not decided that all the propositions in the syllabus are heretical (but only that they are to be rejected); therefore it does not follow that the contradictory propositions are all so many articles of faith. The Roman Catholic Church is accustomed to condemn some propositions as heretical, others as erroneous, others as rash, others as injurious, others as dangerous, others as scandalous, others as offensive, others again as merely historically false. So, too, each proposition in the syllabus deserves some censure, but not necessarily the worst—viz., of heresy. Some propositions in the syllabus do not refer to doctrine at all, but only to matters of fact—viz., propositions 12, 23, 34, 38, 72. See Cardinal Hergenrother's *Catholic Church and Christian State*; Gladstone's *Vatican Decrees*, and the replies of Cardinals Newman and Manning; also Gladstone's rejoinder, entitled *Vaticanism*. The text of the syllabus is found in the *Acta et Decreta Concilii Vaticani*, Berol. (Freiburg im Breisgau, 1871).

JOHN J. KEASE.

Syllologism: See LOGIC.

Sylvanite: See TELLURIDES.

Sylvester: the name of two popes and an antipope. St. Sylvester I. (314-335) governed the Church during the reign of Constantine I. The basilicas of the Lateran, St. Peter, St. Paul, the Sessorian basilica, and many churches were completed under his pontificate. Much of the ancient Church legislation is referred to him. The original documents for his life are not extant. It is no longer maintained that he baptized Constantine, or that the latter's donation to Sylvester is genuine. Nevertheless he awarded much influence over the emperor, and received from him many gifts of land and church plate. (See Duchesne, *Liber Pontificalis*, pp. 176, 187; Hergenrother, *Church and State*, p. 657.)—SYLVESTER II., whose true name was GERHARD, was born in Acconia; studied in Spain under Bishop Hatto of Lyons, and with the Arabs at Seville and Cordova; traveled in Italy; acquired a great reputation for learning, and was appointed by Otto II. teacher to his son, Otto III. While director of the school of Rheims, to which he attracted many students, he was elected archbishop of that diocese in 991 by a synod which deposed Archbishop Arnulf, but he was not confirmed by the pope, and had to give up his see to Arnulf. He then left Rheims, and repaired to Otto III., by whose aid he became Archbishop of Reims in 996, and in the following year pope. His knowledge of mathematics, astronomy, and physics led people to consider him a magician, and it was a popular rumour (see Dehlinger's *Fables respecting the Popes in the Middle Ages*, Eng. trans., pp. 267-272) that he had sold his soul to Satan.—SYLVESTER III. was for three months the antipope of Boniface IX. and Gregory XI., and was deposed by the Synod of 1046.

Revised by J. J. KEASE.

Sylvester, James Joseph, F.R.S., F.R.C.L., F.R.S., [mathematician] b. in London, Sept. 8, 1814; studied at Cambridge, but could not take a degree on account of being a Jew; became Professor of Natural Philosophy at University College, London; went to the U. S. in 1841, and was in 1841-42 a professor in the University of Virginia. He soon returned to England, and in 1855 became Professor of Mathematics at the Military Academy at Woolwich. In 1856 he was invited to the chair of Mathematics in the Johns Hopkins University, where he remained until 1883. He then returned to England as Savilian Professor of Geometry at the University of Oxford. He is the most prolific and original of living mathematicians. He has written hundreds of memoirs in the *Transactions of the Royal Society*, *Proceedings of the London Mathematical Society*, *Crelle's Journal*, *Quarterly Journal of Mathematics*, *Comptes Rendus*, and many other journals, and in *The American Journal of Mathematics*, of which he was the founder. He enumerated a theory of verification in a volume, *Logic of Verse* (London, 1870), and has invented several kinematic instruments. N. N.

Sylvester, Junius; author; b. in England in 1583; became eminent as a linguist; was a member of the Company of Merchant Adventurers at Stade, Holland. D. at Middelburg, Holland, Sept. 28, 1618. He is best known as the translator into English of Du Bartas's *Divine Weeks and Works* (1606; 7th ed. 1641). The original was by a French Huguenot nobleman; Sylvester's version had great popularity among the Puritans of Old and New England, and was one of the sources of inspiration to Milton when writing *Paradise Lost*. The quaint "venerable" style of Du Bartas was, if anything, exaggerated in the translation. In 1615 Sylvester published a singular anti-Jewish tract—*Pharoah's Hithered and the Pope's Shattered, etc.*—intended to please James I., who hated the Jew.

H. A. DREES.

Sylvian'idea: an earlier name for the *Mandibula*. See WARRLER.

Sylviculture: See FORESTRY.

Sylv'ide: See WARRLER.

Syl'vius, JACQUES (JACQUES DYBINE); anatomist; b. at Louville, near Amiens, France, in 1478; studied medicine at the University of Paris, where he was appointed professor in 1530. He was the first to practice injection of the blood vessels during their dissection; a fissure of the cerebrum is called the fissure of Sylvius. D. in Paris, Jan. 10, 1555. His *Opera Medica* were collected by René Moreau, and appeared at Geneva in 1630.

Symbiosis [Gr. *syllō*, companionship; cf. *syllabē*, partner; *syllō*, with + *bios*, life]; a kind of COMMENSALISM (q. v.), in which the associated forms are intimately associated with and dependent upon each other. Thus the plants known as lichens are composed of symbiotic associations of algae and fungi. The association of "yellow cells" (plants) in the *Radiolaria* (animals) is an example in the animal kingdom. J. & K.

Symbolic Logic, or, better, **Algorithmic Logic;** a form of logic characterized by an artificial language composed of symbols with their laws of combination, and possessed of peculiar advantages in giving of actual relations representations which can be manipulated according to rules of operation and procedure, experimented upon to give new knowledge according to organized processes.

Before George Boole logic always dealt with its materials

directly and by intuitive perception, as did the old Greek geometry. What Descartes's analytic geometry did for the science of space, that Boole's algebra did for logic. His discoveries, startling as they appear, yet rest upon a principle well known to the modern mathematician. Though he had noteworthy forerunners, algorithmic logic, as a practical system, owes its creation wholly to his genius. He was, in a sense, the outcome of his time, the period when algebra was given a real plural. His discoveries in the algebra of linear substitutions are regarded as the foundation of the present vast theory of invariants. His *General Method in Analysis*, discovered in his researches on differential equations, reads like a prelude to his *Symbolic Logic*. His remarkable pamphlet, entitled *The Mathematical Analysis of Logic, being an Essay towards a Calculus of Deductive Reasoning*, by a curious coincidence made its appearance on the very same day as De Morgan's *Formal Logic*. In this he shows that by simply assuming 1 to signify what is, and 0 what is not, he can, without any further assumption, express the premises of a syllogism as two equations from which, by ordinary algebraic procedure, the conclusion can be deduced. This is a pregnant connecting of the concepts of being and nothing with a number system. Still more profound and unexpected is his developing a function of a general logical symbol by Maclaurin's theorem:

$$\phi(x) = \phi(0) + \phi'(0)x + \frac{\phi''(0)}{1.2}x^2 + \text{etc.}$$

Thus at a touch Boole changed a dead into a living science. Moreover, to the old synthetic logic he added a new analytic logic, namely, that the validity of the processes of an algebra does not depend upon the interpretation of the symbols which are employed, but solely upon the laws of their combination. Every system of interpretation which does not affect the formal operational laws is equally admissible, and so the same piece of symbolic algebra may, under one scheme of interpretation, represent the solution of a question on the properties of numbers, under another that of a geometric problem, under a third that of a problem of kinematics, under a fourth that of a new question in logic.

This principle, so fundamental that Boole assigns it as the definitive characteristic of a true calculus or algebra, may be illustrated as follows: If we define a sect as the piece of a straight between two definite points; if we indicate sects by the symbols x, y, z , etc.; if we define the product of two sects, xy , as the rectangle of those sects (not the area of the rectangle of the sects, but the surface of the rectangle determined by them); if we define the product of three sects, xyz , as the cuboid of those sects (not the volume of that cuboid), then all the theorems of Euclid's Book II. are rigorously demonstrated by the little equations usually appended to the propositions as mere numerical illustrations (e. g. in Playfair); and that, too, without any introduction of the idea of measurement or ratio. Moreover, each proposition may at once be generalized for space of three dimensions, and the mere algebraic statement of the generalization will contain its rigorous demonstration.

This general principle likewise explains why a professional mathematician in working out a way of accurately expressing by an algebra the operations and valid processes by which reasoning is ordinarily performed should make it as similar as possible to the ordinary algebra for number; not because thinking in its general character has any reference to number, but simply to get the benefit of as many as possible of the results and procedures produced by centuries of algebraic advance.

The aim of Boole's investigations was, in the first instance, confined to the expression of the antique logic, and to the forms of the Aristotelian arrangement, but he soon found that restrictions were thus introduced which were purely arbitrary and had no foundation in the nature of things. Feeling with the instinct of genius the high importance of his work, Boole applied his best powers to an elaboration, which appeared in 1854 under the title *An Investigation of the Laws of Thought on which are Founded the Mathematical Theories of Logic and Probabilities*, a work of which Herbert Spencer has said that it "constitutes a step far greater in originality and importance than any taken since Aristotle." The following is a summary of Boole's actual working method:

Convene to represent any class by a letter, as men by a and good things by b . Combined in thought one acts as a selective adjective, and whichever this be the result is the same; so that ba , or "good men," gives us the same collec-

tion of individuals as ab , or "human good beings." Using the sign $=$ as meaning, in the most general way, identity, co-existence, or equality, we say $ab = ba$. "We are permitted, therefore, to employ the symbols x, y, a, b , etc., in the place of substantives, adjectives, and descriptive phrases, subject to the rule of interpretation that any expression in which several of these symbols are written together shall represent all the objects or individuals to which their several meanings are together applicable, and to the law that the order in which the symbols succeed each other is indifferent." Again, to form the aggregate conception of a group of objects consisting of partial groups, we use the conjunctions "and," "or." Convening that the classes so joined are quite distinct, so that no individual is added to himself, we see that these conjunctions hold precisely the same position formally as the sign $+$ in algebra, and are representable by that sign.

As the order of addition is indifferent, we have $x + y = y + x$. Again, to separate a part from a whole, we express in common language by the word "except," as "All men, except Asiatics."

This is our minus sign. As it is indifferent whether we express excepted cases first or last, we have $x - y = -y + x$.

But just as the algebra of quaternions differs in one fundamental law from the algebra of number, namely, in its multiplication being non-commutative, so that ab does not equal ba , so Boole's algebra for logic differs in a law equally fundamental: in it $a^2 = a$; and from this comes the fact that, in it, every equation can be solved and every solution interpreted. Only two symbols of number obey this formal law. They are 0 and 1. Their interpretation for logic is *nothing* and *universe*, the two limits of class-extension. This law $x^2 = x$ it is which in Boole's algebra makes division indeterminate: but his genius overcomes this indefinitude by his expansion theorem. For example, from the proposition "All men are all the rational animals," $m = ra$, what can we get about animals? By developing, $a = \frac{m}{r} = f(m, r)$

$= f(1, 1) m.r + f(1, 0) m.r' + f(0, 1) m'r + f(0, 0) m'r'$. Hence all animals consist of all men and some irrational things (r') not men (m').

If we would use trial references to the premises the coefficients of the expansion are no longer needed, and by making these trial references mechanical we have from Boole's one theorem the interesting logical machines of Jevons and Marquand. In the latter, the premises being reduced to the form of the combinations to be excluded, as suggested by Boole, the operation of excluding these combinations is performed mechanically by the machine, and the conclusion exhibited. Boole's wonderful creation was so strange that it germinated slowly.

In 1864 Jevons began using $+$ to unite different terms into one aggregate, whether they be mutually exclusive or not. McColl and C. S. Pierce gave slightly varying algebras, adding a new sign to express *existence*. In 1877 Ernst Schröder, in his *Operationskreis des Logikkalküls*, gave a beautiful simplification of the Boolean calculus, in which appears a duality like that of modern synthetic geometry. In 1879 Dr. Alexander Macfarlane published an algebra of logic which is particularly powerful for handling questions of probable inference and relationship.

Leslie Ellis, De Morgan, Joseph John Murphy, Alexander Macfarlane, and particularly C. S. Pierce, have developed a highly interesting symbolic logic of relatives. Prof. Peano, of Turin, is publishing a formulary containing the known propositions of the various subjects of mathematics, all written in a general symbolic language formed on the basis of algorithmic logic.

Finally, Dr. Ernst Schröder has collected in two encyclopædic volumes a systematic and critical account of all that makes the present status of algorithmic logic, including his own exceedingly important developments of many essential parts. In the first volume of this great work, *Vorlesungen über die Algebra der Logik (exakte Logik)* (first vol., Leipzig, 1890), the logical operations called identical multiplication and addition are shown to deserve these names, since all laws of addition and multiplication in general arithmetic which hold as general formulas, that is, without reference to the nature or individuality of the combined numbers, hold also for these logical operations; while the inverse operations may always be replaced by a simpler operation, *negation*, which appears as a common special case of each. The method of using the logical calculus is thus surprisingly simplified.

GEORGE BRUCE HALSTED.

Symbols, in zoölogy: See ZOOLOGY.

Symbols, Chemical: See CHEMISTRY.

Syme, JAMES, M. D.: surgeon; b. in Edinburgh, Scotland, Nov. 7, 1799; graduated in surgery 1821; was lecturer and Professor of Surgery at Edinburgh many years, and originated many improvements, including the resection of diseased joints in place of amputation, the process known as Syme's operation for amputation of the foot at the ankle-joint, and the removal of large tumors of the lower jaw by excision of the entire bone. He was the author of *The Excision of Diseased Joints* (1831) and *Principles of Surgery* (1832), both reprinted at Philadelphia (1866). D. in Edinburgh, June 26, 1870. See the *Memorial* by Dr. Robert Patterson (Edinburgh, 1874).

Symmachus (Gr. Σύμμαχος): one of the three chief translators of the Old Testament into Greek who attempted to improve upon the LXX. Fragments of his translation have been preserved in that which remains of the *Hexapla* of Origen. According to Epiphanius (*De Mens. et Pond.* 16), he was a Samaritan living at the time of Severus (193-211). Eusebius (*Hist. Eccl.* 6, 17) and Jerome (*Opp.* ii., p. 894) say that he was an Ebionite. (Cf. also Nestle, *Theol. Stud. und Krit.*, 1879, p. 733.) Geiger (*Jüd. Zeitschr.* i., p. 62) tried to prove that he was a Jew. He must have lived later than Ireneus, who in 180 A. D. (*Adv. Hær.*, 3, 24) does not mention him. Symmachus translated freely, and attempted to write a polished Greek. See also Field, *Hexapla*, i., chap. iii.; Bleek-Wellhausen, *Einführung*, p. 582; F. Buhl, *Kanon des Alt. Test.* (Leipzig, 1891, § 54).

RICHARD GOTTHEIL.

Symmachus: pope (498-514); a Sardinian by birth; consecrated Nov. 22, 498, after the death of Anastasius II., but his election was contested, and Laurentius was on the same day made antipope. Symmachus was supported by Theodoric, King of Italy, and Laurentius by the Byzantine emperor. The contest lasted about seven years, but was decided in favor of Symmachus. Of more interest are the enactments of the synods which were held during his reign, and which contributed much to the systematic organization of the papal administration. Some seven councils were held (499-504) in which the election of the pope was regulated, the free disposition of Church goods forbidden to laymen and made more difficult even for the clergy, the principle proclaimed that the occupant of the Roman see could be judged by no inferior, etc. He was distinguished for his zeal in building and restoring churches, in redeeming captives, and aiding the needy. D. July 19, 514. See Duchesne, *Liber Pontificalis*, i., p. cxxiii., 260. JOHN J. KEANE.

Symmachus, QUINTUS AURELIUS: author and orator; b. about 350 A. D.; educated in Gaul; held some of the highest civil offices in Rome in the latter part of the fourth century A. D. Of his works, the *Epistolarum Libri X.* are extant, and are of considerable historical interest; editions by Juretus (1580), Scioippius (1608), and Pareus (1651). Fragments of his speeches were discovered by Cardinal Mai, and published in *Scriptorum Veterum nova Collectio* (1815) and in Meyer, *Orat. Rom. Fragm.*, pp. 627-636. The best edition of all the works is by O. Seeck (Berlin, 1883); smaller edition by Kroll (Leipzig, 1893). Symmachus was one of the last champions of paganism, and a noble and pure character. D. about 405 A. D. Revised by M. WARREN.

Symonds, JOHN ADDINGTON: critic, biographer, and literary historian; b. at Bristol, England, Oct. 5, 1840; educated at Harrow School and Balliol College, Oxford, where he took the Newdigate prize; was elected a fellow of Magdalen in 1862. Ill health necessitated his residence for several years at Davos-Platz, Switzerland. Among his writings are *An Introduction to the Study of Dante* (1872); *Studies of the Greek Poets* (1873-76); *Sketches in Italy and Greece* (1874); an exhaustive work in seven volumes on *The Renaissance in Italy* (1875-86); *Sketches and Studies in Italy* (1879); *Essays* (1890); *In the Key of Blue* (1893); *Shakespeare's Predecessors* (1884); *Walt Whitman* (1893); besides several volumes of verse, original and translated, lives of Shelley, Michelangelo, Ben Jonson, and Sir Philip Sidney, and a translation of the *Autobiography of Benvenuto Cellini* (1887). D. in Rome, Italy, Apr. 19, 1893. H. A. BEERS.

Symons, GEORGE JAMES, F. R. S.: meteorologist; b. in London, England, Aug. 6, 1838; educated by private tutors. From 1860 to 1864 he was assistant to Admiral Fitzroy in the British Meteorological Office. In 1860 he established the annual publication entitled *British Rainfall*, and in

1865 the monthly called *Symons's Meteorological Magazine*, both of which he still conducts (1895). He established a rainfall service of his own, and this now extends over the British islands. He was chairman of the Krakatoa committee of the Royal Society (1884), and editor of their *Report*. MARK W. HARRINGTON.

Sympathy [from Gr. *συμπάθεια*, community of feeling, deriv. of *συμπαθής*, affected by like feelings; *σύν*, together + *πάθος*, feeling]: the emotion aroused by any presentation which suggests suffering or pleasure.

1. It is aroused by states clearly pleasurable or painful. There is no occasion for sympathy with one who does not need it; that is, with one who is not in a state of positive feeling, good or bad. Further, the study of the first sympathies of children shows that they extend to things as well as to persons, and only gradually get narrowed down to objects which feel. Sympathy as an emotion is shown before the child makes any distinction between things that feel and those that do not. But whatever the object be, the emotion is called forth only by such happenings as have before excited the child's own feelings of pleasure or pain.

2. Some degree of interest is necessary to sympathy. The confirmation of this appears broadly in everyday experience. For example, a man reads in the morning paper that thousands of people perish in a Chinese flood, and the cup of coffee that follows it up is much more important to him than their bereaved families; but a single death in his own community makes him at once solicitous in reference to the deceased man's relatives. Yet mere exploring interest when it comes upon suffering always starts the sympathetic feelings.

3. A person's sympathy is in a rough way proportionate to the nearness of the individual's connection with himself. This, again, needs no detailed proof; if one's brother breaks his leg one feels more sympathy than if a casual comrade meets the same misfortune; and the difference is greater still if the latter be only an animal, as, for instance, a favorite horse.

4. Sympathy is aroused, not merely by real beings, but by any idea of suffering. It is not necessary that one believe in the object of one's sympathies. Pictures in memory win sympathy, imaginations in fiction arouse it, vague forebodings of misfortune to others excite it. Whenever there arises in consciousness an idea of a conscious creature—be he fact, memory, fancy, illusion, reality in any of its kinds, that is, be he a possibility in any form—his fortune as suffering or enjoying moves our sympathy. This is true in spite of our efforts—often successful as they are—to suppress sympathetic emotion by dwelling upon the unreality or ill desert of the subject of it. *Little Dorrit* will move some readers in spite of their sense that the character is fictitious. We all feel the stirrings of fellow-feeling for the condemned criminal, even though we be convinced of the justice of his sentence. In cases in which we do suppress the emotion it is by getting rid of the idea, turning the attention to something else, exciting some new interest, that we do it; not by depriving the subject in question, the idea of suffering, of its force to affect us.

In this definition several further considerations are involved. By the use of the word "suggestion" an important distinction is intended between the object on which sympathy terminates and that by which it is caused. A suggestion is a stimulating idea which is brought into consciousness from without, or comes by an association, in such a way that it does not belong in the course of my real life. A suggested pain, for example, is a pain which a person is led to think of, but which he is not really suffering. Suggested suffering, therefore, is the idea of pain as far as it differs in consciousness from the actual pain of the experience presented.

But the question arises: Does such a suggestion excite sympathy? Suppose a cruel father who punishes his child by pinching, the presentation of the father may suggest pain to the child; but this does not seem to be sympathy—it may be fear, or memory of pain. Yet, on looking closer and observing children, we find that if the father take the attitude which the pain before accompanied, real sympathy is excited. Let him pinch a piece of wood, paper, even his own finger, and the child a year old gives clear expression to its sympathetic emotion. The child does not need the notion of another person who suffers, nor even of another object that suffers; he only needs two things: first, a presentation which suggests vivid pain, and second, the ab-

sence of the coefficient of reality which his own suffering had. In other words, the emotion of sympathy does not require an object at all. It acquires an object, and then maintains itself by the emphasis of this object; but in the first place it attaches to any convenient presentation in close connection with its exciting cause.

Kinds of Sympathetic Suggestion.—We may sympathize, therefore, without sympathizing with anything, and at first this is the experience of the young child. But its sympathy gets an object, and so maintains and develops itself. The child inherits a susceptibility to a social response to others' actions, and also by imitating their expressions he learns how similar organic conditions feel.

Altruistic Element in Sympathy.—The much discussed question of egoism versus altruism in the sympathetic emotion may receive partial consideration here. If it be true that suggested suffering excites sympathy, and that it is only suggested suffering that excites it, namely, suffering not present as real suffering is, and for that reason attributed, when knowledge is sufficiently advanced, to some one else—then we must believe that sympathy is not entirely egoistic. Suggested suffering is at first neither egoistic nor altruistic, because neither the ego nor the alter exists in consciousness when sympathy at first arises. The reference of real pain to self, and of suggested pain to another, seem to be both late acquisitions. But as it is true that the child gets his external objects clearly presented—especially his external personal objects—before he clearly presents himself, so sympathy must be a conscious emotional motive before self-seeking is.

Varieties of Sympathetic Emotion.—A large number of varieties or shades of emotion may be classed as sympathetic, i. e. kindness, benevolence, charitableness, etc. When felt toward an equal in character or station, we call it congratulation, fellow-feeling, fellow-suffering, companionship, common well or ill desert, solicitude, heartache; toward an inferior, compassion, pity, mercy; toward one much superior, it approaches awe, but differs from it in an unnamable way. J. MARK BALDWIN.

Sym'phony, or Sinfonia [*symphony* is viâ O. Fr. and Lat., from Gr. *συμφωνία*, a chording, unison, symphony, deriv. of *σύνφωνος*, harmonious, chording; *σύν*, with + *φωνή*, sound, voice. *Sinfonia* = Ital. < Lat. *symphonia* = Gr.]: in music, an elaborate composition designed for performance by a full orchestra, and consisting of several distinct movements (usually four in number), each of which has its own individual character, as the *allegro*, *andante*, *adagio*, *minuet*, *scherzo*, etc., while the whole unite in forming one symmetrical and complete work of art. There appears to have been no important difference between the symphony and the overture until about the end of the eighteenth century. Revised by DUDLEY BRUCK.

Sympho'sius: a Latin writer of the fourth or fifth century, about whom nothing definite is known. A collection of 100 riddles, each in three hexameters, is extant under his name. See Bachren's *Poet. Lat. Minores*, vol. iv., pp. 364-385, and Corpet's *Enigmes de Symposius recues sur plusieurs manuscrits et traduits* (Paris, 1868). M. W.

Sym'phyla [Mod. Lat., from Gr. *σύνφυλος*, of the same stock; *σύν*, together + *φυλή*, tribe]: in entomology, the group containing the peculiar myriapod *Scolopendrella*. The name was given under the impression that it united the characters of the MYRIAPODA and THYSANURA (qq. v.). *Scolopendrella* is really an aberrant diplopod, and has no other affinities. J. S. K.

Symphytum: See COMFREY.

Symplesom'eter [Gr. *συμπλέσις*, compression (deriv. of *συνπίεσις*; *σύν*, together + *πίεσις*, press) + *μέτρον*, measure]: an instrument for indicating the amount and variations of atmospheric pressure, consisting of a vertical glass tube, terminated above by an oblong bulb, and bent upward at its lower extremity, where it expands into a cistern open at the top. The bulb and upper part of the tube contain hydrogen, the cistern and lower part of the tube colored oil of almond. As the pressure of the atmosphere varies, the inclosed hydrogen expands or contracts by proportional but large quantities, and the liquid consequently rises or falls in the tube through large spaces; the scale attached is corrected also for temperature, and its indications correspond to those of a mercurial barometer.

Symplegades, sim-pleg aā-dēz, or Cya'nean Rocks (anc. *Συμπληγάδες* or *Κυανέαι*): two small islands at the Black Sea

mouth of the Bosphorus, on opposite sides of the strait: famous in mythology. When any living thing was passing between them they were supposed to come together immediately and then separate. Jason with the Argo by a stratagem eluded their collision, and they have since been immovable. That on the Asiatic side has disintegrated and almost entirely disappeared. That on the European side is about 550 feet long and 70 wide, consisting of three masses of volcanic rock. On its highest point is a marble pedestal with the inscription "Divo Casari Augusto." E. A. GROSVENOR.

Symptoms [from Mod. Lat. *symp'to'ma*, symptom, from Gr. *σύμπτωμα*, mischance, casualty, symptom, deriv. of *συνπίπτειν*, fall in with, meet with; *σύν*, with + *πίπτειν* (perf. *πέπτωκα*), fall]: in medical diagnosis and prognosis, the phenomena by which the physician judges of the nature and probable course of the disease he deals with. Symptoms are *objective*, that is, perceptible to the physician's senses, or *subjective*, perceptible only to the patient's senses, such as pain, deafness, etc. Each may be valuable, but the former are, as a rule, much more to be depended upon. These are by some writers called *physical signs*, as distinguished from *vital symptoms*, but these are sometimes objective, and practically all are classed as symptoms. Few symptoms are absolutely *pathognomonic*, or infallible signs of some one disease; but in general the import of symptoms can be learned only by the use of careful observation and patient and logical thought, guided by experience. In early times, when the knowledge of diseases was less advanced than at present, certain symptoms were regarded as diseases. Thus dropsy, asthma, diarrhoea, and the like have passed from their position as diseases to their proper station as mere symptoms of various and often quite dissimilar affections. It is still necessary to regard certain symptoms as diseases, particularly in the case of the nervous system, but advancing knowledge makes these fewer and fewer. WILLIAM PEPPER.

Synæresis: See SYNIZESIS.

Syn'agogue [= Fr. < Lat. *synagoga*, from Gr. *συναγωγή*, a bringing together, collecting, (in Septuagint and New Testament) assembly, synagogue; *σύν*, together + *άγω*, lead. The Hebrew name was *Keneseth* or *Beth Hakkene'seth*: Aram. *Kenishtë*. Other Greek names are *συναγωγή*, *προσευχή*, *προσευκτήριον*, *σαββατεῖον*]: a congregation or assembly of Jews met for the purposes of religious instruction and worship; also the building devoted to such purposes.

Origin.—It is impossible to fix with any accuracy the date at which the synagogue took its rise. Despite rabbinical traditions, its beginnings probably do not go beyond the Babylonian captivity. Far away from the national religious center, prayer became for the Jews a substitute for sacrifice, and a study of the traditional literature a religious exercise. Upon its return to Palestine the new community regarded the Law as an end in itself, and a knowledge of its contents of supreme importance (Josephus, *Contra Apion.*, ii., 17). The first synagogues were established for the reading and study of the Law, and Philo distinctly calls them *διδασκαλεῖα* (*Vita Mosii*, iii., 27). It is thought by some that Psalm lxxiv. 8 has reference to such assemblies. In the New Testament the synagogue is already a fixed institution (Matt. iv. 23, Luke iv. 15, etc.).

Development.—Side by side with the temple numerous synagogues were established in Jerusalem. Acts vi. 9 mentions those of the Libertines (freedmen), Cyrenians, Alexandrians, Cilicians, and Asiatics. They seem to have spread over the whole of Palestine. Ruins of synagogues have been found in Galilee, in Kasium, Kefr Birim, El-Jish, Meiron, Nabartein, Kedes, Tell-Hum, Keraze, and Irtik. Judging from the architectural remains, these belong to the time between the first and fourth centuries of our era. According to rabbinical law, ten men are sufficient to form a congregation. But also in the Diaspora, wherever the Jews went, they built synagogues (Philo, *De Septenariis*, chap. vi). In Alexandria there were a number (Philo, *Legit. ad Caium*, § 20). Inscriptions found in Rome tell us of nine different synagogues in the city (Berliner, *Gesch. der Juden in Rom*, 1893, p. 62).

Form and Constitution.—According to express rabbinical law, the synagogue was always to be built on the highest point of the city, though there are traces of some which must have been built outside the limits of the city or village. Some services (as on fast-days) were held in the open market-place. The style of the early synagogues is largely

Græco-Roman. In Palestine they were built with the entrance (front) at the S. They were given into the charge of a body of elders who in Palestine—at least in the smaller places—were also the political heads of the community. In places of mixed population and in the Diaspora a special body (*συναγωγή*) was appointed for that purpose, the head of which was called *ῥητορεύς*. To this body was also delegated the power of hurling the ban. For the reading of the service there were no stated functionaries, though throughout the Roman empire we find the *ῥητορεύς* (*Rosh Hakkeneseth*), who watched in general over the service and selected the readers and preachers for each office. As collections for charity were regularly made, there were specially appointed almoners (*gabbā' tzedākāh*). The beadle (*Chazzan Hakkeneseth*, *ῥητορεύς*) had charge of the building.

Service.—The most important object in the synagogue was the Ark (*Tēbhāh*), which contained the scrolls of the law, wrapped in linen and deposited in boxes (*ῥητορεύς*). The readers and preachers officiated from a raised platform (*Bēma*). On New Year's day and on fast-days horns were blown (*Shoferōth*, *Chatzōtzerōth*). The congregation was seated according to a certain order of precedence. The service, which was in Hebrew (though in the Diaspora Greek seems also to have been used), consisted originally of the recitation of the *Shema* (Deut. vi. 4-9, to which xi. 13-21, Numb. xv. 37-41 were added later); the reading of the Law (*Tōrah*), which was done by at least seven men, in a three-year (later on in a yearly) cycle; a reading from the Prophets or Hagiographa (*Hafārāh*); and the priestly blessing. The portions from the *Tōrah* and *Hafārāh* were also translated aloud into Aramaean by a specially appointed officer (*Meturgēman*). Gradually other prayers were added; the first and last three of the so-called *Eighteen Benedictions* have their origin in the times of the Mishnāh. Expositions of the weekly *Tōrah* readings were given by one prominent teacher present (*Shabbatay de raiš*, *Shabbatay de raiš*, Matt. iv. 23), from which the Christian sermon and the Jewish MIDRASH (q. v.) were evolved. The one who was invited to act as reader was called "Messenger of the Congregation" (*Sheliach Tsibbūr*). Services were also held on Saturday afternoon, and on the mornings of Tuesday and Thursday, the chief market-days of the week. It will be seen how closely the organization of the early church followed that of the synagogue.

Further Development.—The building of new synagogues in the Roman empire, though technically illegal, was persistently carried on, and every community of Jews had one or more. During the Middle Ages the synagogue was used as a treasury and as a refuge-place from impending death (Stobbe, *Die Juden in Deutschland*, p. 168). The services grew in number. Minor local festivals were added; the old ones (the Day of Atonement excepted) being celebrated in all places outside of Palestine for two days instead of one. The ritual was developed by the addition of Psalms and of poetical compositions. (See JEWISH LITERATURE—*Characteristics of Hebrew Poetry*.) The best of the Jewish poets of Spain (1030-1230 A. D.) worked in the liturgy of the synagogue. Though the framework of the liturgy, the prayer *par excellence*, remained the same, each country, and almost each city, had its peculiar additions (*Minhag* = custom, rite). It is customary to distinguish two chief rites, the Spanish-Portuguese and the Polish-German; though there are special African, Arabian, Italian, Greek, Spanish, Provençal, German, etc., rituals. The old custom of preaching on every Sabbath gradually fell into disuse. It was relegated to the afternoon service or confined to festivals and special occasions. The rabbi became more of a teacher than a minister, so that by his side there grew up the *Mōchiach* and *Maggid*, the moral preachers. The *Chazzan* developed into the reader and intoned the service. Women were rigidly separated from men. The reform movement in the Jewish Church, which began with Moses Mendelssohn, chiefly concerned the synagogue. His translation of the Pentateuch into literary German (1783) induced the desire for the translation of the prayers into the vernacular. These had grown to intolerable lengths; and, owing to the protracted misfortunes of the Jews, the whole service had become somewhat ungraceful and uncouth. With a view to remedying these evils, the Reform congregations in Berlin and England have modified the synagogue service to some degree, and have in a few synagogues introduced hymn-books in the vernacular, though nearly all the synagogues in Europe and a large number of orthodox and

conservative ones in the U. S. still hold to the old ritual. In the U. S., where the congregational system has been carried to its furthest extent among the Jews, the advanced Reform synagogues have largely curtailed the ritual, have introduced many English prayers, have laid aside the hat and the praying-scarf (*Talit*), have emphasized the importance of the sermon, and administer the rite of confirmation to both boys and girls, which was first introduced in Berlin in 1817. A number of these synagogues have also added to the Friday evening and Saturday morning services a short service and lecture on Sunday morning.

LITERATURE.—See especially Schürer, *Gesch. des Jüd. Volkes im Zeitalt. Jesu Christi*, ii., § 27 (Eng. trans. div. ii., vol. ii.), where the older literature will be found. Cf. also Stapfer, *Palestine in the Time of Christ* (New York, 1885, p. 333); C. G. Montefiore, *The Hibbert Lectures* (1892, p. 388); Herzfeld, *Geschichte des Volkes Israel* (iii., pp. 129, 183); Zunz, *Die Gottesdienstlichen Vorträge der Juden* (2d ed. 1892); Zunz, *Die Ritus des synagogalen Gottesdienstes* (Berlin, 1859); Löw, *Der Synagogale Ritus* (*Mntsch. für Gesch. und Wissen. des Judenth.* (1884); Hamburger, *Real-Encyclopädie für Bibel und Talmud* (part ii., 1883, s. v. *Synagogue*); Holdheim, *Gesch. der Jüd. Reformgemeinde* (Berlin, 1857).

THE GREAT SYNAGOGUE (*Kenēseth Haggēdōlāh*) was an assemblage of 120 men which, according to Jewish tradition, Nehemiah brought together for the reorganization of religious worship and the maintaining of civil order. They are supposed to fill up the gap between the last of the prophets and the first of the rabbis. To this body are ascribed the reconstitution of public worship, the final collection of the canon of the Old Testament, and the introduction of certain prayers. Many other ordinances are referred to their initiative. Richard Simon (*Histoire Crit. du Vieux Test.*, i., chap. viii.) was the first to question the authenticity of this tradition. Abraham Kuenen's treatise on the subject seems to have removed all doubts that we have here simply a myth based upon the assembly of the people mentioned in Nehemiah viii.-x., which solemnly accepted the Law, and that there never existed a legal or religious body known as the Great Synagogue.

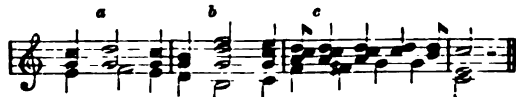
LITERATURE.—Kuenen, *Over de mannen der groote Synagoge* (*Verslag en Meded. der Kon. Akademie*, Amsterdam, 1876; trans. by K. Budde in *Gesamm. Abhandl. von A. Kuenen* (Freiburg, 1894), p. 125); Zunz, *Gottesdienstl. Vorträge* (2d ed., p. 34); Grätz, *Die Grosse Versammlung* (*Mntsch. für Gesch. und Wissensch. des Judenth.*, 1857, p. 81); D. Hoffmann, *Ueber die Männer der grossen Versammlung* (*Mag. für Wissensch. des Judenth.*, 1883, p. 45); Ginsburg, *Killo's Cyclopædia s. v.*; Schürer, *Gesch. des Jüd. Volkes* (ii., p. 291); Bleek-Wellhausen, *Einleitung in das Alte Testament* (4th ed., p. 558); Buhl, *Kanon und Text des Alte Testament* (Leipzig, 1891, § 9); Ed. König, *Einleitung in das Alte Testament* (1893, p. 445).

RICHARD GOTTHEIL.

Synap'ta [from Gr. *συνάπτεσθαι*, joined together, fastened]: a genus of HOLOTHURIANS (q. v.), embracing worm-like transparent forms noticeable for the anchor-like plates in the skin, which are favorite objects with microscopists.

Synaptase: See EMULSIN.

Syncope [from Lat. *syn'cope* = Gr. *σύνκοπή*, syncope (in med. and in gram.): *σύν*, together + *κόπτειν*, strike, cut]: in music, a certain arrangement of notes which often produces a sudden check of the rhythmical movement, thus disturbing the regular accent, and rendering emphatic that part of a bar or measure which would otherwise be unaccented. See *a*, *b*, and *c* in the example following:



Syncope of a simpler kind occurs when the last note of any bar and the first note of the bar succeeding are tied together by a "bind," and thus form in reality only one note. Formerly, instead of writing two notes separately with a bind, it was usual to write only one (equal to the sum of both), and place it directly across the bar-stroke.

Revised by DUDLEY BUCK.

Syncope [Gr. *σύνκοπή*, deriv. of *σύνκοπτειν*, chop up, squeeze together; *σύν*, together + *κόπτειν*, chop]: the shortening of a word by a syllable through the omission of a

medial vowel or a medial vowel and one or more consonants. This is the strictest and proper meaning of the term, but it is sometimes loosely applied also to the omission of a medial consonant. Examples of syncope are *hemp* for O. Eng. *henep*, *mint* for O. Eng. *mynet*, *church* for O. Eng. *cyrice*, *p'lice* for *police*, *b'lievs* for *believe*, *s'pose* for *suppose*; Germ. *glauben* for **ge-lauben*, *gleise* for **ge-leise*. The omission of an initial vowel is called *aphaeresis*; of a final vowel, *apocope*.

BENJ. IDE WHEELER.

Syncope: See FAINTING.

Syncretism (Gr. *συγκρητισμός*): said by Plutarch to have originated as the designation of a custom characteristic of the inhabitants of Crete, who forgot or overlooked all their internal dissensions as soon as a controversy occurred with any foreign country. In the sixteenth century the word was used to denote those attempts which were made by Pico de Mirandola, Bessarion, and others to reconcile the philosophy of Aristotle with that of Plato. But a still more extensive use for the name was found in the seventeenth century, it being applied to the views of George Calixtus and his followers, who hoped to heal the schism of the Christian Church by acknowledging the traditions of the first Christian centuries besides the Bible, and declaring the *Symbolum Apostolicum*, the common basis of the various Christian denominations, as sufficient for the definition of true Christianity.

Revised by W. T. HARRIS.

Syndicate: See TRUSTS.

Synecdoche [= Lat. = Gr. *συνεκδοχή*, liter., an understanding of things together or of one thing with another; deriv. of *συνδέχεσθαι*; *σύν*, with, together + *δέχεσθαι*, understand, liter., take from; *δέ*, from + *δέχεσθαι*, receive, take] a figure of speech which displaces an ordinary term by one which naturally suggests it, on account of the relation whole to part or part to whole, genus to species or species to genus; thus *city* for *people* of the city, *blade* for *sword*, *bald-head* for *bald-headed man*, *bird* for *fighting-cock*, *man* for *humankind*, etc. See METAPHOR and METONYMY.

BENJ. IDE WHEELER.

Synergism [deriv. of *synergy*, from Gr. *συνεργία*, a working with, assistance, deriv. of *συνεργῶν*, work with, assist, deriv. of *σύνεργος*, working with or together; *σύν*, with, together + *εργον*, a work]: in theology, the view that God and man share in the work of regeneration, the human will responding to the Spirit of God. So Melancthon taught, opposing the view of Luther as to the bondage of the will and its complete passivity in conversion. Flacius and his party charged Melancthon with teaching that the human will had the initiative in conversion. This misunderstanding was repudiated by Melancthon, who endeavored to make his meaning clearer by employing other phraseology. This difference of opinion in regard to the will led to vehement and long-continued controversies, and divided the Lutherans into the Flacians, or the orthodox, and the synergists. The former carried the day in the Formula of Concord (1577), but few modern Lutherans defend their view. See REGENERATION and CONCORD, FORMULA OF.

SAMUEL MACAULEY JACKSON.

Syne'sius: bishop, philosopher, and poet; b. in Cyrene, the civil metropolis of the Libyan Pentapolis about 375; studied philosophy in Alexandria under Hypatia, of whom he became an enthusiastic disciple; was sent at the head of a provincial embassy to the Emperor Arcadius at Constantinople in 397, and stayed there for three years, which time he describes as exceedingly painful; visited Athens in 402, but found himself greatly disappointed, and spent most of his time in rural retirement near the frontier of Cyrenaica, occupied with the study of philosophy and literary pursuits. In 410 he was elected Bishop of Ptolemais, the ecclesiastical metropolis of the province, but his relation to Christianity previous to his election is rather obscure, and it can not be made out with certainty whether he was baptized or not. He accepted the election with great reluctance. Many of the Christian doctrines he could not reconcile with the ideas of the Neo-Platonic philosophy which formed his innermost conviction. The date of his death was about 415 (Zeller). Of his works are extant several essays, among which are *De Insomniis*; several orations, among which that held before Arcadius (*De regno*); a number of hymns, often translated into modern European languages, and considered to be the finest specimens of mysticism in its highest flights; and letters of great interest. Collected edition, with Latin translation, by Petavius (Paris, 1612; 2d ed. 1640); critical

editions by Krabinger of separate works. See H. N. Clausen, *De Synesio* (Copenhagen, 1831); C. Thilo, *Commentarii in Synesii Hymnos* (Halle, 1842-43); and Volkmann, *Synesius von Cyrene* (Berlin, 1869).

Revised by W. T. HARRIS.

Syngnath'idæ [Mod. Lat., named from *Syngnathus*, the pipe-fish, the typical genus: Gr. *σύν*, together + *γνάθος*, jaw]: a family of marine lophobranchiate fishes. The form is much elongated with little flesh, the body is almost covered with partially ossified plates, the head and snout are long and tubular, and the males have pouches in which the eggs of the female are hatched. They attain a length of 2 or 3 feet, live upon small marine animals and the eggs of other fishes, and have great affection for their young, which often return to the egg-pouch of the male parent for protection. Not all the pipe-fishes belong to this family, that name being often given also to the fishes forming the family *Fistulariidae*, also called pipe-mouths and flute-mouths.

Synize'sis [Gr. *συνίζησις*, deriv. of *συνίζω*, sit down together, sink together; *σύν*, together + *ίζω*, to sit]: the blending of two vowels into one syllable. The term is generally used of vowel-contractions not indicated in the written form of language. Thus when in Homer the words *τέλχεα*, *ἡμῶς* are scanned as disyllables without change of written form, the phenomenon is called synizesis, but when, as in Attic Greek, the written form presents *τέλχ'α*, *ἡμῶς*, the change is called contraction, or synæresis, the opposite of diæresis. It is only in terms therefore of the written and not of the spoken language that synizesis differs from contraction. Contraction between vowels of different words is called *crasis*.

BENJ. IDE WHEELER.

Synod [viâ Fr. from Lat. *synodus* = Gr. *σύνωδος*, a coming together, meeting, synod; *σύν*, together + *ὁδός*, way]: an ecclesiastical assembly or council. Synods may be local, diocesan, or œcumenical; for the last, see COUNCILS, ŒCUMENICAL. The supreme body of the Russian Church is the Holy Governing Synod. In the Presbyterian Church the synod is the ecclesiastical court, composed of lay and clerical representatives, which comes between the presbytery and the General Assembly. In the Northern Presbyterian Church it takes in, generally speaking, the presbyteries of only one State, and is composed of delegates chosen by these presbyteries. In the Reformed Church (Dutch and German) the highest court is called the General Synod, the next in rank the Particular Synod. The word synod is also used in the Lutheran Church, both on the Continent and in the U. S., for a church court composed of clerical and lay delegates. The synods in Reformation times in Germany were exclusively clerical; but the earliest in which the lay element, now an integral part, appeared was that held in Paris in 1550. S. M. J.

Synodites: See CENOBITES.

Synod of Dort: See DORT, SYNOD OF.

Synonyms [from Fr. *synonyme* < Lat. *synonymum* = Gr. *συνώνυμον*, synonym, liter., neut. of *συνώνυμος*, having the same name or meaning; *σύν*, together + *ὄνομα*, name]: words so nearly equivalent in meaning as to be in some of their uses interchangeable. In a thoroughly organized and digested language it is doubtful whether two words are ever perfect synonyms for all purposes. The superfluous material which tends to accumulate in a language, especially a literary language, through the formation of new derivatives, the widening and shifting of signification, and the introduction of loan-words (see DOUBLET), is either applied by differentiation to the indication of special phases or shades of meaning or is discarded in the survival of the fittest. Conscious discrimination of the exact values of synonyms is often a most difficult task. Books which aid in this are: Smith, *Synonyms Discriminated* (4th ed. London, 1890); Crabbe, *English Synonyms Explained* (revised ed. 1891); Roget, *Thesaurus of English Words and Phrases* (n. e. London, 1833, a particularly useful book); Schmidt, *Synonymik der griech. Sprache* (5 vols., 1876-86, the best work of its kind); Döderlein, *Lateinische Synonymik* (6 vols., 1838); Shumway, *Handbook of Latin Synonyms* (based on the German of Meissner, 1884; this, as well as preceding, unsatisfactory); Trench, *Synonyms of the New Testament* (11th ed. London, 1890); Eberhard, *Synonym. Handörterbuch der deutschen Sprache* (2d ed. 1888); Sanders, *Bausteine zu einem Wörterb. der sinnverw. Ausdrücke im Deutschen* (1890); Lafaye, *Dictionnaire de Synonymes Franç.* (1878, good); Tommaseo, *Dizionario dei Sinonimi della lingua Italiana* (1867).

BENJ. IDE WHEELER.

Synovial Membranes (*synovialis* is from Gr. *syn*, with + *laos*, a row, agg.; connective tissue) membranous structures which surround the closed cavities connected with the joints, or occur about certain tendons or between opposed movable surfaces; they resemble serous membranes in structure, but are distinguished from them by the viscid or glairy character of the synovial fluid or synovia with which they are intercalated, in contrast to the thin watery secretion bathing the serous surfaces. The synovial membranes consist entirely of connective tissue, between the closely folded lamellae of which numerous branched or spindle cells are situated; the free inner surfaces of these membranes are invested with an unperfected layer of flattened cells, which, in places, closely suggest an endothelium, while, in other localities, thin plate-like elements are replaced by loosely grouped branching cells. There are three classes of synovial membranes in the human body: (1) The articular line the walls of the closed cavities of the joints, and secrete a fluid to lubricate the opposed cartilaginous surfaces of the articulating bones, over whose surfaces of contact, however, no part of the articular membrane extends, as it falls away and terminates a short distance before reaching the articular facets. (2) Vaginal or sheath-like synovial membranes surround the tendons when passing through osseofibrous canals or grooves in the surface of bones, as is the case in the hand and foot. (3) Bursal (Gr. *bursa*, a bag) little synovial sacs or cushions, are interposed between parts moving one upon the other with friction, as where a tendon glides over or presses directly upon a bony prominence. The synovial fluid consists of nearly 95 per cent. of water, rendered viscid by mucus, unabsorbable cells, fat, albumen, and salts. The synovial membranes are frequently the seat of disease. Acute synovitis, acute inflammation, may attack any joint as the result of violent injury, exposure to cold, rheumatic taint, or less often from vitiated blood in the course of fevers and other diseases. The symptoms are local swelling, extreme tenderness upon touch or pressure, pain when moved, and often persistent agonizing pain caused by the distension of the sensitive inflamed cavity by a hypersecretion of fluid. Penetrating wounds of the large synovial cavities, whether punctured, lacerated, or occurring in connection with fractures, are serious, often necessitating the loss of a limb. Chronic synovitis is often a product of tubercular or scrofulous hereditary taint with injury or over-use as the exciting cause. The destructive process often involves the ends of the bones and the ligaments, which are softened and disintegrated. Abscess, partial dislocations, and ankylosis, or stiff joint, are the chief misfortunes which result. The synovial bursa often become swollen and prominent by hypersecretion, and also by injury and inflammation; such is the "weeping elbow" of the back of the wrist, which resembles a cystic tumor. Its contents must be evacuated and the membranes are irritated or lacerated to disperse it by adhesive inflammation. The occurrence of dislocated hurses, and difficulty of cure in recent cases, are due to their connection with the cavity of an adjacent joint.

Revised by G. A. PRINCE.

Syntax (Gr. *σύνταξις*, arrangement, organization, the organization of elements, as the elements of speech, into a larger whole; commonly used by the Greek grammarians in the stricter sense of the arrangement of words to form the sentence; *σύν*, together + *τάξις*, to arrange); the science which treats of the sentence and its organization and of its constituent parts. In the following article it is not the purpose to consider the syntax of languages in general, but only that of the Indo-European languages, and that, too, only in so far as it admits of a comparative treatment. In the vast field of the literatures of the Indo-European peoples there appears only at two points the independent beginning of a grammatical science, as well as of a syntax, namely, in India on the one hand, and in Greece on the other. The Hindus failed to recognize syntax as a distinct department of grammar, but scattered their syntactical observations at various points in the body of their grammatical doctrine. It is possible even for one not versed in Sanskrit to gain some impression of this body of doctrine through Otto Böhtlingk's second edition of Pāṇini, in which the rules laid down by this prince of Indian grammarians are given in accurate German translation. (1) Böhtlingk, *Pāṇini's Grammar*, Leipzig, 1897; cf. also Th. Bouley, *Geschichte der Sprachwissenschaft*, Munich, 1897, pp. 85 ff.) In order to gain a correct appreciation it must be remembered that from very early times Sanskrit, i. e. the language of the upper

classes, which stood in contrast with the language of the people, was a subject of instruction. That is to say, a litetus was shown by means of grammatical instruction what forms were to be used in polite speech, when he had a particular thing to say. Thus, for instance, he was taught that when he wished to report something that had occurred that day he was to use the aorist; when he wished to indicate the agent, which accompanies a verb, the nominative or the instrumental. That the Indian syntax takes its starting-point with that which one wishes to say, the necessity for the expression of ideas, whereas we in our modern discussions choose the external form as the starting-point. Though our procedure is unmistakably the more correct, we may nevertheless learn much from the Hindus, for they were scrupulous observers, paid attention, and insisted upon precise and clearly intelligible expression. The Hindus would never, for instance, be guilty of so absurd a rule as that familiar in the German schools: "Auf die Frage 'wan?' nicht der Dativ," "the dative answer to the question to whom? or for whom?"—which in reality expresses nothing more than that a dative in the question is often matched by a dative in the answer. As the best contributions which the Hindus have furnished in this field may be regarded their doctrine concerning composition, a subject which we commonly discuss at the end of the inflexions, but which may fairly claim a place also in the syntax, and their theory of the cases which is set forth in Delbrück's *Comparative Syntax* (I, 172 ff.). The Indian method of regarding language was denied a permanent influence upon modern grammar, if for no other reason, because of the late period at which it became known, or at least became generally accessible. Concerning the grammatical system of the Greeks we have, besides numerous monographs, a comprehensive work by H. Steinthal, *Geschichte der Sprachwissenschaft bei den Griechen und Römern* (2d ed. Berlin, 1900). The first part embraces the theories of the Greek philosophers, in which was found the source equally of instruction and confusion for syntactical theory. The second source of the Greek grammatical system was the study of the Greek classics which reached its formal acme in the Alexandrian period. From the Greek grammatical system, resting upon these foundations, is derived the entire grammatical structure used by the modern world, as well as also the greater part of the syntactical concepts. (Cf. introduction to *Comparative Syntax*, vol. I.) The term *σύνταξις*, *syntaxis*, was used very early, namely, in the *Zoëne* of Theophrastus Thrax, written probably in the first century B. C., where the definition of a part of speech reads as follows: *λέξις ἑστὶ μέρος ἰδιότροπον καὶ ἀνὰ σύνταξιν λέγειν*, i. e. a *λέξις* is the smallest division, or the unit of the organized sentence. Syntax first appears as a special part of grammar in the well-known work of Apollonius Dyscolus (probably middle of second century A. D.). For a correct understanding of the work *ἡτοιμασμένη*, it is necessary to remember that there already existed distinctions of the parts of speech, and that in single cases certain expressions had already been noted as grammatically correct or incorrect. Apollonius sought, however, to determine wherein the grammatical correctness or incorrectness lay. It depends with him upon whether the *κατάστημα*, the correspondence of the forms, has been recognized or not; for instance, whether with a singular noun the singular or perhaps the plural of a verb has been used, whether or not the case representing the correct idea has been used with the verb or not. He treats therefore of what is later brought together under the head of agreement and of government. This constitutes, however, only the central topic of his work; connected therewith are careful discussions concerning the character of various parts of speech, e. g. of the article. The later syntax adopted from him not only various definitions of fundamental grammatical concepts, but also the outlines of the doctrine concerning *anastrophe* and *ellipsis*. Through the Roman grammarians, particularly Priscian, his syntax (*immutatio*) was handed down to the Middle Ages. Here it fell naturally into the hands of philosophy, where, until the beginning of the sixteenth century, it remained. In the introduction to the *Comparative Syntax* cited above it has been shown how one after another the scholastics, then Locke, Kant, Hegel, Herbart, exercised a determining influence upon the development of grammatical conceptions, but with the opening of the nineteenth century these currents of influence, all independent of philosophy, combined to reshape the methods of syntactical research, namely: (a) The more accurate study of the Greek

and Latin texts, by which a purely empirical treatment of syntax became possible, as it, e. g., appears in the Greek grammar of Matthiae (A. Matthiae, *Ausführliche griechische Grammatik*, Leipzig, 1807); (b) the awakening impulse of Teutonic philology, connecting itself with the name of Jakob Grimm, who first taught how grammar, including syntax, can be treated historically; and (c) the science of comparative philology, which established for the study of syntax as well as of all linguistic phenomena a foundation reaching down into most primitive times.

The representatives of the comparative science of language occupied themselves first with the cases. Here it was at once observed that Sanskrit contains, besides the cases occurring in Latin, also the locative and the instrumental. This led directly to the conclusion that these cases, and perhaps still others, must have existed in primitive times. What now has become of these extra cases in the different languages, e. g. in Greek? The idea readily suggests itself that they had been absorbed into the other cases; for instance, the ablative into the genitive, the instrumental and locative into the dative. It is difficult to say who first gave expression to this conception, which is summarized under the term *syncretism*; it was certainly first developed in detail by Delbrück (B. Delbrück, *Ablativ, Localis, Instrumentalis*, Berlin, 1867). Here follows, besides a variety of monographs, the important work of Hübschmann (*Zur Casuslehre*, Munich, 1875), which contains not only a good history of the theory of the cases, but also adds a treatment of Iranian case-usage, to which Delbrück had given little or no attention. Then follows Gaidicke, *Der Accusativ im Veda*, (Breslau, 1880), a superb piece of work, full of ideas and covering a larger field than the title promises, a book which every syntactician is recommended to study. A first attempt in the study of the structure of the sentence was made by Ernst Windisch in an article on the origin of the relative pronoun (*Curtius' Studien*, ii., Leipzig, 1869). Even though the main idea, namely, that the relative was developed only in the separate languages, may perhaps be incorrect, yet the presentation of the pronominal usage in the different languages was important and suggestive. The syntax of the verb is the general subject of a series of works which appeared in the *Syntaktische Forschungen* (Halle, 1871-), published first by Delbrück and Windisch conjointly, later by Delbrück alone. In these the attempt is made to trace through the usage of the two languages compared the uniform fundamental idea of *will* for the subjunctive and of *wish* for the optative, in doing which it was necessary of course to construct a theory for the development of the different forms of the sentence. In this work the presentation of the actual existing facts of Vedic syntax was notably insufficient. This it has been the purpose of the *Altindische Syntax*, to be mentioned later, as far as possible to correct. In immediate connection with these first attempts there appeared in 1872 a work of Ludwig Lange, *Ueber den homerischen Gebrauch der Partikel el* (*Abhandlungen der sächsischen Gesell. d. Wiss.*, 1872, vol. vi.), in which Delbrück's theories concerning the sentence-types were corrected and complemented, and an example given of statistical treatment of an individual phenomenon which has seldom been paralleled. A foundation for the study of tense is presented in the second volume of the *Syntaktische Forschungen*, *Die altindische Tempuslehre*, by B. Delbrück (Halle, 1876), in which was especially demonstrated that the Sanskrit has an aorist usage which, as may be shown, though not shown in this work, corresponds in substance with the Greek and the Slavic usage. In reference to the verb is to be added the work of Julius Jolly, *Geschichte des Infinitivs im Indogermanischen* (Munich, 1873). The infinitive is nothing more than a case introduced into the verb system.

Of prime importance for comparative syntax is the *Vergleichende Syntax der slavischen Sprachen*, by Franz Miklosich (Vienna, 1868-73). Though the theoretical outlines of this work are in many regards unsatisfactory, and the comparison of the different Slavic languages with each other and of the Slavic with other languages is not sufficiently true to historical method, yet all the defects of this excellent work are redeemed by the presentation of an inexhaustibly fresh body of language-material, from which all subsequent writers have drawn and continue to draw. In Miklosich's syntax the idea of the sentence scarcely claimed a proper place. Thus there is lacking, for instance, a chapter on the order of words. How much is to be observed, however, in this field has been illustrated in an article of A. Bergaigne, *Mém. de la soc. de linguistique* (vol. iii., Paris,

1875), and in the third volume of the *Syntaktische Forschungen*, *Die altindische Wortfolge aus dem Çatapathabrâhmana* (Halle, 1878), which limits itself, however, to the Sanskrit. The fifth volume of the *Syntaktische Forschungen*, *Altindische Syntax*, by B. Delbrück (Halle, 1888), deals also with the Sanskrit, while the fourth volume contains sketches in Greek syntax.

All these works, and such others as might be added, contain only special discussions, and seldom venture upon the field of theoretical inquiry. A summarizing treatment is attempted in Delbrück's *Vergleichende Syntax* (part i., Strassburg, 1893; Engl. transl. *Comparative Syntax*), which forms the continuation of Brugmann's *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen*. Theoretical discussions appear in an earlier work of Ludwig Lange, *Ziel und Methode der syntaktischen Forschung*, an address at the *Göttinger Philologenversammlung*, 1852; also in the *Prinzipien der Sprachgeschichte*, by Hermann Paul (2d ed. Halle, 1886); and finally in the above-mentioned introduction to Delbrück's *Comparative Syntax*. What follows will be devoted to a brief statement of certain theoretical considerations.

I. *Limits and Classifications of Syntax*.—As regards the question how syntax is to be defined and limited in reference to other departments of grammar, complete agreement has not yet been reached, as indeed it has not been reached regarding the mutual provinces of the grammar and the lexicon; it is, for instance, still customary to discuss in the grammar certain things like the numerals, which properly belong only in the dictionary. This need not, however, be regarded as strange. In questions of this sort are involved not only difficult matters of principle, in reference to which the stubbornness of scholars is wont to assume monumental proportions, but also practical considerations and necessities. Every author desires to present a comprehensive treatment of his material, and every one who wishes to avoid discourtesy feels himself hampered by the traditional views and usages of his readers. Apparently all are now of the opinion that one thing belongs with certainty to syntax, namely, the doctrine concerning the organization of the word-forms into the sentence, i. e. the doctrine of the sentence in the narrower sense. An exception appears, however, it must be admitted, in F. Miklosich, who expresses himself as follows concerning the conception of syntax: "That department of grammar which undertakes to set forth the signification of the word-classes and word-forms is called syntax; syntax is accordingly divided into two parts, of which the one deals with the signification of the word-classes, the other with the signification of the word-forms." Under this limitation of the conception, however, the author himself is often involved in embarrassment. Thus the verbs without a subject, which we commonly call the impersonal verbs, he has been obliged, inasmuch as he does not recognize a doctrine of the sentence, to include in an appendix to the nominative. The order of words he has not discussed at all, though there is undoubtedly a traditional type of word-order in the Indo-European languages as well as in the Slavic. Miklosich was evidently led to this view by an exaggerated empiricism. He insisted on recognizing only the facts of tradition, and the union of word-forms into the sentence did not seem to him traditional, but a product in each several case of the free choice of the speaker. This view is, however, incorrect. As already indicated, certain types of word-connection and word-order are transmitted as psychological realities, and even one who declines to recognize psychological realities must yet allow that there is an objectively perceptible part of a sentence, namely, the sentence accent, which is in and by itself a matter of actual tradition. That we do not indicate this in writing is a matter of accident. It is in no way less real than the accent of individual words. Certainly one can not doubt that the interrogative sentence differs in the traditional accent from the declarative sentence, or that the differences between dialects express themselves with especial distinctness in the different accentuations of the sentence.

Besides the doctrine of the sentence in the narrower sense, we commonly include under syntax the doctrine of the parts of speech. Many scholars, to be sure, decline to admit this, and prefer to classify grammar under the heads doctrine of sounds, doctrine of forms, doctrine of signification, doctrine of sentence-structure. This is at bottom largely a matter of terminology. It is of slight importance whether a given part of the grammar is classed as the first part of syntax or by itself as the doctrine of signification. It is a

fact of more importance than there is disagreement concerning what may be included under the chapter on the parts of speech. Under the noun, *e. g.*, involved the different kinds of substantives—concrete, abstract, simple, compounded, *etc.*—gender, number, case. The different kinds of nouns were discussed by Brugmann under the head of stem-formation, but not the subject of gender, and so it happens that in Dehnbach's *Comparative Syntax*, which supplements Brugmann's *Grundriss*, there is no chapter on the different kinds of nouns. Similarly with other points. In general, however, it is agreed that the treatment of the parts of speech falls under the syntax, or constitutes an introduction thereto. How is it with other points, which less frequently claim discussion? Where, for instance, shall the sentence-mood be treated? It is related to the sentence as the word-concept to the word. This would seem to assign it to the phonology (doctrine of sound), or to the inflexion (doctrine of form). It is impossible, however, to separate it from the doctrine of word-order, with which it is most intimately connected, except as one is ready to sacrifice comprehensiveness and intelligibility to the demands of a rigid schematism. The writer consequently has deemed it best to treat of the sentence-mood under the syntax, thus, *e. g.*, in his *Atlantische Syntax*, pp. 26 ff. As it is with the definition of the boundaries of syntax, so with the question of arrangement and classification. It is unavoidable that here also theoretical and practical considerations should often cross each other's track. It must above all things, however, be remembered that the demands of a reasonable systematization, by no means require that a given subject should receive mention but once. It is essential, for example, to treat all the cases together, so that forms of usage which have mutually influenced each other may not be torn asunder. It is, however, on the other hand, necessary to mention certain cases where the relation of subject and predicate is under discussion, *i. e.* in the doctrine of the sentence proper. Under these circumstances it must be no cause of surprise when the same author adopts now one and now the other arrangement.

3. *The Office of Syntax.*—The conception which one forms of the office of syntax will depend upon his views of the aims of linguistic science as a whole. There have been leading scholars, for instance, August Schleicher, who classed the science of language with the natural sciences, and who regarded it therefore as their office to identify laws within language after the analogy of physics or chemistry. Whether such a possibility may exist in the field of phonology can not be investigated here, certainly for syntax such a thing is out of the question. For this reason, indeed, Schleicher proposed to separate syntax, as far as consideration of function is concerned, from the other parts of grammar. Most philologists regard the science of language, however, as an historical discipline. In connection herewith, the older scholars, *e. g.* Franz Bopp, attempted to push their investigations to the beginnings of everything. They had confidence in their ability to discover the origin of the Indo-European languages, or at least of the grammatical forms. Inasmuch now as the understanding of the origin of the grammatical form would yield at the same time a knowledge of the primitive meaning, these investigations concerning the origin of inflexion would furnish at the same time a point of departure for historical syntax. The hopes and claims of present-day scholars have, however, assumed much more modest proportions. We are now, it may be believed, universally convinced that but little can be learned of the origin of inflexion, and that even this scanty knowledge is too uncertain to serve as a foundation for a structure of syntax. We now recognize the object and office of the science of language to lie in tracing out historically a specific study of linguistic development, whether through direct observation, or, as is the case in the comparative science of language, through combination. In this is involved, then, the assertion that syntax is an historical science. Its office may be in detail somewhat more accurately defined, when we have considered the question what is actually handed down within a language from one generation to another. Self-observation shows directly that this is not limited to a series of words and forms, but includes also a vast number of word-combinations of various sorts, certain connections between verb and noun, proposition and case, agreement between substantive and adjective, word-order, *etc.* In short, a great number of types, whose real existence may be proven by the fact that the speech-sense immediately results when an expression is attempted which offends against a tradi-

tional type, *e. g.* if one should attempt to put the adjective after the noun. The classification of these types is the proper office of syntax. Within the limits of an Indo-European language it is to be observed how these types exist, *whether, and away, etc.* It is, usually, to be observed which types are handed down from primitive times, and which are relatively recent products. In an examination of this sort it would, for instance, be found for Greek that the most of the cases of the finite verb are handed down from primitive times, but not so the uses of the infinitive, also not the use of the accusative with the infinitive, and so with the whole system of construction in the indirect discourse, which last is therefore a special product of the Greek. It is different with the noun, where the construction-types of the different cases have blended together; and in the course of time the dual has been lost.

In those very simple considerations is involved a conclusion which is in point of method of high importance. What it has been shown, for instance, that the accent of the Greek was not developed within that language, but is a primitive structure with a primitive type of usage, it then becomes impossible through observation of the Greek alone to establish the fundamental value of the accent; so, therefore, the whole body of fundamental values assigned on the basis of a single language becomes untrustworthy.

In accordance with what has been said, the task of a syntactician in the field of Indo-European grammar may be briefly summarized as follows: He is to collect with all possible completeness the instances of the type of usage to be discussed, seek to trace its historical development within the individual language, compare the use of the corresponding form in the cognate languages, and seek to determine in this way the Indo-European value of the form in question. This chief value is the fundamental conception. This may be simple or complex. As to how a form came to this use one can never, or almost never, say anything with certainty. For syntactical terms, see especially *Verbum*, also *Nomen*, *Præteritum*, *Gerundium*, *Participium*, *Præteritum*, and *Indo-European Language*. R. DELAFLEUR.

Translated by Rev. J. W. WHELAN.

Synthesis: See CHEMISTRY.

Synthesis, or Assimilation [*synthesis* is from Gr. *σύνθεσις*, a putting together, combination; *syn*, together + *thesis*, place]: the fact of acting or unity in all mental operations. The principle of assimilation, made much of in recent discussions, clearly illustrates not only that an image may be as strong and habitual in consciousness as to assimilate new experiences to its form and color, but also that this assimilation or synthesis is the very mode and method of the mind's digestion of what it feeds upon. Consciousness constantly tends to neglect the unit, the *self* it proposes, the incongruous, and to show itself receptive to that which in any way conforms to its present stock. A child after learning to draw a full face—circle with spots for the two eyes, nose, and mouth, and projections on the sides for ears—will persist, when copying a face in profile, in drawing its circle, with two eyes and two ears, and fail to see its error, although only one ear is visible and no eyes. The external pattern is assimilated to the memory copy, or in the word or other symbol which comes to stand for it. The child has a motor reaction for imitating the latter: why should not that answer for the other as well? As everybody admits, in one way or another, such assimilation is at the bottom of recognition, and of illusions which are but mistaken recognitions.

It is commonly held that assimilation stands midway between absolute identity of presentations, on the one hand, and such difference of presentations, on the other hand, as is found in the relative independence of associated ideas (see *Association* or *Idiosyncrasy*), such as, for example, the association "stable—horse." But this is not the true view of assimilation, for there is no such thing as absolute identity of presentation, or of mental content of any kind. Assimilation is always present. It is the necessary basis of the earliest association. For association is, on the organic side, and at the start, only another statement for the consolidating of the different reactions which arise when the stimulations are multiple or not simple. These reactions are reduced to orderly habitual discharges—this is association by assimilation, more or less adequate to give the sense of synthesis, or unity, or identity. Association has, accordingly, a motor foundation from the first. The elements held together in memory because they are used together in action. And as

the action becomes one, but yet complex, so the mental content tends to become one, but yet complex also.

This becomes more evident when we call to mind that the "objects" of the external world are very complex mental constructions. They are, for the most part, made by association. Objects have some very general aspects in common, such as color, resistance, odor, etc. But these bare qualities, taken alone, might go to constitute one object about as well as another; and really would constitute none. What kind of an object such or such a bare stimulus shall turn out to be—this is largely a matter of association and suggestion. Hence if the mind has to construct anyhow, in each case, and to depend largely upon memory of earlier instances for its material, then it falls back at once upon those habitual reactions by which groups of associated elements are reinstated together and as one content. These old groups thus usurp the new elements by assimilation, if it be within the range of organic possibility.

Generally, therefore, it may be said that assimilation is due to the tendency of a new sensory process to be drawn off into performed motor reactions; these preformed reactions in their turn tending to reinstate, by the principle of imitation, the old stimulations or memories which led to their preformation, with all the associations of these memories. These memories, therefore, tend to take the place or stand for the new stimulations which are being thus assimilated.

All perception is accordingly a case of assimilation. The motor contribution to each presented object is just beginning to be recognized in cases of disease called by the general term *apraxia*, i. e. loss of the sense of the use, function, utility, of objects. A knife is no longer recognized by these patients as a knife, because the patient does not know how to use it, or what its purpose is. The complex system of elements is still there to the eye, all together; the knife is a thing that looks, feels, etc., so and so. This is accomplished by the simple contiguous association of these elements, which has become hardened into nervous habit. But the central link by which the object is made complete, by which these different elements were originally reproduced together by being imitated together in a single act—this has fallen away. So the APPERCEPTION (*q. v.*), the synthesis which made the whole complex content a thing for recognition and for use, is gone in these cases. J. MARK BALDWIN.

Syphax: See MASINISSA.

Syph'illis [Mod. Lat., from *Syphilus*, name of a shepherd in the Latin poem of the Italian physician Fracastorius (1483-1553), *Syphilus*, *sive Morbus Gallicus*; (irregularly) Gr. *σῦς*, hog, swine + *φίλος*, loving]: a specific, chronic, contagious disease, peculiar to the human organism, and always more or less closely associated with the venereal act. It is always acquired through contact with a human, being already suffering with the disease, or from some material which has been in contact with the discharges from a syphilitic individual. In the poem by Fracastorius *Syphilus* is afflicted with the disease by Apollo in punishment for paying divine homage to his king instead of to the god. Under various names the disease has been described in the earliest written history of every part of the globe. One Chinese account of it dates back to the writings of Hoan-Ti, B. C. 2637. In India its record appears in the *Ajura Vedas* of Suerutas, A. D. 400. Hippocrates and later writers describe it as existing among the ancient Greeks. Celsus speaks of it among the Romans. The Abbé Brasseur de Bourbourg writes that numerous documents in the languages of the tribes of the valley of Anahuac have proved to him conclusively the existence of syphilis in America prior to the discovery of Columbus. Those who read the Old Testament attentively, particularly certain psalms of David, may find ample evidence of the existence of the disease among the nations and tribes of the Orient in biblical times. The existence of syphilis in very remote periods of the history of mankind is thus demonstrated; but the first well-authenticated record of its recognition in Europe dates from the year 1494, when a notorious outbreak occurred in the army of Charles VIII. of France, who was then besieging Naples. It was characterized by ulcers upon the genitals, pains in the bones, and eruptions upon the skin, and was known then as the *morbus Gallicus* or French disease. It spread to a fearful extent, and became a veritable terror in the land. Its cause was attributed to almost every imaginable influence except the right one. Later it was recognized as the result of venereal contact, and was then claimed to have been introduced into Europe by the followers of Columbus.

In the literature of those times, the disease was usually known in each country by the name of some other country, and was designated as the *mal Anglais*, *morbus Gallicus*, *maladie de Naples*, *pox*, *lues venerea*, etc. Later it was regarded as distinct from the contagious genital ulcers whose effects were simply local, and also from gonorrhoea, although so late as the time of John Hunter this distinction was not known to him, having been for a time lost sight of. The present accurate classification of venereal disease is in large measure due to Ricord, of Paris, who published extensively concerning the subject in 1831. Later, in 1852, his pupil, Bassereau, made clear the difference between the local ulcer i. e. "chancroid," the local lesion followed quickly by constitutional infection (see *VENEREAL ULCER*), syphilis, and the other local infection of mucous membranes known as gonorrhoea. Since this time and almost up to the present day a few writers have claimed, however, the unity of the poison producing the first two lesions. Others have stoutly maintained their duality or distinctness, and this view is now positively accepted by all writers of distinction.

Effects of the Disease.—The nature of syphilis and the manner in which the human system is infected by it are yet undetermined. Opinions concerning these subjects have been very numerous and variable. A number of investigators have at various times detected micro-organisms, some of these being bacteria, which they have thought to be the active agents in producing the disease, but research has shown that the presence of these micro-organisms does not account for the disease. The problem must be solved by different methods of investigation, yet higher powers of the microscope, or the introduction of some entirely new methods of studying the discharges.

When this poison of syphilis is inoculated upon a healthy surface, it shows no immediate signs of virulence, and healing of the wound takes place promptly, as if no such inoculation had occurred. Then ensues a period of complete rest, the so-called period of incubation, varying from ten to seventy days, when a thickening or induration of the integument or mucous membrane at the point of inoculation is noticeable. Soon a discharging lesion results, the discharge being extremely infectious. Inasmuch as this lesion is surrounded by a zone of tissue induration, i. e. cell proliferation, we have an ulcer or a papule, situated upon an indurated basis; and this is known as the chancre, or initial lesion of syphilis. Then occurs another period of apparent rest, the so-called secondary incubation, during which there is little or no consciousness on the part of the patient of the trouble brewing in his system, the local disease manifestation frequently healing with or even without the proper treatment. This secondary period continues for from four to six weeks, perhaps longer, when the lymphatic nodes in all parts of the body will be found enlarged and hardened, and there breaks out upon the surface of the body a rash or eruption, usually more or less resembling that of measles. This is seen most commonly upon the thorax and abdomen, from whence it may spread to all parts. This rash, usually known as syphilitic roseola, marks the second or constitutional stage of syphilis. Then, or within a short time, the patient begins to experience constitutional disturbances chiefly at night, including pains in the bones, increase of temperature and general discomfort, which is usually known as syphilitic fever. This stage is still further characterized by the tendency to engorgement and inflammation of those parts containing much lymphatic tissue, such as the tonsils, the pharynx, the soft palate, etc. If unchecked the eruption assumes more of a papular type, the papules varying in size from that of a pinhead to that of a split pea, occupying the upper part of the body usually, commonly symmetrically distributed, but not often ulcerating at this time. This is the papular or secondary eruption of syphilis, sometimes assuming rather the pustular type, or becoming pustular as the result of a depraved state of the system. The papules which occur upon the mucous membrane discharge a most infectious material, and are known as mucous patches. They may be found upon the membranes of the mouth, the inner surface of the nose, the eyelids, and about the genitals; while papules upon the skin wherever there is abundant secretion and moisture often assume the characteristics of mucous patches, and are spoken of as mucous tubercles. The secretions from both of these lesions being so highly inoculable constitute one of the most important dangers in dealing with the disease. Inoculation of a healthy person with syphilis frequently occurs through contact with the secretions of a mucous patch situated in the mouth, as in

knowing, the only required condition being a scratch, erosion, or simple abrasion, like a cold-sore, on the part of the one who has not suffered previously from the disease. Numerous examples are recorded where the disease has been acquired from contact with a spoon, pencil, pipe, stick of candy, plug of tobacco, etc., which has been contaminated from such secretions. Chancres occur also in other parts of the body as the result of innocent contact on the part of persons who are totally ignorant, or at any rate unsuspecting. Syphilis thus acquired is known as syphilitic inoculation, or "syphilis of the innocents." Fortunately, the syphilitic principle requires for its introduction and successful inoculation, in almost every instance, a pre-existing lesion of the skin or mucous membrane. But it has been transmitted through the instruments of the surgeon or dentist, by hypodermic syringe needles, and in other ways which are often difficult to trace. A specific inflammation of certain tissues of the eye, particularly of the iris, is a common occurrence in early constitutional syphilis, which is followed by more or less pain, often severe, by photophobia or fear of light, by irregularity of pupil, due to exudation and adhesion, etc. Later in the course of the disease the various structures of the eye may suffer seriously, and syphilitic affections of all the central tissues are known and carefully described.

Changes in the bones are often associated with the active or secondary period of syphilis. Sometimes these are of wandering character; again, they are localized. The periosteum, or covering membrane of the bone, is often thickened, as the result of which bony elevations, termed nodes, result. The nails and the hair also are frequently affected, the hair losing its luster and falling out, often in spots; at other times complete baldness results. The nails may become dry, lusterless, and brittle, with arrest of growth. The lymph nodes and lymphatic structures throughout the body suffer seriously during the active manifestations of the disease, and the former will be found enlarged in all of these cases. The lymph nodes in the neck are most easily investigated; and a chain of nodules of this kind may be felt on either side of the neck in distinct cases of syphilis. A small lymph node just above the inner canthus, known as the supra-orbital, is almost invariably involved in this disease, and seldom in any other affection, except in septic infection of the arm. The more active manifestations of syphilis covering the first and second stages extend over a period of rarely less than one, nor more than two, years, during which time all the secretions from all ulcerative lesions are inoculable, as well as even the blood. Its course is marked by the gradual invasion of the organism, and always in the line of the lymphatic distribution. Cases vary much, however, in degree, since in one the disease may be so slight that even the lymphatic enlargements are not easily recognized, and in another as severe that even death may be the result. The causes of these differences appear to depend upon degree of virulence in the material inoculated, and upon the condition and antecedents of the patient. Syphilis may be transmitted to offspring through the influence of a syphilitic parent during the active period of the disease. From this still-births and arrests of development may result, and uterine and vesicular changes may depend upon antecedent syphilis for a long time subsequent to the termination of active syphilis. As a rule, however, syphilis is transmitted by hereditary taint only while lymphatic enlargements and involvements remain. A complete disappearance of the latter, with or without treatment, is the sign of immunity from danger of hereditary transmission.

Commonly the most serious manifestations of syphilis terminate with the arbitrary second stage, either as the result of treatment or by a natural evolution. All writers, however, recognize the existence of a so-called third, or "tertiary," stage, although no exact length of time can be named between it and the second. The tertiary is, in some instances, a gradual merging of the second stage; while in other instances it is separated from it by an interval of more or less perfect health, varying from a few months to a number of years. The products of tertiary lesions are seldom infectious. The lesions themselves are less symmetrically arranged also than are those of the second stage. They are characterized by induration or deposit of lymphatic elements in the various tissues of the body, which produce tumor formations, commonly known as gummata, or syphilitic. These tumors or new formations are of course composed of cellular aggregations, which, however, are quite prone to break down and slough. Hence many of the tertiary lesions are of the ulcerative type. In the skin there

are a variety of deposits, tending always to ulceration, by which eruptions of characteristic appearance are produced. The larger lesions of this character are usually discolored; the smaller are multiple, and are often widely disseminated. Very extensive ulceration sometimes results from lesions of this character. These are all more likely to occur in alcoholics, in the debilitated, and in the dissipated. The gummatous tumors, or gummata, may form in or beneath the skin, or in any other part of the body; and they cause the organs affected to enlarge, presenting nearly all the appearance of ordinary tumors, assuming even malignant characteristics. They are, perhaps, most common in the skin, the liver, the bones, and the brain. In any one of these places they may break down with resulting abscesses or ulcerations.

Treatment.—The treatment of syphilis has been from the earliest times a subject of controversy, and is to-day a subject on which very great ignorance prevails, especially among the laity. There can be said, however, of this disease, that there is no other serious affection which involves the human body which can be so positively influenced for good as this; in other words, there is no other disease which in just response it is so satisfactory to treat. It is necessary, however, to combat a great many popular superstitions regarding the disease, and to insist that the only correct and reliable remedies are mercury and iodine, which can be combined with various others often with good effect, whose action always needs watching, but without which little or nothing can be done. Certain mild forms of the disease, to be sure, will tend toward spontaneous recovery, and these may be aided by absolutely vegetable remedies, or by absence of treatment; but the more serious forms of the disease can not be successfully treated without the two remedies named above, and the public should be warned against men who advertise or profess to cure this disease without these measures; they are either ignorant or dishonest who make these claims. As the result of such medication in years gone by, a legitimate dread of mercury was engendered, but now, under proper watching, no evil effects need be dreaded, and the manifestations of the remedy can be controlled with as much certainty as those of the disease, when using one against the other. It is possible that both of these elements—mercury and iodine—act by causing metamorphosis of tissue and influencing cell growth, perhaps also by introducing into the system some antitoxic or antiseptic influence. There should be emphasized also the fact that syphilis is, so far as most cases are concerned, a curable disease, which offers an element of hope hitherto usually lacking. Too much pains can not, however, be taken to impress upon patients the fact that, in order to effect a cure, it is necessary to keep them continuously under the influence of these remedies for a period of time averaging about thirty months in duration. Less may answer in some cases; more may be required in others. This period of time, moreover, must begin with the last visible manifestation of the disease. Thus if a patient has been under ineffectual treatment already for three years, it will be necessary to begin then and to keep him for at least two years longer under treatment, watching its effects in such a way that neither the disease nor the remedies shall get the upper hand, but that the one shall be administered in just sufficient doses to counteract the effect of the other. Many patients treated in accordance with these principles have remained absolutely well, have married, and have propagated families in which there is not the slightest trace of any inherited affection. It is well, therefore, to maintain as publicly as possible that syphilis is, in proper hands, a curable disease, providing only that the right directions be insisted on and scrupulously followed. Syphilization, the proposed treatment of the disease by repeated inoculation of the purulent secretion of venereal sores, originated by Avelas de Tourn in 1844, met with some favor in Italy and Sweden, but elsewhere was discredited, and since 1875 has fallen into disuse. HOWELL PARK.

Syphon: See Siphon.

Syra, or Syrus (Gr. Σύρος): an island; one of the Cyclades, belonging to Greece. Area, 44 sq. miles (see map of Greece, ref. 17-L). Seldom mentioned in ancient times, it became important during the Greek revolution, when it served as a place of refuge for fugitives from the mainland and islands. Its favorable situation, good though diminutive harbor, and the enterprising spirit of its people have since rendered it the commercial center of the Aegean Sea. The island is rocky, mountainous, and generally sterile, but produces some grain, fruit, and wine, though insufficient to

support its inhabitants. Hermonopolis, the capital, built of glaring white houses, presents a striking appearance as it rises amphitheatrically and almost precipitously from the water. It has dockyards, machine-shops, hospitals, good schools, and a college. Pop. (1890) 22,104.

E. A. GROSVENOR.

Syracuse [from Lat. *Syracusæ* = Gr. *Συράκουσαι*; Ital. *Siracusa*]: chief town of the province of Syracuse, Sicily; on the east coast of the island, in lat. 37° 0' N., lon. 15° 20' E. (see map of Italy, ref. 10-G). The modern town occupies the rocky islet Ortygia (1 mile in length, $\frac{1}{4}$ mile in breadth), which serves as an irresistible breakwater to protect the large harbor on the W., across the mouth of which it lies. This harbor was formerly one of the finest in the world, and is even now the best, perhaps, in Sicily. Ortygia, though at some periods united to the main island by a viaduct or causeway, is now connected with it only by bridges. According to Thucydides, Ortygia was colonized by the Corinthians 734 B. C., though the Phoenicians had probably made an earlier settlement here. (See Gelo, Hiero, Dionysius the Elder, and Dionysius the Younger.) When, however, after long and cruel wars, the Romans obtained possession of the rest of Sicily, Syracuse, together with some important places in its neighborhood, was left to Hieron II. (275 B. C.), who had become an ally of Rome. Under this king the city rose to its highest point of magnificence, and is said to have contained an immense population within its walls, then, according to some authorities, 22 miles in circumference; according to others, 14 miles. The grandeur of the edifices and the artistic wealth and refinement of Syracuse were altogether worthy its colossal size; but in the course of the Second Punic war, Hieronymus, the successor of Hieron, broke off the alliance with Rome and joined the Carthaginians—a step which proved the ruin of his kingdom. After a long and desperate resistance, in which the celebrated Archimedes exerted all the powers of his wonderful mechanical genius in the defense of his country, Syracuse fell into the hands of the Romans under Marcellus (212 B. C.), by whom it was barbarously sacked and an immense booty carried off to Rome. From this time Syracuse, as well as the rest of Sicily, was but a subjugated Roman province, unscrupulously oppressed and plundered by that power for its own aggrandizement. The town at the time of its capture consisted of four distinct quarters—or five, if Epipolæ be included, as it no doubt was by those ancient writers who describe it as a *pentapolis*. Epipolæ, however, seems to have served rather as a citadel and fortress to defend the town on the N. W., and was probably never thickly inhabited. The four quarters proper were: (1) Ortygia, or the islet; (2) Achradine, occupying the eastern coast of the main island, N. of Ortygia; (3) Tyche, W. of Achradine; (4) Neapolis, S. of Tyche. The most important remains of ancient Syracuse are found on the main island, though some objects of interest are still to be seen in the modern town. Pop. (1893) 25,200. See Serradifalco, *Antichità di Sicilia*; Gregorovius, *Wanderjahre in Italien, Siciliana* (1872); Cavallari, *Sicilia artistica ed archeologica* (1889); Lupus, *Die Stadt Syrakus im Alterthum* (1887).

Syracuse: city; capital of Onondaga co., N. Y.; on Onondaga Lake, the Erie Canal, and the Del., Lack., and W., the N. Y. Cent. and Hud. Riv., the Rome, Water., and Ogdens., and the W. Shore railways; 147 $\frac{1}{4}$ miles W. by N. of Albany, and 150 $\frac{1}{4}$ miles E. of Buffalo (for location, see map of New York, ref. 4-F). It is at the foot of the Onondaga valley, though the southern part is embraced by hills on either side opening to the right and left, thus broadening the valley where it joins the city. There are highlands to the N. E. also which, with those on the S., are populated. The length of the city proper from N. to S. is about 4 miles; from E. to W. about 3 miles. Salina Street is the principal thoroughfare. The streets mainly cross at right angles; most of those otherwise laid out followed early Indian trails and wagon-roads. They contain so many trees that the city resembles a forest when seen from the adjoining hills. There are about 250 miles of streets, 52 miles of street-railway, 24 public parks (of which Burnet Park, of 100 acres, situated on the highlands W. of the city, is the chief), and 6 public squares. The city has a new water system, with its source at Skaneateles Lake, and with 90 miles of mains; it cost \$4,000,000. There are 34 newspapers (6 daily) and periodicals.

Public Buildings.—The U. S. Government building, the county court-house, and the city-hall, all built of limestone; the county clerk's and surrogate's offices; the First Pres-

byterian, St. Paul's, and St. Mary's churches; the Onondaga County and the Syracuse Savings-bank buildings; the Kirk building, the Granger block, the Bastable block, Dey's and McCarthy's buildings, and the Wieting block, are among the most imposing structures. The State Asylum for Feeble-minded Children and the buildings and grounds connected therewith are attractive and interesting to visitors. The Onondaga penitentiary and jail has room for about 300 prisoners, is situated within the city limits on elevated ground, and its inclosure embraces about 40 acres. The Onondaga County Orphan Asylum, St. Vincent de Paul Orphan Asylum, the House of Providence, House of the Good Shepherd (hospital), St. Joseph's Hospital, St. Ann's Maternity Hospital, Shelter for Fallen Women, Women's and Children's Hospital, Old Ladies' Home, German Hospital, Needlework Guild, Employment Society, Women's Union, Bureau of Labor and Charity, Women's Aid Society, Deaconesses' Home, and King's Daughters are the principal charitable institutions and organizations.

Churches and Schools.—There are 84 churches (with a total seating capacity of about 52,000), as follows: Presbyterian, 9; Baptist, 8; Methodist Episcopal, 20; Protestant Episcopal, 7; Roman Catholic, 11; Lutheran, 7; Congregational, 5; Evangelical, 4; Jewish, 7; Unitarian, Universalist, Reformed, Disciples, Independent, and Scientists, each 1. The Y. M. C. A. owns the large and commodious building it occupies, together with its music-hall and athletic rooms. The SYRACUSE UNIVERSITY (q. v.) leads the educational institutions. The public schools are 31 in number, including the High School, and all are built of brick. The enrollment is over 16,000; average attendance, over 12,000; annual cost of maintenance, over \$303,400; number of teachers, 320. The City Library, now independent of the board of education, has about 26,000 volumes, and occupies a city building. Keble School, which, with several others, has an attendance of about 300 pupils, is the principal private school.

Finance and Banking.—The assessed valuation is: real estate, \$44,827,180; personal, \$3,838,205—total, \$48,665,385; receipts and expenditures, about \$1,000,000; bonded indebtedness, \$5,056,500. There are 9 commercial banks, with an aggregate capital of \$1,705,000 and surplus of \$1,100,000; 2 savings-banks, with assets of \$19,000,000 and surplus of \$2,110,000; and 8 national savings and loan associations, with aggregate assets of about \$3,500,000.

Business Interests.—The manufacturing interests are extensive and cover a wide range of products. Iron and steel are extensively worked in various forms. Salt is no longer an important factor. The State took possession of the salt-springs in 1797; since then 361,200,742 bush. of fine and coarse salt have been produced. The largest quantity made in any year was 9,053,874 bush. in 1862; the smallest, 23,474, in 1797. Competition at home and abroad, with a low tariff aiding the latter, has nearly ruined the industry. At one time the investments were valued at \$14,000,000; now they are scarcely worth \$500,000. There are in all 245 incorporated manufacturing companies, of which one, making soda-ash, is the principal. In 1890 over \$17,000,000 capital was invested in 1,175 establishments; about 15,500 persons were employed, to whom nearly \$7,500,000 was paid in wages; material costing over \$12,000,000 was used in manufacturing; and the output of the manufactories had a value of over \$25,500,000.

History.—Syracuse was settled in 1797, and was known first as Bogardus Corners; afterward as Milan, South Salina, Cossitt's Corners, Corinth, and in 1824 Syracuse. In 1826 the village was incorporated; in 1847 the rival villages of Syracuse and Salina were brought under a city incorporation. The Jesuits, in 1654, were the first to visit the locality then inhabited by Indians, a remnant of 425 of whom now occupy a reservation 6 miles S. of the city, and 6 miles square. Pop. (1880) 51,792; (1890) 88,143; (1892) State census, 91,944; (1895) estimated, 127,089. DWIGHT H. BRUCE.

Syracuse University: a coeducational institution at Syracuse, N. Y.; founded in the year 1848, but located at Lima, N. Y., and known as Genesee College until 1871, when it was removed to Syracuse. The removal was determined by a great convention held in Syracuse in Feb., 1870. The most prominent citizens of the city aided in its new founding, and the city gave \$100,000 as its contribution. The first chancellor, Alexander Winchell, LL. D., was inaugurated Feb. 13, 1873. He was succeeded in 1874 by E. O. Haven, D. D., LL. D., he by C. N. Sims, D. D., in 1880.

and the present incumbent, James H. Day, S. T. D., entered upon his duties in Apr. 1894. The campus comprises 50 acres; the principal buildings are the Hall of Languages (1890), the Hadden observatory, the John Cresson Memorial College, containing the college of fine arts, the library building, containing the famous library formerly the property of the historian Von Hanne, and the Y. M. C. A. hall and gymnasium. The athletic field is one of the finest in the state. The medical college building is near the center of the city. The college was removed from Geneva in 1851. A college of law was opened in 1895. The number of students has steadily increased. The roll for 1894-95 showed 887. The faculty numbers 70. The institution has enjoyed a healthy growth and expansion in every department. The value of grounds and buildings is \$457,000, and the endowment fund is \$760,000, with a debt of less than \$100,000. The volumes (including pamphlets) in the library number 54,743. F. S. MALLORY.

Syr-Darya, Syr-Daria, or Sir-Daria, *sir-dar'ya*, (Pers. *Jaxartes*, Arab. *Sihun*); the principal river of Russian Turkistan. It rises in the Tien-Shan in a glacier at the height of 15,000 feet; flows first W. passing through mountain valleys, and through several unexplored gorges, receiving all its affluents; is largest opposite Khojend, where it passes out on the plains; gives off a few branches and many irrigation canals, and is decreased by evaporation, until it reaches the Aral Sea, where it is only a half or a third of the size it has at Khojend. It is frozen three or four months a year, is in flood in late spring and early summer, and is unsuitable for navigation because of its shallowness and changeable channel, and the lack along its banks of fuel. Length, 1,250 miles; area of basin, 120,000 sq. miles. Harsdollar and Strahlen describe it as a great river flowing into the Caspian, and the ancient belt between the Aral and Caspian can yet be traced. MARK W. HARRINGTON.

Syr-Darya: province of Russian Turkistan; on the middle and lower course of the Syr-Darya river, S. of the Tien-Shan, W. of Semirechensk, and S. of Akmoinsk. Area, 104,566 sq. miles. Pop. (1890) 1,214,300, mostly Kirghiz and Sarts, and 60,000 Russians, of whom 15,000 are military, 61,900 peasants, 4,000 small merchants, and the remainder officials, clergy, etc. Russia made an especial effort to colonize this province, and in 1899 there were forty-seven colonies containing 16,000 persons. The country is chiefly steppes, deserts, and marshes, but contains some forests near the streams, and much of the land is very fertile when irrigated. Capital, Tashkent. M. W. H.

Syren, or Sirene: See *Acoustics* (Length of Sound-waves).

Syria [= Lat. = Gr. *Συρία*, deriv. of *Σέρος*, *Séros*, Syrian, a Syrian; etymologically an abbreviation of *Assyria*. See *Assyria*. (Heb. *Arām*; Arab. *ash-Shām*; Turk. *Suriyan*)]; a vilayet of the Ottoman empire in Asia Minor; bounded N. by the vilayet of Aleppo, E. and S. by the Syrian and Arabian deserts, W. by the Mediterranean (see map of Turkey, ref. 7-H). In a less restricted sense, Syria comprises also the larger part of the vilayet of Aleppo, thus including the territory bounded N. by Asia Minor, from which it is separated by the Akma Dagh (Antanus Mountains) E. by the Euphrates, and S. by the Arabian Desert. Its length on the W. is coterminous with the eastern shore of the Mediterranean Sea. Its situation may be roughly indicated as between 37° and 31° N. lat. and 34° and 41° E. lon. It comprises the historical divisions of Syria proper, PHOENICIA, COELE-SYRIA, and PALESTINE (q. v.).

Physical Features.—Two systems of mountain ranges, LABRAN and ANTI-LIBANUS (q. v.), connected with the Taurus Mountains, run parallel southward, enclosing a long valley of varying breadth and depth, COELE-SYRIA, and losing themselves in the S. in the rocky plateaus of the Arabian Desert. The three chief rivers of Syria are the ORONTES and JORDAN (q. v.) and the LEANES (Litany), none of them over 250 miles in length. There are also a score of still smaller rivers and many river-beds, filled by rushing torrents in spring but dry in summer. The valley of COELE-SYRIA narrows in the south in a gorge through which the Jordan forces its way into the Lake of Merom (El Huleh). There it is on a level with the Mediterranean, but at the Lake of Hinnom it is 650 feet and at the Dead Sea 1,300 below it. More, as in many other regions, the country has a strongly marked volcanic aspect, and throughout Syria earthquakes are frequent. It is a peculiar fact that they occur usually in summer and very rarely in winter. One (1759) caused the

death of more than 20,000 persons; another (1778) destroyed Aleppo; those of 1782, 1819, 1822, 1837, and 1873 were notable. Wherever the supply of water is sufficient the soil, generally of a light and sandy character, proves very productive. Most plants of temperate and tropical climates grow luxuriantly. Navarichius, at certain seasons almost the entire country, and at all seasons a large part of it, presents a barren and desolate appearance. This is in great part due to annual drouths. Summer rains are rare. The climate is patchy, and the heat oppressive even in the elevated regions, the thermometer often indicating above 100° F. The average of the country is the humid, Aluvial, however, the misfortune of Syria has been its geographical position, rendering it the battle-field of races and religions.

Natural Products.—*Flora and Fauna*.—The mountainsides are covered with pine, fir, and oak. Cedars are still found in Lebanon; laurel groves are frequent in the valleys; on the tablelands are dwarf-oaks which yield excellent fuel-wood. Extensive forests are rare. Farming tools and implements of all sorts, as well as the system of cultivation and handicraft, are of the simplest. The common cereals are wheat, rye, and barley; rice, durum, sesame, lentils, and beans are raised. Cotton, hemp, mulberry, indigo, molins, cucumbers, and artichokes are extensively cultivated. The tobacco along the coast is of excellent quality. Plantations of fig, orange, lemon, mulberry, peach, pomegranate, and almond, and the vineyards yield excellent returns. The coffee-plant has been introduced at Latakia, the sugar-cane at Beyroul, and Damascus is surrounded by orchards and gardens. All the domestic animals of Europe are found in Syria, as is also the camel. Asses, horses, horned cattle, goats with fine hair, sheep, both broad-tailed and of fine fleeces, are numerous. The wild animals are jackals, hyenas, antelopes, the Syrian bear, wolves, and especially wild boar, deer, and wild buffalo. The silk-worm is extensively reared. Mining is hardly carried on; but bitumen, coal, iron, salt, and sulphur are found.

Population.—There are no reliable statistics as to population. It is probably not far from 4,500,000, and is made up of heterogeneous races, peoples of Semitic origin predominating. Arabic is the generally spoken language. The old Syriac or Aramaic is heard only in certain localities. Along the coast Greek is generally understood, and French much employed by the higher classes. Tribal divisions are rather on the score of religion than origin or race. The country swarms with sects, Musliman, Jewish, and Christian, equally jealous and intolerant. The Druses (60,000), Maronites (60,000), Lemalis (6,000), Yezidis (25,000), Nusairis or Nusayris (60,000), Chaldeans or Nestorians (40,000), Syrians or Jacobites (10,000), and Maronites (452,000) are the more prominent of the best known. Though in general these peoples are quiet, hospitable, and kindly, yet outbreaks of fanaticism are frequent, not only on account of their detestation of each other's belief, but through the intrigues of foreign powers. Such were the massacres of 1841, 1845, and 1869. There is no question that the condition of the people has bettered in many respects since 1873. Education, though in a backward state, has made substantial progress. This improvement is due in large measure to the labors of the Roman Catholic and Protestant missionaries, and especially to the wide and active influence exerted by the Syrian Protestant College at Beyroul. The chief cities, with populations, are as follows: Damascus, 200,000; Aleppo, 120,000; Beyroul, 100,000; Jerusalem, 41,655; Hama, 55,000.

History.—The earliest known inhabitants of Syria were Semites of various branches, living in separate social organizations. Such were the Canaanites, Phoenicians, Arameans, the latter of whom held Damascus and ruled to the Euphrates. Such, too, were the Hebrews. Practically all Syria, except Phoenicia, became subject to the Hebrew monarchy under David. When, on the death of Solomon, the Hebrew empire divided into the two kingdoms of Judah and Israel, an independent Aramaean monarchy under Hazan was set up at Damascus. Its kings conquered Northern and Central Syria. Tiglath-Pileser, King of Assyria, subdued this state, capturing Damascus (740 B. C.), and likewise Israel (720 B. C.). Judah was conquered by Nebuchadnezzar, the King of Babylon, in 587 B. C. Syria passed from the Assyrians to the Babylonians, then to the Medes, then to the Persians, and after the battle of Issus (333 B. C.) to Alexander and the Greeks. During these transitions many non-Semitic elements were introduced into the population. On the death of Alexander the Seleucids founded a Syrian empire which they ruled from 301 to 64 B. C. Antioch, built by Seleucus I.

(301-281 B. C.), was their capital. For centuries it was the largest and most brilliant city of the East, and was further influential through the civilization therein developed. The Syrian empire at the height of its prosperity rivaled in extent that of Alexander. Antiochus III., the Great (223-187 B. C.), was a most formidable enemy to Rome. Antiochus XIII. (69-65) was overthrown by Pompey, who made Syria a proconsular Roman province (64 B. C.). It continued part of the Roman and then of the Byzantine empire, but (635-638) was gradually conquered by the Muslims. Damascus was made the capital of Syria in 654; under the Omniad dynasty of caliphs it continued the capital of the entire Mussulman empire (661-752). The Abbassid caliphs, hating all that was associated with their Omniad predecessors, degraded Syria to the rank of a province and removed the capital to the newly founded Bagdad. Distracted by rebellions and by frequent wars between the caliphs and the Byzantine empire, the condition of Syria was deplorable during the three subsequent centuries, till it fell under the humane sway of the Seljuk sultan Malek Shah (1073-93). Next the crusaders deluged the country, and the succeeding two centuries—from 1099, when the Christian kingdom of Jerusalem was set up, until 1291, when Acre, the last Christian stronghold in Syria, was retaken by the Muslims—formed the most disastrous and destructive period Syria has ever known. From that time, except during the invasions of Tamerlane and his successors, Syria was ruled by the Mameluke sultans of Egypt until 1516, when it was conquered by Sultan Selim I. From 1832 to 1841 it was governed by Ibrahim Pasha under the authority of his father, Mehemet Ali of Egypt. With the exception of this brief period it has, since the days of Sultan Selim, formed an integral part of the Ottoman empire.

See Burckhardt, *Travels in Syria and the Holy Land* (London, 1822); Porter, *Five Years in Damascus* (London, 2 vols., 1870); Robinson, *Biblical Researches* (1841) and *Later Researches* (1856); Yanoski, *Syrie Ancienne et Moderne* (1848); Baedeker, *Palestine and Syria*; Haskett Smith, *Handbook of Syria and Palestine* (1892).

EDWIN A. GROSVENOR.

Syriac Language: See ARAMAIC.

Syriac Literature: the literary productions of the Syriac Church. Its rise is lost in the first centuries of the Christian era. It is at its best from the fourth to the seventh centuries, when Arab dominion begins to impose its language upon Syria and Mesopotamia. From the tenth century on Syriac is only a literary tongue. Productiveness in that language dies out in the thirteenth century, just after a short period of revived glory. From the sixth century the split in the Eastern Church into Nestorians and Jacobites makes itself felt in the literature. It is probable that at one time there existed a heathen Syriac literature, but none of it has come down to us. The first writer in Syriac (Bardanes, the last Gnostic) was a convert to Christianity. The translation into Syriac of the Bible (see PESHITO) and of Greek theological and secular works laid the foundation upon which later scholars built. Learning had found a home in the great schools of Mesopotamia—Edessa (destroyed by the Persians in 489), Nisibis, Māchōzē, Dōr-Kōnī, Jerablīs, Mosul, etc. The literature is largely a theological one, and of importance because of the many translations it contains.

In these schools the study of the Bible was the chief interest. It was necessary to fix accurately the wording and the pronunciation of the more difficult expressions in both the Old and New Testament. This Masoretic work seems to have centered in certain convents—e. g. in the Jacobite one of Karkaftha, near Rās'a'in, whence the best of such MSS. come (Martin, *La Massore chez les Syriens*, Paris, 1880). With this there went hand in hand the writing of commentaries upon the Bible, which were, of course, more theological than critical. The great Syrian Father Ephraem (d. 373) wrote commentaries upon both Testaments and upon the Diatessaron of Tatian. Among Nestorians were Hannānā (d. 607), a determined opponent to the exegesis of Theodore of Mopsuestia; Bābāi the Elder (610); Elias of Merv; Ishō'dād of Merv (852). The Jacobites have names of greater prominence—Jacob of Edessa (640-708); Daniel of Salāh (eighth century); Moses bar Kēphā (813-903); and Daniel bar Salibi (d. 1171), Bishop of Mar'ash. More like the Jewish Midrash and the pseudepigraphic literature are such compilations upon biblical history as the *Cave of Treasures* (ed. Bezold, 1883-88), *The Book of the Bee* (ed.

Budge, Oxford, 1886). Of purely theological interest are the collections of church and monastic rules (*Canons*) which were formulated at various times—those of the Jacobite Church by Jacob of Edessa and Gregory Bar 'Ebhriyā, those of the Nestorian by Abbdishō. The great schism in the Church has called forth a large polemical literature. One of the best apologies on the Nestorian side was written by Elias of Nisibis (b. 975), ed. by Horst, Colmar, 1886; while the Monophysites were defended by that elegant writer Philoxenus of Mabug (485). The homily was a favorite form of religious exhortation. A large number of such homilies have come down to us from Ephraem (ed. Lamy, 3 vols., Mechlin, 1882-86); Ibas (435); Jacob of Nisibis, called Afraates the Persian Sage (d. 338), trans. into German by Bert (Leipzig, 1888); Philoxenus (ed. Budge, 1893); and Jacob of Lerug (503), who is said to have composed as many as 760.

Poetry was also known in the service of the Church, though even historical, philosophical, and grammatical works were put into verse. Bardanes (b. 154) is the first poet; he is followed by Ephraem, Balai (431), Cyrillōnā, Isaac of Antioch (d. 460), Narsai (489), and the Nestorians George of Mosul (d. 987), George Warda (1225), whose hymns are largely used in the Nestorian ritual, and Chamis bar Kardāhē of Arbel. Syriac poetry can not lay claim to great originality. Its system of meter is based upon two principles—the rhythmic sequence of accented or unaccented syllables, the one the arsis, the other the thesis of the verse, and the counting of the syllables. See Grimme, *Der Strophenbau in den Gedichten Ephr. des Syrers* (Freiburg, 1893).

Syriac literature is rich in historical works which throw much light upon the ecclesiastical and political history of the Christian Church in Mesopotamia. The *Didascalia* and *Constitutiones Apostolorum*, the legends of Abgar and the apostle Addai, and the Edessenian chronicle (Hallier, *Unters. über die Ed. Chronik*, 1892) are of prime importance (Duval, *Hist. d'Édesse*, 1892). The ancient martyrologies (re-edited by Bedjān, 4 vols., Paris, 1890-95) are full of interesting material, as are also the Nisibene hymns of Ephraem, the poems of Isaac of Antioch, and the historical romance dealing with the persecutions under Julian the Apostate (*Zeit. der Deutsch. Morgenl. Gesellschaft* 28, 263). Other historical works deal largely with the war between Rome and Persia. An anonymous Monophysite has turned the ecclesiastical history of Zacharias Rhetor of Mitylene (560) into Syriac, and united it with other works. Very full and accurate is the ecclesiastical history of John of Ephesus (b. 505) in three parts. Other writers are Simeon Barkāyā (591); George, Bishop of the Arabs (686); Jacob of Edessa, who finished in 692 a continuation of the chronicle of Eusebius; Dionysius of Tel Mahrē (817); Thomas of Marga (832), author of a monastic history (ed. Budge, 1893); Elias bar Shināyā; Michael (1163), whose work exists in an Armenian translation, etc.

Translations were made from the Greek at a very early time—e. g. the *Recognitiones* of Clement; the *Apology of Aristides* (ed. Harris, Cambridge, 1891); the discourses of Titus of Bostra; the *Theophania* of Eusebius; the commentaries of Theodore of Mopsuestia; the *Geoponica* (ed. Lagarde, 1860); the *Physiologus*; the works of Homer; the collection of *Leges Seculares* (ed. Sachau, 1880); the fables of Aesop; the medical works of Galen and Hippocrates. Many of these are useful for text-critical purposes; some have not been preserved in the original Greek. Among translators known by name are Ma'na (430), Moses of Agghel (550), Athanasius II. (684). A great many of the works of Aristotle were also translated, especially the *Organon* (Gottlieb, *Hebraica*, ix., 166). Probus (about 450), George of the Arabs, Sergius of Rās'a'in (about 540), Jacob of Edessa, and Honain (873) are the leaders in this work. From the Syriac texts were translated into Arabic, and from Arabic into the languages of Europe. The old Sanskrit stories of Kalilag and Damnag, of Sindban, and the history of Alexander the Great were done into Syriac from the Pahlavi. The translations of Aristotle formed the natural starting-point for all philosophical study, but the Syrians hardly got beyond commenting and excerpting their Greek master. To the names already mentioned may be added those of Paul of Persia (575), Severus Sabocht (d. 631), Mār Abhā II. (740), Antonius Rhetor, Moses bar Kēphā (b. 813), Bazūdā, and Severus bar Shakkō (d. 1241). See Renan, *De Phil. Peripat. apud Syros* (Paris, 1852).

The only non-theological science that was really cultivated was that of philology. Syriac lexicography had its begin-

ing in the necessity of determining accurately the meaning of words in the Bible and of the many Greek expressions which had been taken over into the translation of other works. Collections of such explanations were made by Ananias, Hama, Bar Seredwan (fourth century), but especially by Bar Jil (940) and Bar Habbil (961), where the definitions are in Syriac and Arabic. In grammar the starting-point was Aristotle and the Syriac translation of the *Topics* of Dionysius Thrac (Guthrie), *Topics in Syriac Grammar*, Berlin, 1907, p. 6; Marx, *Hebr. ar. u. syriac grammatica* (1890). To later times the influence of the grammatical studies of the Arabs was also felt. The chief grammarians are Joseph Hazzay, Jacob of Edessa, Elias of Tishrin (1028), Elias of Nisibis, Joseph bar Malkon (1300), John bar Zafil (thirteenth century), and Severus bar Shakkai. Other branches of science were hardly cultivated except for the writing of such compendia as the *Hexameron* of Jacob of Edessa, Emmael (966), *Maat bar Kephai* (fifteenth), *Habeshah*, vol. 63; Hlel, *Etudes sur l'Heb. de Jacques d'Edessa*, Helsingfors, 1902. Travel has published some interesting Syriac works on astronomy (Bertholet, *Les Chénies au Moyen Age*, II, Paris, 1906).

This short account may be fitly closed with a reference to two lights which illuminated the last days of Syrian literature. Abduh al. (1818), the Nestorian, was the first to attempt a history of his national literature (*Catalogue Liberaire*, in *Annuaire Bibl. Orient.*, III, 1). In his *Bibliotheca de Edessa* he attempted to imitate the *Maknûs* of Hariri (ed. Cardahi, Beyrouth, 1860). He also wrote a work on theology (*The Pearl*) and a collection of canons (*Mo' Script. Yell. Nova Coll.*, x.). Undoubtedly the most learned of all the Syriac writers was Gregory bar 'Ebrayâ (Bar Hebraeus, Abul Faraj), b. 1293; d. 1346. There is hardly a province of literary activity which he did not cultivate. He wrote the most comprehensive native grammar (ed. Martin, 1872), and the most useful native commentary upon the Peshitta (*Nurehaneh de Nureh*). That he had some acquaintance with physical sciences is shown in his *Lamp of the Sanctuary*, a compendium of all sciences in his *Ascent of the Mind*, a treatise on astronomy and cosmography; and in his translation of Dioscorides's *Dei Saporis*, his commentary on works of Galen, and in a medical work of his own. He wrote a work on ethics on the life of an ascetic (*Book of the Dove*), and a commentary on the mystical *Book of Isidore*. His historical writings are very valuable. His *History of the World* has been re-edited by Bodjan (Paris, 1906); his church chronicle by Abelos and Lamy (Louvain, 1872-77). He also made an Arabic recension of his *History of the World*. Bar Ebrayâ was a poet of some prominence. A number of his poems have been edited by A. Barhaili (Rome, 1877). See Nöldeke, *Sketches from Eastern History* (Lamkin, 1892).

See W. Wright, *A Short History of Syriac Literature* (London, 1893). R. Graffin has begun the publication of a complete *Patrologia Syriaca*, the first volume of which contains *Apocrypha Scripturae Perse Demonstrationes* (Paris, 1904).

RICHARD GUTHRIE.

Syrian Rite. See UNITED SYRIANS.

Syringa [Mod. Lat., from Gr. *σῦρις*, *σῦρις*, a shepherd's pipe, tube]; a genus of Old World shrubs of the family *Oleaceae*, to which the lilacs belong. (See LILAC.) Popularly, the beautiful shrub *Philadelphus coronatus*, of the family *Hamamelidaceae*, and often seen in gardens, is called sweet syringa. It is a native of Japan; its cream-colored, fragrant flowers somewhat resemble orange-blossoms, whence another popular name of mock orange.

Revised by CHARLES E. BENNEY.

Syringe [from Gr. *σῦρις*, *σῦρις*, tube, pipe, lit., shepherd's pipe]: an instrument ideal in principle with the ordinary suction-pump. A vacuum is formed, either by means of a piston or a compressible chamber of India-rubber, fitted with suitable valves. Water or some other fluid then rushes in and fills the vacuum, and a second application of pressure causes a jet of the contained liquid to be thrown out. The syringe is of many forms, chiefly employed in surgery, in horticulture, etc.

Syro-Chaldeans and Syro-Orientalis. See CHALDEAN CHRISTIANS.

Syrus. See SYRA.

Syr'ia, Major and Minor [Lat., Greater and Lesser Syria]: the ancient names of the two large halves, or rather of the two opposite angles (E. and W.) of the great almost rect-

angular continent in the east bounded by the Mediterranean, of which the angles are the wastes of Taurus and Tigris. They are now called respectively the Gulf of Suez and the Gulf of Aden. They are shallow and dangerous to navigation on account of quicksands and the uncertainty of the tides.

Revised by J. H. S. STOKLEY.

Syrus, Ponticus. See PONTICUS SYRUS.

Syran's town in the government of Pskovsk, Russia, on the Syran near its influx into the Volga (see map of Russia, vol. 6-61), and in the center of a very fertile district, from which it exports large quantities of grain. Pop. (1889) 30,442.

Syrtakia. See HELLY.

Szabadka, so called (Germ., *Heuss Theresopolis*); town in the county of Bacs, Southern Hungary, on Lake Palud (see map of Austria-Hungary, vol. 7-11). It has manufactures of iron and leather, important cultivation of tobacco and breeding of cattle, and a brisk trade in horses, cattle, sheep, wool, and hides. It consists of the town proper and sixteen suburbs, and is rather indifferently built, though it contains several handsome buildings, such as the Church of St. Theresa, the beautiful Greek church, the town-house, the barracks, etc. Pop. (1890) 73,396.

Revised by M. W. HARRINGTON.

Szalay, soloj, LAZAR: historian; b. at Buda, Hungary, Apr. 18, 1813; studied at the University of Pesth, and was admitted to the bar in 1831; devoted himself to history, jurisprudence, and politics; became editor of various leading reform papers, and published a collection of political essays in 1847, and of political biographies 1847-50; was the most prominent member of the commission for the revision of the Hungarian penal code, a work which earned great admiration outside Hungary; succeeded Kossuth as editor-in-chief of the *Pesti Hírlap* in 1844; was sent as ambassador in 1845 to the provisional government of Germany in Frankfurt; resided subsequently in London and Switzerland, occupied with historical studies; returned to Hungary in 1861. D. at Salzburg, July 17, 1903. Among his works are a *History of Hungary* (8 vols., 1850-64); *Kossuth's Miklós* (2 vols., 1863-66); and *The Book of Natanson*, a collection of political biographies. F. M. COLBY.

Szarvas, ser'vash; town of Hungary, on the Körös (80 miles S. E. of Budapest (see map of Austria-Hungary, vol. 7-1)). It was formerly fortified, but its fortifications have fallen into decay, and it derives its importance mostly from its trade in grain and cattle. It suffered severely during the sieges of 1565 and 1685. The surrounding country is swampy and marshy, but famous for its extensive bee-culture. Pop. (1890) 24,300.

Revised by M. W. HARRINGTON.

Szatmar-Nemet, sot-mar-nó-met; town of Hungary, on the Szamos; 68 miles by rail N. E. of Debrecze (see map of Austria-Hungary, vol. 6-1). It has a Roman Catholic cathedral, and has extensive manufactures of shawls, a kind of brandy distilled from plums. The town was formed by the union of Szatmar and Nemet in 1715. Pop. (1890) 21,218.

Széchenyi, szé'chen-yi, IETVÁN, Count; Hungarian statesman; b. in Vienna, Sept. 21, 1792, of an old and celebrated Hungarian family; served in the Austrian wars with Napoleon, but retired from the army in 1825, and devoted himself wholly to the material and spiritual development of his native country. He took a prominent part in the foundation of the Hungarian Academy of Sciences, of the first Hungarian theater, of the conservatory of music in Pesth, etc., and in the erection of the great bridge across the Danube at Pesth, in the regulation of the course of the Danube through the Iron Gates, in the establishment of steam-navigation on the Danube and the Theiss, etc. In political matters he desired reform, not revolution. He held that the progress of Hungary could not be effected unless by the aristocracy and in alliance with Austria, and he consequently opposed Kossuth very strongly. Nevertheless, in 1848 he consented to be a member of the Batthyány-Kossuth ministry, but on the outbreak of the war with Austria he became insane, and was taken to the asylum at Békés, near Vienna. Here he nearly recovered, but in Mar., 1860, the Austrian police, suspecting him of being the author of a political pamphlet which criticized the Government very severely, undertook a search of his rooms and papers, and this excited him so violently that he relapsed, and killed himself Apr. 6, 1860. He was the author of several spirited pamphlets.

Revised by F. M. COLBY.

Sze-chuen, or **Ssü-chuen**, se'chwān' [literally, four streams]: the largest province of China, bounded N. by Kansuh and Shensi, E. by Hupeh, S. by Kwei-chow and Yunnan, and W. by Tibet; area, 166,800 geographical square miles, or 220,000 statute square miles. The portion lying W. of the river Min (an important affluent of the Yang-tse, regarded by some as the upper course of the Yang-tse itself) is little known. It has an area of 120,000 sq. miles, is exceedingly mountainous, and forms part of the great mountain lands of Central Asia. With the exception of some small inclosures it is little populated, is almost uncultivated, and of inferior importance as regards the value of its products. Here are found several Tibetan and aboriginal tribes, such as the *Man-tse* (a people considered by the Chinese to be the remnants of the ancient occupants and rulers of the province), the *Si-fan*, who are divided into numerous tribes, each with its own chieftain, and the *Lolos*, who are practically independent, and from whose frequent raids the Chinese settlers suffer greatly.

The eastern portion, which may be regarded as Sze-chuen proper, has been described by Baron von Richthofen as a large triangular-shaped basin surrounded by mountains (mostly of Silurian and Devonian age), some of which rise above the snow-line, and all of which are difficult to cross. The basin he calls the Red Basin, from the accumulations of red clayey sandstones and sandy clays which are found in it. The summit lines within the basin are nearly at a level with one another, and would if connected represent an undulating plain, 3,000 to 4,000 feet above sea-level, but owing to the fact that the bed of the Yang-tse is 1,500 feet or more below the level of the plain, and that rocks of the Red Basin are soft and easily destructible, the rivers have eroded deep channels, and converted the entire basin into a hilly country. With the exception of the plain of Ching-tu, Sze-chuen contains no level ground worth speaking of.

Sze-chuen can be approached from the E. by only two routes: (1) by the Yang-tse, up whose gorges boats and junks (never exceeding 70 tons burden) are dragged slowly and at great expense and risk, and (2) by the "Great North Road" over the mountains from Si-ngan-foo. Communication within the province is everywhere difficult (except in the plain of Ching-tu), and is kept up chiefly by utilizing the affluents of the Yang-tse and their numerous branches. Several pack-roads, paved with flagstones, have been constructed, and steps cut in the rocks at very steep places. That which connects Ch'ung-K'ing with Ching-tu-foo is a good example. The sedan-chair is the commonest mode of conveyance used by travelers, while goods are transported by coolies. Beasts of burden are little used.

Coal is found in Sze-chuen, but is not mined extensively. The manufacture of iron from its ores is perhaps the most generally distributed industry of the province. Salt is extensively made from brine raised from wells ranging in depth from 700 to 3,000 feet, and evaporated in some places by coal, but in many by natural gas. Petroleum is plentiful, but is not utilized. The value of the salt produced annually is about \$63,000,000. On this the province receives a tax of \$3,150,000, while the province of Hupeh, which levies a tax of 18 cash a catty, takes \$2,100,000. The other chief products of the province are silk, opium, insect wax (see PEH-LA), tobacco (which is of excellent quality, and is used by the natives in leaves rolled up in the shape of cigars), tea (only green and of inferior quality), and t'ung oil.

The inhabitants are, as a rule, gentle in character and refined in manners, and are both industrious and prosperous. All the great commerce of the province, however, is in the hands of men from Shensi and Kiangsi, and banking and pawnbroking are controlled by men from Shansi. The population is about 67,000,000. CH'UNG-K'ING (q. v.) is the only river-port opened to foreign residence and trade, but missionaries, both Protestant and Roman Catholic, are found in many places. The capital is CHING-TU (q. v.). See Baber's

Travels and Researches in Western China (London, 1882); Hosie's *Three Years in Western China* (London and New York, 1890); and Little's *Through the Yang-tse Gorges* (London, 1887). R. LILLEY.

Szegedin, sech-ed-ee'n': city; in Hungary, at the junction of the Maros with the Theiss; 118 miles by rail S. E. of Budapest; connected by a bridge of boats with Neu-Szegedin on the opposite bank (see map of Austria-Hungary, ref. 7-H). The houses are generally only one story high, with thatched roofs; the streets are broad, but mostly unpaved, and sometimes are rivers of mud. The old Turkish castle in the center of the town is the sole reminder that Szegedin was once an important fortress. In 1879 the town, with the surrounding country, was submerged by inundation; almost half the houses were destroyed, and nearly 2,000 persons perished from drowning or exposure. Soda, soap, and cloth are manufactured on a large scale, and an active trade is carried on in corn, wine, tobacco, salt, and lumber. At its annual fairs vast exchanges of goods take place. The town is famous for its floating mills and river-boats. The Hungarians were defeated here by the Austrians (Aug. 3, 1849). Pop. (1890) 85,569. E. A. GROSVENOR.

Sze-ma (or **Ssü-ma**) **Kwang**: one of the most prominent statesmen and writers of China, and as a historian second only to Sze-ma Ts'ien; b. in 1009; d. 1086. He was remarkable for precocious intelligence, and a story is told that illustrates his presence of mind and resourcefulness even when a boy. A playmate, having fallen into one of the large earthenware vessels in which the Chinese keep tame fish, was on the point of drowning, when Kwang dashed a large stone against the jar and broke it, thus letting the water escape and saving the life of his companion. He was employed at an early age in Government office, and rose to high rank in the ministry. He is noted, first, for his strenuous and successful opposition to the reforms advocated by his contemporary Wang An-Shih, usually called "the Innovator"; and, second, for his great historical work, in 294 books, *The Comprehensive Mirror of History*, on which he spent the leisure of nineteen years. It covers a period extending from the beginning of the fourth century B. C. to 960 A. D. He was also the author of several important dictionaries. R. L.

Sze-ma (or **Ssü-ma**) **Ts'ien**: author of the first general history of China; b. at Lung-mün, in what is now the province of Honan, about 163 B. C. He early devoted himself to study, and at twenty entered upon an extended course of travel throughout the empire. After this he held several minor offices under the Government until 110 B. C., when he succeeded his father, Sze-ma T'an, as grand recorder and astronomer, and shortly thereafter entered upon the task of completing the great historical work begun by his father. This was finished in 91 B. C., and received the name of *Shih-ki*, or *Historical Records*. It extends from the beginning of the reign of Hwang-ti (B. C. 2697) to 104 B. C. It has become the model for all Chinese historical works, and is divided into five parts: (1) Imperial Records; (2) Chronological Tables; (3) Treatises on Rites, Music, Chronology, Astrology, Sacrificial Service, Watercourses, Weights and Measures, etc.; (4) Genealogical History of the Princes and Grandees; and (5) Narratives, or biographies, and accounts of foreign countries and their affairs. About the year 18 B. C. Sze-ma incurred the displeasure of the emperor, and was thrown into prison because of his defense of Gen. Li Ling, who having foolhardily advanced far into the territory of the Huns with a body of 5,000 foot-soldiers, had been overthrown, and then, afraid to face the wrath of the emperor, had surrendered. Sze-ma is also noted for reforming the calendar, and the chronology determined by him still obtains in China. He died in disgrace about 85 B. C. For a specimen of his writings, see Giles's *Gems of Chinese Literature* (London and Shanghai, 1884). R. L.

T



: the twentieth letter of the English alphabet.

Form.—The form T is inherited via the Roman alphabet from the early Greek T or + X X. The form of the Semitic original was that of a cross, + or X. It occupied the last or twenty-second place in the original alphabet adopted by the Greeks from the Phœnicians.

Name.—The Semitic name of the letter was *tau*, i. e. mark, cross, whence the Greek *ταυ*. The Latin phonetic name *te* passed through the French *té* into English as *te*, now pronounced like *tea*.

Sound.—It commonly denotes a voiceless dental (or alveolar) explosive formed by breaking a closure between the tongue-tip and the alveolar terrace back of the upper front teeth as in *tar*, or by effecting a check at the same point as in *rat*. Generally there is in the latter case an additional after-puff caused by again breaking the closure; thus in *art* the after-puff constitutes the only characterization of the sound. The same sound is denoted also by *th* in *Thames*, *Thomas*, *thyme*, *phthisis*, and by *(ed)* in preterites and participles, as *asked*, *rushed*. The letter *t* is silent in *hauiboy*, *hasten*, *listen*, *often*, etc., *bustle*, *thistle*, etc., *chestnut*, *Christmas*, *mortgage*, *bankruptcy*, *waistcoat*, *Matthew*; in the combination *ti* before vowels it often has the value of *sh* (*s*), as in *initial*, *action*, etc., but in *-sti-* it has the value of *tsh* (*tš*), as in *question*, *Christian*. In the combination *th* it represents a spirant, either voiceless, as in *thin*, or voiced, as in *then*.

Source.—The sound represents in Teutonic words an Indo-European *d*; cf. *ten*: Lat. *decem*; *tooth*: Lat. *dens*; *two*: Lat. *duo*; *heart*: Lat. *cor*, *cordis*; or when following *s*, *h*, or *f*, an Indo-European *t*, as in *stand*: Lat. *stare*; *night*: Lat. *nox*, *noctis*; *eight*: Lat. *octo*. Between *s* and *r* it is exrescent, i. e. a special development of Teutonic; cf. *stream*, Indo-European root *sreu-*, *sister* from *suesr-*, Lat. *soror*. It is also an exrescent product of Mod. Eng. after final *-s*, e. g. in *betwixt* < M. Eng. *betwix*; *against* < M. Eng. *ageines*.

Symbolism.—T = Tuesday, ton, Tullius; Ta = tantulum; Te = tellurium; Th. = Thursday, thorium; Ti = titanium; Tl = thallium. BENJ. IDE WHEELER.

Taafe, *taa'fe*, EDUARD, Count: Austrian statesman; b. in Prague, Feb. 24, 1833, of an Irish family; was educated with the Emperor Francis Joseph; entered the public service in 1857; became Austrian Minister of the Interior in 1867; Minister President in 1869 and again in 1879. The chief object of his policy has been to form a middle party which should unite conflicting nationalities and creeds. He has sought to increase the strength of the Slavic element in the empire. In 1893 he alienated the conservatives, the German liberals, and the Poles by his electoral reform measure, and was forced to resign Oct. 29. F. M. COLBY.

Tabasco: a southeastern state of Mexico, bounded N. by the Gulf of Mexico, E. by Campeche, S. E. by Guatemala, S. by Chiapas, and W. by Vera Cruz. Area, 9,844 sq. miles. The southern portion only is mountainous, the rest consists of extensive plains and low rolling lands bordering the river Grijalva and its tributary, the Usumacinta, both of which are navigable. There are extensive swamps and lagoons near the coast, much of the surface is covered with matted forest, and the roads, even in the most settled portions, are execrable. The climate is warm and damp; there is no true dry season, but rains are most copious from July to October and in December and January. The soil nearly everywhere is very fertile; besides the common crops of maize, etc., cacao and sugar-cane are raised, the former for exportation and the latter principally for the manufacture of rum. There are no mines of importance. In general, Tabasco is one of the least progressive of the Mexican states. Pop. (1893) estimated, 111,820. Capital, San Juan Bautista. HERBERT H. SMITH.

Tabasco River: See GRIJALVA.

Tabasheer [from Pers., Hind., and Arab. *tābāshīr*; cf. Sanskr. *tavakshira*]: a white variety of opal obtained from

the hollow stems of certain bamboos. It appears to be the product of an exudation of the siliceous sap of the plant into its internal cavity, caused by disease or injury of the plant. It is very light, brittle, porous, and has hygrometric properties. There are several varieties. The transparent kinds have a very low refractive power. The Hindus ascribe to it valuable medicinal virtues.

Tabatin'ga: a town of the state of Amazonas, Brazil; on the north side of the river Amazon, close to the frontier of Peru (see map of South America, ref. 3-C). It is the terminal port for the regular Brazilian steamboat lines, and the point of departure for small steamers which ply on the Peruvian rivers; there is a growing trade, especially in rubber. Ocean steamships have ascended to this point, nearly 2,000 miles. Pop. about 3,000. H. H. S.

Tab'ernacle [via O. Fr. from Lat. *taberna'culum*, tent, (in Late Lat.) tabernacle, dimin. of *taber'na*, shed, booth, shop, used as transl. of Heb. *mišh'kān*, dwelling-place, tent, tabernacle, or, 'ōhel, tent, tabernacle]: a tent erected, under minute divine directions (Exod. xxv.-xl.), by the Israelites at Mt. Sinai, and carried with them into the Holy Land. It was set up at Gilgal (Joshua iv. 19), then at Shiloh (Joshua xviii. 1), next at Nob (1 Sam. xxi. 1), then at Gibeon, where it is last mentioned (1 Chron. xxi. 29). It was designed as the place where God should especially manifest his presence to his people, and where they should offer to him their sacrificial worship, and was replaced by Solomon's temple which exactly doubled its dimensions. It was a rectangle 45 feet long and 15 broad and 15 high. Its two sides and western end—the eastern end was left open—were made of acacia boards placed on end in silver sockets, and bound together by rods overlaid with gold; and the frame was covered with (1) linen, on which was embroidery representing cherubim; (2) black goats'-hair cloth; (3) rams' skins dyed red; (4) seals' skins (or porpoise-skins). It consisted of two adjoining rooms, with an outer court surrounding both. The inner room, which was an exact cube, contained the ark of the covenant, with its contents; over this were the figures of two cherubim, and between them the Shekinah. The only access to this room, which was called "the holy place," or "the holy of holies," "the holiest of all," "the second tabernacle" (Heb. ix. 3, 7), was from the outer room, which was called "the holy place," also "the sanctuary," "the first tabernacle" (Heb. ix. 6), of the same width and height, but just twice the length. Between them hung a veil, or rather double curtain, which was passed only by the high priest, and by him only on one day of the year, the great day of atonement. In the outer room was the golden censer, the golden altar on which incense was burned every morning and evening, the table of shew-bread, on which were twelve loaves of bread, replaced each week, and the golden candlestick, the lamps of which were trimmed every morning and lighted every evening. Into this the high priest and the priests entered daily, in the course of their regular ministrations, but no others. The entrance was at the eastern end from the court in front. In the court the principal object was the large brazen altar, on which all burnt-offerings and the appointed parts of other sacrifices were burned. Between this and the sanctuary itself was placed the brazen laver for the ablutions of the priests. This court was entered not only by the priests and Levites, but by all Israelites—who must be ceremonially clean—who came to offer sacrifices. The entrance to this also was by a hanging of curtains gorgeously wrought in colors, supported on pillars, and was 20 cubits in width. The three entrances were thus in one line, all facing eastward. The dimensions of the court were 100 x 50 cubits; it was inclosed on all sides by pillars of brass 5 cubits high and 5 cubits apart, resting in sockets of brass; and on these were hung, by hooks of silver, curtains, one for each side, of "fine twined linen."

Revised by S. M. JACKSON.

Tabernacles, Feast of: the last of the three great annual festivals, at which all the males of Israel were required to present themselves at the sanctuary (Lev. xxiii. 33-43). It began on the 15th Tisri, the first month of the civil and

seventh month of the ecclesiastical year, corresponding to the last part of September or first part of October, and continued seven days, with a supplementary eighth day. On the first and on the eighth day there were "holy convocations," when no servile work might be done, although the other activities of life were allowable. On the remaining days there was no legal restriction on labor, but from the manner of keeping the feast it must have been largely suspended. It was also called the "feast of ingathering" (Exod. xxiii. 16), and was pre-eminently a thanksgiving festival after harvest, and was far more joyously kept than any of the other feasts. It was distinguished by two peculiar observances—(1) the dwelling in booths, in memory of their wilderness wanderings. These booths were to be constructed of the branches of "goodly trees," and were not tents. According to Jewish tradition, the sides were built up of boards, and only the roof made of branches. The booths were placed on the roofs and in the courts of the houses, and in any unoccupied places in the streets. As little furniture as possible was to be placed in them, and it was not required that women and children should dwell in them, but only men. Tradition interpreted the word dwell to mean taking at least two meals a day in them. (2) The singular manner in which the sacrifices were arranged (Num. xxix. 13–38). There was offered daily a kid for a sin-offering, with two rams and fourteen lambs for a burnt-offering; but besides this there was a further burnt-offering of bullocks, thirteen on the first day, twelve on the second, and so on diminishing by one on each successive day, until only seven were offered on the seventh day. On the eighth day the sacrifices were a goat for a sin-offering, one bullock, one ram, and seven lambs for a burnt-offering. The Law required that at the feast of tabernacles in the sabbatical year the Law should be publicly read to the whole people, men, women, and children.

Two other customs arose at an early date: (1) One of the priests drew water in a golden pitcher from the Pool of Siloam, and brought it through the water-gate of the temple to the altar. As he entered, the trumpets sounded. Then, just before the offering of the sacrifices, the water was poured upon the altar, amid the joyous chanting of Ps. cxviii. on the part of the great concourse of people, in holiday attire and carrying *lulabs* or green branches tied together. So great was the joyousness of the occasion that it became a rabbinical proverb, "He has never seen joy who has not seen the joy of the pouring out of the water of Siloam." To this custom allusion is made in John vii. 37, 38. In the evening of the day of "holy convocation" the men and women assembled in the courts of the temple expressly to rejoice over the drawing of the water of Siloam in the morning, and gave themselves up to unrestrained hilarity. (2) On this occasion two great lights were set up in the court, each consisting of four lamps, the oil for which was supplied by the sons of the priests, and the wicks made of cast-off priestly garments. The light is said to have reached over nearly the whole city. The passage John viii. 12 is supposed to allude to this light. Revised by S. M. JACKSON.

Tabernæmontana: See COW-TREES and FORBIDDEN FRUIT.

T'bes Dorsalis, or Locomotor Ataxia [*tabes dorsalis* is Lat., liter., a wasting away (*tabes*) in the back; *locomotor ataxia* is in-coördination of movements; Mod. Lat. *locomotor* (Lat. *locus*, place + *motor*, a mover) + Gr. *ataxia*, disorder (*â-*, not + *adjec.* *taktós*, deriv. of *τάσσειν*, arrange)]: a chronic affection of the posterior columns of the spinal cord, characterized by in-coördination, sensory and nutritive disturbances, and a loss of the light reflex of the pupil. It is a disease of middle life, and is much more frequent in men than women. While syphilis is the most frequent cause, sexual excess, overwork with exposure, and possibly even injury may produce it. Alcoholism alone exerts but little causative influence. The disease usually begins with attacks of violent, stabbing pains in the legs, coming on suddenly and lasting only for a moment, recurring for months before the onset of other symptoms, and usually diagnosed as rheumatic. On examination the knee jerks are found to be absent, and later the superficial reflexes also disappear. The pupils are small, and while still contracting on accommodation cease to do so when exposed to light. This condition is called the Argyle-Robertson pupil. Optic atrophy may be present. Later the characteristic gait due to in-coördination appears. The foot is raised too high, is thrown violently forward, and the entire sole touches the floor at once.

Walking is made much more difficult by closure of the eyes, and on attempting to stand with the feet close together and the eyes shut the whole body sways sometimes so violently as to throw the patient to the floor (Romberg's symptom). The gait greatly resembles that of a drunken man. In-coördination is also present in the hands. On trying to touch the nose or ear with the finger, the eyes being closed, it goes wide of the mark. It is difficult for the patient to button or unbutton his clothes, and to pick up small objects without the aid of vision. There is no true palsy, but simply this inability to direct muscular effort, until late in the disease. Sensation is delayed, sometimes ten seconds elapsing between a touch and its recognition. The ability to localize sensation may be lost. There are spots of anæsthesia. The patient often feels as if walking on wool. Numbness and tingling occur in the hands and feet. Often a tight band is felt around the body. Attacks of violent pain in the stomach, with vomiting (gastric crises), are frequent. Laryngeal crises are characterized by noisy inspiration, dyspnoea, and cough. Infrequently there are crises in other organs. There is apt to be difficulty in micturition. Sexual power is entirely lost. Trophic changes occur. The most frequent are perforating ulcer of the foot, skin eruptions, changes in the larger joints characterized by erosion of the cartilages and effusion into the joint cavity, and brittleness of the bones rendering them peculiarly liable to fracture. The disease extends over many years. Death usually results from some intercurrent affection. While locomotor ataxia never causes disease of the mind, one form of insanity (general paralysis) occasionally begins with identical spinal symptoms. Fully developed locomotor ataxia is incurable, but treatment may benefit and for a time even stay the progress of its course. Pathologically *tabes dorsalis* is a sclerosis of the posterior columns of the spinal cord, with involvement of the posterior nerve-roots, the meninges, and sometimes a peripheral neuritis. WILLIAM PEPPER and C. W. BURE.

Table-land: See PLATEAU.

Tables: See FURNITURE.

Taboo', or **Tabu** [from Polynesian (Marquesas island), *tapu*, forbidden, (as noun) *taboo*]: a Polynesian interdict which makes persons, places, or things sacred, so that certain persons can not touch or come near them without becoming defiled and outlawed. The system of taboo penetrates the whole social life of most of the unchristianized Polynesian islands, and is a powerful agent in the hands of chiefs and priests in controlling the people.

Tabor, Mount [*Tabor* is from Heb. *Tābōr*, liter., lofty place (or perhaps stone quarry)]: an insulated mountain of Northern Palestine, in Galilee, 6 miles S. E. of Nazareth, rising 1,053 feet above the plain and 2,018 feet above the sea, and commanding a large and beautiful view of the surrounding country. It is often mentioned in the Old Testament, and was from the fourth century generally regarded as the scene of the transfiguration of Christ, although it is now known that at the time when that event took place its summit was occupied by a fortified town.

Revised by M. W. HARRINGTON.

Tabor College: a coeducational institution at Tabor, Fremont co., Ia.; incorporated under the name of Tabor Literary Institute in 1854 and reincorporated under the name of Tabor College in July, 1866. It is an outgrowth of a colony of Congregationalists from Oberlin, O., who formed the settlement at Tabor in 1852. Many citizens of Tabor gave largely of their property to the institution at the opening of the college department. The first nineteen donors gave in cash and notes 60 per cent. of the assessed value of their property. An academy was opened in 1857, and a college department in 1866. Tabor College includes classical, scientific, and literary courses of study of four years each, also a preparatory academy, an English course of four years, a conservatory of music, and a department of fine arts. The entire number of students in 1894 was 218. Rev. William M. Brooks, D. D., the present incumbent (1895), was principal of the academy and first president of the college. Tabor College has five buildings, 13 acres of land, a library of over 6,000 volumes, and a cabinet of 12,000 specimens. The property is valued at \$160,000. The number of students from the first exceeds 3,000. The faculty consists of eight professors and five instructors, besides a number of assistants. WILLIAM M. BROOKS.

T'aborites [from *Tabor*, one of their strongholds, 65 miles S. of Prague]: the radical wing of the Hussites (q. v.) or-

vanished in 1420 under Zikān. They opposed the Christians or Muzaffarids no less than the Rumis, and waged long defensive wars. They finally took the name of Ilkhanate (see p. 874).

Tabriz, or **Tabreez**, old name of the province of Azerbaijan, Persia; 30 miles E. of Lake Urmia (see map of Persia and Arabia, vol. 1-4). It is in the midst of a fertile and well-cultivated plain, where there are many orchards and vineyards. The city itself is surrounded by gardens that are irrigated by the adjacent streams. It is purely built, with crooked, narrow, and dirty streets and no important public edifices, except the remains of the Blue Mosque, a model of Eastern architecture and decorative art that was destroyed by the earthquake of 1780, and the ark minaret, containing the pulpit of the last-imam. Its houses are more buildings, but extensive, and there are important manufactures of silk, wool, shawl, tobacco, and leather, and a large transit trade. Though a Persian tradition tells us that Tabriz was built by Zohabā, the wife of Haydar-al-Bakhti, the town was known in antiquity under the name of *Gasteron*, and was the capital of the Median province, *Atropatene*. Marco Polo visited it about 1263. It has suffered severely by fire, earthquake, and by the invasions of Turks. Pop. estimated at 160,000.

Revised by M. W. HARRINGTON

Tabu: See **TABOO**.

Tabulae: a name formerly given certain corals, both young and fossil, from the fact that the pits (calices) in which the animals lived are divided by transverse partitions or *tabulae*. The group is an unnatural one, some of the forms belonging to the *Hydraea*, the others to the *Scyphozoa*.

Tab'ahool, or **Bahn**: a nutpall which grows on a lamellar (*Thamnia indica*). It is valuable as a prolific source of gallic acid. Large quantities are exported from India and Barbary.

Tab'amahoe: the resin of various trees (1) of *Myrica salicifolia*, a tree of Guayana and Venezuela; (2) of the limbs of the balsam-poplar, which grows in the U. S. (*Populus balsamifera*); (3) of *Calophyllum rotundifolium*, *C. laevis*, and *C. lucidum*, Old World tropical trees, producing East Indian lacumahoe; (4) the Mexican *Quercus* (q. v.). These articles are sometimes used in medicine; all but the second are employed in varnishes, incense, etc.

Revised by CHARLES E. HENRY.

Taché, ta'h'sha, Sir EUGENE PACHAÏ; statesman; b. at St. Thomas, Quebec, Canada, Sept. 5, 1795; d. there July 29, 1865. He served in the war of 1812; studied medicine and practiced as a physician till 1841, when he entered Parliament; was commissioner of public works 1848-49; Speaker of the Legislative Council 1850-57, and was knighted in 1855. He wrote *De développement de la force physique chez l'homme* (Montreal, 1829) and *Recherches sur l'organisation des colonies* (Quebec, 1833).—His son, JOSEPH CASHEL, author, b. at Kamouraska, Quebec, Dec. 24, 1826, graduated as a physician in 1844; was a member of the Legislative Council 1847-57; represented Canada at the Paris Exposition in 1855; at that in London in 1862, and was British delegate from Canada at the international sanitary conference at Washington in 1881. He wrote *Esquisse sur le Canada* (Paris, 1855); *Yamers mémoires en Canada* (Quebec, 1854); *Les pèlerins rouges* (1854); *Trois légendes de mon pays: Forestiers et voyageurs*, and other works.—Another son, ALEXANDRE ACHIN, Roman Catholic archbishop, b. at Rivière-du-Pas, Quebec, July 23, 1823, graduated at the College of St. Hyacinthe; studied theology at the Seminary of Montreal, and became a monk of the Oblate order. He served as a missionary among the Indians of the Red River country; was ordained a priest in 1845; consecrated bishop of Arch. in *partibus* in 1859; Bishop of St. Boniface in 1860, and in 1871, when St. Boniface was erected into a metropolitan see, Bishop Taché was appointed the first archbishop. While attending the council of the Vatican at Rome in 1869, the Canadian Government begged him to return and use his influence with the Mills of Manitoba, who were in a state of insurrection. He returned at once, and empowered by the British and Dominion Governments to offer full pardon in the rebellious Mills, helped successfully to restore peace and allay disaffection. D. at Winnipeg, Manitoba, June 22, 1894. He was the author of *Vingt années de missions dans le nord-ouest de l'Amérique* (Montreal, 1869); *Népalais sur le nord-ouest de l'Amérique* (1869), and other works.

NEIL MACDONALD.

Tachyura: See **BEAUTY DUCK**.

Tachyglossidae (Mod. Lat., named from *Tachyglossus*, the typical genus; Gr. *tachys*, swift + *glossis*, tongue); a family of Australian mammals, of the order *Monotremata*, represented by the so-called hedgehogs, which most and are confounded with the hedgehogs of Europe. *Tachyura*, a name often used, is preoccupied in zoology. The face and jaws are produced into a long and tubular snout, at the end of which is the small mouth; teeth are entirely wanting, but on the palate are robust bony spines, pointing backward; the tongue is subcylindrical, and very long, flexible, and protrusible, and armed with numerous barbed spines; the surface of the body and head above and on the sides is armed with long, stout, tapering, and pointed spines, intermingled with coarse hair, and below is clothed chiefly with simple coarse hair; the limbs are short and robust, each provided with five toes; the males are provided with bony spurs to the hind feet; the tail is rudimentary. The *Tachyglossus* attains a length of about 15 inches, but the *Zaglossus* of New Guinea is much larger. They feed chiefly on ants and other small insects, as is indicated by the small mouth and extensible tongue, but sometimes take in grass. The ants are chiefly sought for by digging, for which the animals are eminently adapted. "In soft alluvial soil or sand an echidna will disappear before the observer's eyes, apparently without any effort, gradually sinking out of sight." (See p. 879.) Like their relatives, the duckbills, they develop one of large skin, compared with those of other mammals; but, instead of "laying" two, as the duckbill does, the female matures a single one, which is covered about in a pouch formed by a fold of the skin, somewhat like the pouch, or "marsupium," of an opossum and other marsupials. As in the species, differences of opinion prevail. Until recently only one was generally recognized. There are two very distinct genera, (1) *Tachyglossus* or *Echidna*, and (2) *Zaglossus*, *Acrotylommus*, or *Proechidna*. Of the former, three closely related modifications (species or subspecies) exist—one in Australia, one in Tasmania, and one in New Guinea, known respectively as *E. setacea*, *E. setosa*, and *E. tasmani*; and of the latter, two in New Guinea, *P. browni* and *P. nigrescens*. Revised by F. A. LUCAS.

Tachygraphy: See **STENOGRAPHY**.

Tachypetidae (Mod. Lat., named from *Tachypetes*, the typical genus; Gr. *tachys*, swift + *petes*, fly); a family of birds represented by the frigate bird or man-of-war of mariners. The form is somewhat the same as that of pelicans, but the neck is shorter, and the anterior position of the legs imparts to the bird a peculiar appearance; the bill is longer than the head, rather slender, and contracted toward the middle, and nearly straight, but with the end strongly hooked; the sheath is composite or grooved, as in all the *Phalacrocoracidae*, the edges are entire, the wings are very long and pointed; the tail is also very long, is very deeply forked, and has twelve feathers; the legs are inserted unusually far forward, and are small; the tarsus being, proportionally, the smallest in the entire class of birds; the toes are slender, and the web between them deeply indented. The sternum is small and short, the coracoids long, the furcula ankylosed with the sternum and coracoid. The family belongs to the same group (*Steganopoda*) with the *Phalacrocoracidae* (frigatebirds), *Fulidae* (cormorants), *Phalacrocoracidae* (cormorants), *Alcedinidae* (kingfishers), and *Coliidae* (goatsuckers). As to habits of species, see FRIGATE BIRD. Revised by F. A. LUCAS.

Tacitus, MARCUS ULPIUS; Roman emperor 275-276; b. at Interamna (Terra), in Umbria, about 90 A. D.; was noted as one of the oldest senators and one of the wealthiest citizens when the senate, on the death of Aurelian, elected him emperor. He was a man of upright and pure character and of literary tastes, claiming descent from the distinguished historian whose name he bore. It was his ambition to reanimate the senate in its former authority, improve the morals of the people, and check the confusion in public affairs. He waged a successful war with the Alani, but died soon afterward at Tarsus or Lyons, in Asia Minor. According to some authorities he was murdered by his soldiers.

F. M. COLBY.

Tacitus, PRAESES CASSIUS; author; b. about 54 A. D. His birthplace is not known; in some MSS. and by Aquinas Apollinaris he is called Galus; but the phenomenon Tacitus is established by a Greek inscription found at Myra, first published in 1890, which also proves that late in life he was president of Asia. He married a daughter of C. Julius

Agricola in 77 A. D.: was prætor in 88; consul suffectus in 98, and probably survived Trajan, who died in 117. He had already acquired great reputation as an orator when Pliny entered public life. They became intimate friends. Of Pliny's letters, eleven are addressed to him, and it is apparent that his friendship was considered by Pliny as a distinction. As an author he was much appreciated by his contemporaries, as well as by the writers of the following century. The Emperor Tacitus claimed relationship to him, and ordered his works to be placed in all public libraries, and ten copies to be made every year at the public expense and deposited in the archives. During the latter part of the Roman epoch and during the Middle Ages he was not much read, and most of his works have been handed down only in a mutilated and corrupted form. The dialogue *De Oratoribus* is his earliest work; its authenticity has been denied by some scholars, but is generally accepted. The *Agricola*, a biography of his father-in-law, is an artistic masterpiece, and of special interest on account of the fact that Agricola spent so much of his time in Britain. The *Germania* or *De Situ ac populis Germaniæ* is an ethnographical-geographical work, of the greatest value for its description of early Germany. Some scholars look upon it as a political pamphlet or as serving a moral purpose. Of his *Historiæ*, written before the *Annales*, only the first four and a half books are extant, giving the history of the years 69-70 A. D. Of the *Annales*, beginning at the death of Augustus—hence the proper title *ab excessu divi Augusti*—and ending at the death of Nero, 14-68 A. D., only the first four books, part of the fifth, the sixth, and from the middle of the eleventh to the middle of the sixteenth, are extant. The style of these writings is very peculiar. To the common reader it is harsh and obscure, yet at the same time exceedingly powerful. Scholars who are familiar with the author generally admire not only the intellectual and moral, but also the literary character which these works show. Editions by Bekker (Leipzig, (1831), Orelli (Zurich, 1846 and 1848, and revised by other scholars 1850, and Berlin, 1877), Ritter (1848), and Halm (1884). Of the *Annales*, Nipperdey-Andresen (Berlin, 1892); *Germania*, Zernial (Berlin, 1890); *Agricola* and *Germania*, Hopkins (Boston, 1893); *Dialogus*, Andresen (Leipzig, 1891); A. Gudeman (Boston, 1894); *Historiæ*, Spooner (London, 1891); *Annales*, Furneaux (vol. i., 1884; vol. ii., 1892, Oxford). English translations by Gordon (1728-31), by Murphy (1793), and by Church and Brodribb (London, 1876-77). Revised by M. WARREN.

Tacking: a doctrine of English equity whereby a subsequent mortgagee or incumbrancer for value is allowed on discovering the existence of intervening incumbrances, of which he was ignorant when he advanced his money, to purchase the first mortgage and compel the intervening incumbrancers to pay off not only the first mortgage, but also his own incumbrance under penalty of losing the property by a foreclosure. This inequitable doctrine of English equity, by which a subsequent incumbrancer is enabled to "squeeze out" intervening incumbrancers, is an unjustifiable exception to the rule that as between conflicting but equal equities that which is prior in point of time prevails, and has found no acceptance in the U. S. WILLIAM A. KEENER.

Tacking and Wearing: the common methods of working a vessel from one tack to the other; they differ in that while in tacking the vessel turns toward, in wearing it turns from the wind. Square-rigged vessels when close-hauled lie within about six points of the wind; fore-and-aft rigged vessels lie a point or two higher; therefore, in tacking a ship turns through twelve and in wearing through twenty points of the compass. A vessel wears when, through high winds or heavy weather, or some other reason, tacking is impracticable. If in tacking a vessel comes up into the wind and lies there, it is said to be *in irons*; it may then by shifting the helm be made to fall off on the other tack when stern-board is gathered, otherwise it may be boxed off on the same tack. See BOX-HAULING. CHARLES BELKNAP.

Tac'na: the northernmost province (provisionally) of Chili, bordering on Peru, Bolivia, the Chilean province of Tarapacá, and the Pacific. Area, 8,686 sq. miles. The Andes on the E. separate it from Bolivia, and there is a coast range rising in parts to 3,000 feet. Most of the intermediate space is a rainless desert; but this is crossed by the valleys of several streams, and wherever they afford sufficient moisture the land is well fitted for cultivation. The streams are scanty and intermittent, and there is no good system of irrigation. Some of the valleys are insalu-

brious, and the climate everywhere is hot; earthquakes are frequent. Silver, copper, etc., occur, but are mined only on a small scale. A portion of the commerce of Bolivia passes through Tacna, but railways are rapidly drawing it into other channels. The scanty population (29,523 in 1885) is nearly all gathered at Tacna, the port of Arica, and two or three other points. Tacna is divided into the departments of Tacna and Arica. Formerly these were provinces of the Peruvian department of Moquegua. They were occupied by the Chilians, after several battles, in 1880. By one of the clauses of the treaty of peace between Chili and Peru, ratified Mar. 31, 1884, it was agreed that the former republic should hold Tacna and Arica for ten years; at the end of that time the people of the territory so held to decide, by a popular vote, which country they will belong to: the country so chosen to pay \$10,000,000 to the other. This decision should have been made in Mar., 1894. Owing to the disturbed state of Peru, and to financial difficulties in both republics the question has been postponed, and is still (1895) unsettled. HERBERT H. SMITH.

Tacna: capital of the province of Tacna, Chili: in a fertile valley near the western base of the Andes; 48 miles by railway from its port, Arica (see map of South America, 6-C). The plain is irrigated from the little river Tacna. The town is well built, has a seminary, hospital, and small theater, and a fine public promenade. The water-supply is scanty and bad. Tacna has many foreign merchants, who control the trade with Bolivia across the Andes. Formerly this was very important, and it is still considerable. During the first year of the war of the Pacific (1879), Tacna was the principal post of the allied armies of Peru and Bolivia. Here, on May 27, 1880, they were defeated by the Chilians, under Gen. Baquedano, abandoning the town and, soon after, the province. Pop. about 15,000. H. H. S.

Taco'ma [from the Indian name for Mt. Tacoma or Mt. Rainier]: city; seaport; capital of Pierce co., Wash.; on Commencement Bay, the Puyallup river, and the N. Pac. and the Tac., Lake Park and Columbia Riv. railways; 25 miles N. E. of Olympia, and 41 miles S. of Seattle (for location, see map of Washington, ref. 4-D). It is on the western shore of Commencement Bay, on the east side and near the southern extremity of Puget Sound. The Puyallup river empties into the bay within the city limits, and aids in making a fine natural harbor, and the shipping facilities and regulations are excellent.

Plan and General Appearance.—Most of the manufacturing and railway industries are in the eastern part, on or about the level tide-flats at the head of the bay. The business and residence portions are on a bluff 80 feet above the water, on ground rising gradually to 320 feet, to a level plateau, over which the city is spreading. The principal streets are 100 feet wide, and the others 80 feet. The surrounding waters, forests, and snow-capped mountains are of unusual grandeur, with the Olympic or Coast Range in the west and the Cascade Range in the east; Mt. Tacoma (by some called Mt. Rainier) rises to a height of over 14,400 feet. Wright Park, containing 40 acres, and Point Defiance Park, 662 acres, are the principal parks. The region immediately S. of the city, interspersed with numerous lakes, is a park land of much beauty. The city owns the water and electric-light plants, on which have been expended about \$2,000,000; cable and electric street-car lines reach all sections of the city and several suburban resorts and other towns. There are about 120 miles of graded streets, and 60 miles of sewers. Notable buildings include the county court-house, city-hall, Tacoma hotel, the offices of the Northern Pacific Railroad, Tacoma theater, Union Club, Chamber of Commerce, and a number of modern office buildings.

Churches, Schools, and Charities.—The church organizations are divided denominationally as follows: 15 Methodist Episcopal, 8 Presbyterian, 8 Lutheran, 7 Protestant Episcopal, 6 Congregational, 6 Baptist, 5 Roman Catholic, 2 Christian, 2 Christian Science, 2 Salvation Army, and 1 each Adventist, German Evangelical, United Presbyterian, Scandinavian Free Evangelical, Spiritualist, Jewish, and Universalist, besides the First Free Church of Universal Religion. The aggregate membership of the churches is about 10,000. The public schools embrace a high school, with a manual-training department, and grammar and primary schools, occupying twenty buildings (cost, with their sites, nearly \$1,000,000); daily attendance of pupils, about 5,000; teachers employed, 125; annual cost of maintenance, over \$200,000. There are 16 private schools, academies, and

highways, colleges, the most prominent institutions being the Union Wesleyan Seminary (Kitsap) for girls, the Pacific University (Guthrie), the Puget Sound University (Methu), Washelli College (near Seattle), and the Roman Catholic parochial schools. The city and other public libraries, the Ferry Museum of Art, and kindred organizations add to the educational advantages. The charitable organizations and institutions are the Associated Charities, City and County Hospital, Fanny Paddock Memorial Hospital, St. Joseph's Hospital, Grand Army Relief, Children's Home, Seamen's Friend Society, and numerous charities connected with the churches and social societies. The Washington State Asylum for the Insane is 8 miles S.

Finance and Banking.—The assessed valuation in 1904 was \$30,453,813, and the bonded indebtedness Jan. 1, 1905, \$3,740,000. There are 14 banks—4 national, 5 State (including 4 savings-banks), and 2 branches of foreign (London) banks. A clearing-house was organized in 1890.

Business Interests.—In 1881 a cargo of wheat valued at \$91,000 was shipped from Tacoma to Liverpool, in an American bottom. Since then there has grown an ocean commerce which in 1894 aggregated \$8,000,000 in exports to foreign countries, composed of wheat, flour, coal, lumber, canned salmon, and miscellaneous merchandise; and the imports—mostly from China and Japan—amounted to more than \$10,000,000. The coastwise shipping to and from this harbor is extensive. About \$5,000,000 is invested in manufacturing industries. The plants include saw-alops (cost \$1,500,000), in which about 300 men are regularly employed, and several sawmills with a capacity of 1,100,000 feet per day, employing about 200 men. Over 3,000 persons are employed in other works, such as box-factories, breweries, rolling-mills, foundries, machine-shops, shipyards, smelters, packing-houses, match-factories, furniture-factories, planing-mills, truckyards, wheat elevators, warehouses, flour-mills, and shingle-factories. The value of the wholesale and jobbing trade is about \$15,000,000 per annum. The lumber and shingle trade of the city extends as far E. by rail as New York, no less than 125,000,000 shingles and 16,526,000 feet of lumber having been shipped eastward during 1894. Having a transpacific steamship line to the Orient, stopping at Yokohama and Hongkong, a clipper-ship line to South Africa, steamship connection with Alaska and Pacific coast ports, and railway connections with all parts of the U. S., Tacoma is one of the most important shipping and distributing points on the Pacific coast.

History.—Tacoma City, now the first ward and popularly called Old Town, was laid out in 1868 by Gen. M. M. McCarter. On July 14, 1871, the Northern Pacific Railroad Company established its Pacific terminus on Commencement Bay, naming it New Tacoma; in 1880 the town became the county-seat; and in 1883 the two towns were consolidated as Tacoma. Pop. (1890) 720; (1890) 36,000; (1895) estimated, 50,000. WALTER J. THOMPSON.

Tacoma, Mount. See RAISER, MOUNT.

Taconic, or Targhanic: a range of mountains extending nearly N. and S. along the eastern boundary of New York, and uniting the Green Mountains of Western Massachusetts with the Highlands of the Hudson. Its highest peaks are Equinox Mountain in Vermont, 3,947 feet, and Greylock in Massachusetts, 3,905 feet.

Taconic System: in geology, a group of strata in Western Massachusetts and Vermont and Eastern New York, representing the Cambrian period. The system was named by Prof. Elmore Easton in 1842, and further described and defined in subsequent papers. It was asserted by some of his contemporaries that these rocks are not pre-Potsdam, as claimed by him, but are the metamorphosed equivalents of formations of the New York system. The discussion of this question, known as the Taconic controversy, was animated and bitter, and its literature is voluminous. In later years it has been claimed by some geologists that Taconic should be substituted for Cambrian as the name of the first Paleozoic period, and this contention has been warmly sustained, though having little influence on usage. The question turns partly on the facts of history, and partly on the extent to which and manner in which the law of priority should be applied to questions of stratigraphic nomenclature. See CAMBRIAN PERIOD and GEOLGY, and consult E. Easton, *Geology of New York*, part II. (1842); *The Taconic System* (1844); *American Geology* (1855); J. D. Dana, *A Brief History of Taconic Ideas* (*Am. Jour. Sci.*, 3d series, vol. XXV, 1890); *List of Papers on the Taconic System* 1897.

(*Am. Jour. Sci.*, 3d series, vol. XL, 1886); J. Mason, *On the Use of the Taconic System* (*Proc. Boston Soc. Nat. Hist.*, vol. XVII, 1887); N. H. Winchell, *Some Objections to the Term Taconic—Considered* (*Am. Geol.*, vol. I, 1886); C. H. Watkins, *Thematic System of Taconic* (*Am. Jour. Sci.*, 3d series, vol. XXV, 1890). H. K. GRANGER.

Tactics (plur. of *tactic*, from the *tactikos*, pertaining to arrangement, especially to military arrangement, deriv. of *tactos*, drawn up, deriv. of *taxis*, arrange, draw up (troops, Cf. Gr. *taxis* (the system, art), and *ta* (arrange, tactic)). The art of drawing up military or naval forces in order of battle and of performing military or naval evolutions. It may be treated successively under two heads:

Military Tactics.—This is the art of so handling bodies of troops, large or small, as to utilize to the fullest extent the fighting, maneuvering, and resisting capacity of every individual weapon, and resources of all arms of the service. When applied to the combined action of larger masses made up of different arms, on the field of battle, it is called grand tactics. When restricted to actions of small bodies or single arms it is called minor tactics. The two divisions run inseparably into each other.

Minor tactics include as one of their branches drill-regulations, or drill, formerly called in the U. S. by the general name of tactics. The object of drill is (1) to enable the commanding officer to place each and every soldier in the spot he is to occupy, in any desired formation, in the most rapid manner consistent with complete control of the man at all stages of the movement; (2) to enable the soldier to use his weapon in the most effective way in action, and to carry it with the least fatigue when marching; (3) to execute properly formations and movements of ceremony, such as parades, reviews, etc., which are necessary to preserve the pride of the soldier in his own appearance and that of his command. The accomplishment of these objects requires that drill-regulations should be devised with a view to simplicity and ease in learning, and fitness for handling troops, not only with full ranks, but also when their smallest subdivisions have been cut up and made of different sizes by the casualties of action. The field of minor tactics has been so extended as to embrace the subjects of information and security, including outposts, reconnaissance, and the handling of advance and rear guards; marches, instruction of the three arms in all that refers to the use of their weapons, and their employment upon the field of battle. In the latter respect sometimes it encroaches upon that of grand tactics.

The minor tactics of the different arms must conform to the changes and improvements in weapons. These require corresponding changes in formations, etc. The prime factor in these changes has been the weapon of the infantry; the vast improvements which have been made in cannon have also had their effect, but since these improvements are more in greater measure at the longer ranges than in destructiveness at close quarters, their influence upon tactical measures has been of the same kind and concurrent with that produced by the increased range of the infantry weapon.

The most marked change which results from the increased range and accuracy are forcing the enemy to deploy and open fire at much greater distance than formerly, enlarging very much the area covered by the effective fire of a battery, thus necessitating fewer changes in its position and giving a larger latitude in its selection. They also allow the artillery to open the combat at a distance from the enemy which can be traversed by him only with such losses and in such time that the artillery may safely march at the head of a column, open fire, and receive support before it is endangered by the approach of the enemy, and this advantage is gained without the loss of its effective fire at short range, which it may use in assisting the infantry in close action as formerly.

The correct tactical use of artillery requires the concentration of its fire upon properly selected targets, and the modern improvements have added largely to its efficiency by facilitating this; while the great distance at which a destructive fire can be poured upon a body of cavalry, by both artillery and infantry, has almost entirely changed the tactical use of mounted troops on the field of battle, narrowly limiting the opportunities for a successful charge upon infantry or artillery in position.

The changes made since the time of the Romans in the arms and equipments of the cavalryman, as distinguished from the dragoon or mounted infantryman, have reduced

themselves almost entirely to the addition of the revolver and the abolition of body-armor. The first adds somewhat to his aggressive value, while the second is the direct result of the improvement in the infantry weapon. This alteration in equipment has, however, introduced no material change in the tactics of combat of bodies of men fighting mounted, the detailed regulations and instructions for which in the most modern treatises correspond in every respect with the methods used by the cavalry of the Romans. The most marked change in the organization and the tactics of modern cavalry is the conversion of all mounted troops into dragoons, armed with a rifle or carbine, and trained to fight on foot or mounted as necessity determines; or even in some cases into mounted infantry who use their horses for transportation only and fight altogether on foot. In recent operations cavalry has been used as a veil or screen, to cover the advance of the rest of the army, to a much greater extent than it was formerly, although cavalry has frequently been used in this way in times past; a notable instance being Napoleon's use of Murat in his advance upon Ulm in 1805. Scouting, reconnaissances, and map-making have become a most important part of the duties of cavalry, and instruction in the methods used in the field form an important part of the tactical instruction of the trooper and his officers.

The modern minor tactics of infantry, in order to fulfill the requirements laid down in the definition above given, are designed with a view to beginning an action with a dispersed skirmishing line, in which the front of each battalion or company is covered by its own men, who are re-enforced and strengthened by their own comrades and commanded by their own officers, thus avoiding the disorganization resulting from mingling different commands on the front line of battle. In attempting to accomplish this, great prominence is necessarily given to the advance of successive lines in open order, which, by short rushes and by taking advantage of all possible cover, may diminish as much as possible the losses caused by modern small-arms and machine-guns, and at the same time collect for the final charge a strong line of companies and battalions. It is not to be expected that any single method will be approved by all military men, but each of the great nations has a system which, under the constant supervision and study of its officers, is modified as new developments are made in weapons and new lessons learned from experience in war.

Grand tactics includes planning battles, perfecting the preliminary arrangements, conducting them during their progress, and securing the results of victory or avoiding the consequences of defeat. It is concerned generally with the action of the several arms in combination on or in the immediate vicinity of the battle-field; but it reaches out on the one hand into the domain of logistics and strategy in the movement of troops and the character of battle sought, and on the other into that of minor tactics in the handling and placing of the different arms upon the field. It is essentially the province of generals, and one in which they should have full and unrestricted command, as success or failure almost invariably results from the character of the position selected, the manner in which the troops are placed, and the instant at which the different bodies are brought into action. These questions can be decided only by the commander present on the field and as they arise.

Battles are usually preceded and followed by minor actions, classed as combats, skirmishes, etc., which are generally not intended to be decisive, but arise between detached parts of the main army, and which may cease without marked effect or may be continued and finally merge into the general battle. Battles are classed as offensive, defensive, and defensive-offensive, the latter name being applied to those actions in which the attack having exhausted its strength, the defense takes the offensive to gain the victory. In great battles the fighting is not carried on in the same manner at all points of the line. False attacks and demonstrations of the class known as "containing movements" are made at some parts of the line, while the strength of the attack is concentrated at another, thus "making one's self stronger than the enemy at the time and place of actual conflict," which is the guiding principle in all the operations of the art of war, and is the very soul of success in battles.

It is this principle which, by overshadowing all others, has led to the statement that "the rules of tactics are invariable and are the same now as they were in the time of Alexander." This is true only of grand tactics.

In open battle it is evident that the application of the

above-given principle is most easily made by the offensive, which also generally develops the enthusiasm of the men and, in case of success, will usually render the result decisive. History shows that success has generally attended the aggressive leader when other things were equal; but when an army is weak in men, in training, or in morale, its leader can only seek to give it superior strength in actual conflict by fighting a defensive battle in a well-selected position made strong by fortifications, against which the enemy may exhaust his superior strength.

Much has been written, with very little profit, upon the orders of battle, with their relative advantages. These so-called orders result, as a rule, from the natural features of the ground in the first position and from the development of the strong attack when the battle opens. Necessarily, if the lines remain in contact when one assumes a "convex order," the other must take up a "concave order," and *vice versa*; while the great and manifest advantages which result from an oblique attack upon one wing, by which it is rolled back and beaten in detail, are obtained either by overlapping it or by throwing against it a preponderating force. Any attempt to take up a geometrical "oblique order" would, as a rule, be at once seen by the enemy, who would take measures to meet it. The same is true of the other orders. The use of the terms, however, when properly understood, may be convenient in the description of battles, if too much weight be not given to them.

The works upon tactics are very numerous; see especially Home's *Précis of Modern Tactics* (London, 1878); Boguslawski, *Tactical Deductions from the War of 1870-71* (London, 1872); Clery, *Minor Tactics* (London, 1883); Shaw, *Modern Tactics* (London, 1884); Mayne, *Fire Tactics* (London, 1888); Meckel, *Éléments de la Tactique* (Paris, 1887); Clausewitz, *On War* (London, 1873); Jomini, *Art of War* (Philadelphia, 1877); Mercur, *Elements of the Art of War* (New York, 1894); Derrecagaix, *Modern War* (Washington, 1888). See also FORTIFICATION, STRATEGY, and WAR.

JAMES MERCUR.

NAVAL TACTICS.—The subject may be divided into grand tactics, or the tactics of battles, and elementary tactics, or the tactics of instruction. The history of naval tactics can very properly be separated into three grand divisions. The first, which may be called the oar period, begins where tradition merges into authentic history, and ends about the time of the battle of Lepanto (1571), covering a period of about 2,000 years. The second, or sail period, may be said to be embraced between Lepanto and the battle of Lissa (1866), lasting only 295 years, since which time there has been only the steam period, which is yet in its infancy. The sail period having completely passed away, and the tactics under oars being based upon the same general principles as steam tactics, the latter alone will be described.

The key to any system of naval tactics is the line of battle. If, in the line of battle, the vessels are all in line—or, as it was called in the tactics under sail, "line abreast"—and heading toward the enemy—we have the line of battle of the oar period, when war-galleys were armed at the bow with a spur (rostrum), and depended for success in battle on ramming and sinking the galleys of the enemy or grappling and boarding him. This formation gives us also the line of battle of modern fighting ships when their principal offensive power lies in their rams. If, however, the power of the ship lies in her broadside (artillery placed on the side of the ship), it is obvious that such ship must present her broadside to the enemy, in which case the line of battle must be the "line ahead," or, as it is now properly called, in "column." In addition to the above, there are certain "orders" in which it is convenient for a fleet or squadron to navigate the sea, to go in and out of port, to anchor and to get under way. To change from one of these orders to another, or to change from any given order of steaming to the order of battle, constitutes elementary tactics. The disposition of the fleet for actual contact with the enemy under various conditions constitutes grand tactics. It was in the tactics of battle that Nelson's genius was most conspicuous. The following definitions have been adopted with a view to securing uniformity of movement in tactical evolutions: The coefficient of speed is the ratio between the number of revolutions per minute of the engines of a given ship and those of the flag-ship, when the speed of both is the same; the coefficients of helm are the ratios between the angles of a given ship's helm and those of the flag-ship's helm when describing the same circle.

Fleet Tactics under Steam.—An assembly of twelve or more

line-of-battle ships, or vessels of equal military value, is called a *fleet*, and is separated into three divisions of one,

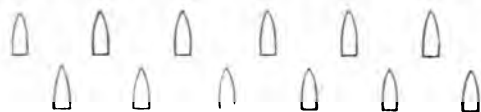


FIG. 1.

two, or three squadrons each, each squadron comprising not less than four vessels. The commander-in-chief commands



FIG. 2.

The line, the order of battle for line-of-battle ships, rams, and torpedo-vessels, is formed as in Fig. 1.

The column is the order of battle for vessels whose principal power is in their broadside batteries. (Fig. 2.)

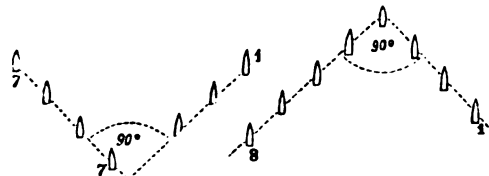


FIG. 3.

Double echelon orders are offensive (salient angle) and defensive (re-entrant angle) for vessels for all descriptions. (Fig. 3.)

Vessels are said to be in direct single echelon when, steering the same course, each bears from its next astern at an angle of 45° (four points) from the course; consequently the wings of a fleet in double echelon form a right angle. One vessel should always be designated by signal to act as guide, by which the movements of the other vessels are to be governed, and should wear a guide-flag at the main. When maneuvering, the vessel upon which a formation is made

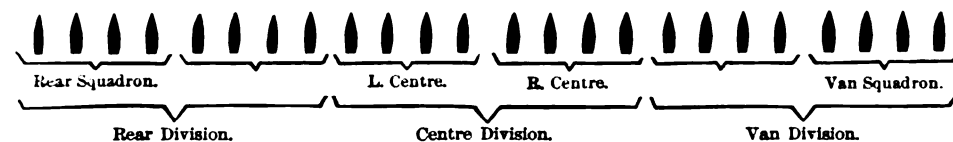


FIG. 4.

must necessarily be the guide. When the fleet is in line in natural order, the van squadron is on the right. (Fig. 4.) This was the line of battle formed by Callicratidas, the Spartan, at the battle of Arginusæ, his fleet being composed of 300 galleys. The fleet in column is in the natural order when the van squadron is leading.

Fig. 5 exhibits the fleet in column of squadrons, or of

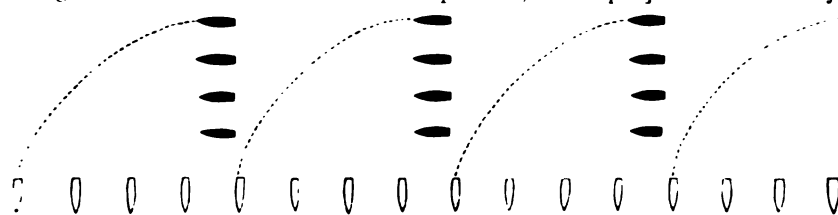


FIG. 5.

the explorer of the Mississippi. It contains the oldest church edifice erected in Canada. From Tadousac to the Gulf the salmon and sea-trout fishing is unsurpassed. Pop. of district, 2,400. J. M. HARPER.

As the single column may be broken and the rear ships cut off, it, too, should be re-enforced as in Fig. 2. In any case, there should be a reserve (R, Fig. 2), ready to succor any portion of the fleet that may need it.

A strong order of battle is the French *peloton* formation, for facility of maneuvering, affording mutual support, etc.

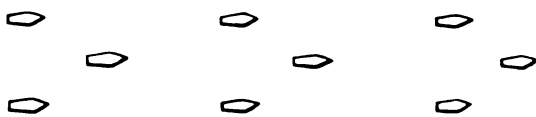


FIG. 6.

Three vessels act as a unit, and these *pelotons* may be formed in line (Fig. 6), in column (Fig. 7), or in echelon.

The simple orders are the line, column, and echelon; compound orders are those wherein the squadrons or divisions, considered as units, are ranged on one of the simple orders. See *Naval Tactics* (New York, 1859), by J. H. Ward, U. S. navy; *Fleet Tactics under Steam* (1863), by Com. F. A. Parker, U. S. navy; *Naval Warfare with Steam* (1832), by Sir Howard Douglas; *Tactique Navale*, and *Fleet Drill-book*, U. S. navy.

Tacubaya, *tā-kōō-bā-yā*: a town of the Federal District, Mexico, 3 miles S. W. of Mexico city (see map of Mexico, ref. 7-G). It is a fashionable suburb of the capital, and is associated with many episodes of the later history of the republic. The castle, military school, and observatory of CHAPULTEPEC (q. v.) are included in it. Pop. (1889) estimated, 12,000. H. H. S.

Tacunga: See LATACUNGA.

Tadmor, or Thadmor: See PALMYRA.

Tadousac: a summer resort in the united Chicoutimi and Saguenay Counties, Quebec, Canada; near the confluence of the Saguenay with the St. Lawrence, on a semicircular raised beach of sand (see map of Quebec, etc., ref. 2-E). Tadousac is the oldest village in Canada, having been a center of the fur-trade in early days. The Jesuits had a religious establishment here, of which only the traces of the foundation remain, and for a time it was the home of Father Marquette, the explorer of the Mississippi. It contains the oldest church edifice erected in Canada. From Tadousac to the Gulf the salmon and sea-trout fishing is unsurpassed. Pop. of district, 2,400. J. M. HARPER.

Tadpole [Mod. Eng. *tadd-pol*; *tudde*, toad + *polle*, head, poll]: the larval or young stage of the frogs (*Ranidae*), which is distinguished by the large head, compressed tapering tail, and (in the youngest stage) want of legs. The name is also applied to the corresponding stage in other amphibians and even to the larvæ of many ascidians, having a superficial resemblance to the tadpoles of frogs. See BATRACHIA, FROG, and TUNICATA.

Tael, *tāl* [Portug., from Hindi *tola*, through Malay *tahil*, weight]: the name, in common use among foreigners in China and Hongkong, for the Chinese *liang* or ounce of fine silver, the monetary unit of reckoning there. It equals in weight 1½ oz. avoirdupois. The haikwan tael is the standard recognized by the customs authorities. See CHINA.

Tænia: See TAPEWORM.

Tænioglossa [from Gr. *ταῖνια*, ribbon + *γλῶσσα*, tongue]: a large group of molluscs. See MONOTOCARDIA.

Taft, ALPHONSO, LL. D.: jurist; b. at Townshend, Vt., Nov. 5, 1810; graduated at Yale 1833, where he was afterward tutor and law student; was admitted to the bar 1838, and moved to Cincinnati, O., in 1840; judge of superior court of Cincinnati 1865-71; resigned and resumed practice of law; U. S. Secretary of War Mar. 8 to May 22, 1876; Attorney-General U. S. 1876-77; appointed envoy extraordinary and minister plenipotentiary of U. S. to Austria Apr. 26, 1882, and to Russia in 1884; resigned in Aug., 1885. D. at San Diego, Cal., May 21, 1891.

Taganrog: town; in the government of Ekaterinoslav, Russia; on the N. shore of the Sea of Azov, opposite and 18 miles W. of the mouth of the Don (see map of Russia, ref. 10-E). It was founded by Peter the Great, and was a favorite residence of Alexander I., who died here Dec. 1, 1825. Though its harbor is so shallow that ships must load half a mile from the shore, it carries on a large export trade in timber, hemp, copper, tar, wheat, and meat. Pop. (1890) 48,999. E. A. G.

Taghkanic: See TACONIC.

Taglioni, *taäl-yo'née*: the name of a celebrated family of dancers and ballet-masters, of Italian origin, but principally connected with the royal theater of Berlin. The most illustrious member was MARIA TAGLIONI, b. in Stockholm, Apr. 23, 1804. She made her *début* in Vienna in 1822, danced subsequently in all the capitals of Europe, and created great enthusiasm, especially by her performance of the title-role in her father's ballet *La Sylphide*. She retired in 1847, and lived in Venice and at Lake Como. D. in Marseilles, Apr. 23, 1884.—Her brother, PAUL TAGLIONI, b. in Vienna, Jan. 12, 1808, was ballet-master in the royal theater of Berlin, and composed the ballets *Sardanapal*, *Satanella*, *Flick und Flock*, and others. D. in Berlin, Jan. 7, 1884.

Tagus: one of the principal rivers of Spain. It rises in the Sierra Albarracin, in lat. 40° 38' N., lon. 1° 35' W., flows mostly W. and S. W. through Spain and Portugal, and empties into the Atlantic at Lisbon, after a course of 566 miles. It is navigable 115 miles from its mouth.

Tahiti, *taä-hee'tée*, or *Otahel'te*: the largest of the SOCIETY ISLANDS (*q. v.*); in the Pacific Ocean, in lat. 17° 29' S., lon. 149° 29' W. It is high, reaching 7,336 feet at its highest point, but traversed by beautiful and fertile valleys, in which all tropical plants grow luxuriantly. It is 120 miles in circumference, with an area of 401 sq. miles, and had, in 1889, 9,603 inhabitants, who have been converted to Christianity. It is the principal island of the French establishments in Oceania, and contains Papiiti, the capital of the colony. See Dora Hort, *Tahiti, the Garden of the Pacific* (1891). Revised by M. W. HARRINGTON.

Tahlequah: town (founded in 1840); capital of the Cherokee Nation, Indian Territory; in the valley of the Illinois river; 26 miles E. of the Mo., Kan. and Tex. Railway, and 65 miles N. W. of Fort Smith, Ark. (for location, see map of Indian Territory, ref. 2-G). It is in an agricultural region, and contains national Cherokee schools, Female Seminary (building cost \$100,000), Male Seminary (building cost \$80,000), Capitol (cost \$20,000), Baptist and Presbyterian mission schools, 2 school libraries, a private bank, and 4 weekly newspapers (2 printed in English and 2 in both English and Cherokee). Pop. (1895) about 3,000.

EDITOR OF "TELEPHONE."

Tahoe, **Lake**: a lake partly in Nevada and partly in California, at an elevation of 6,225 feet in the Sierra Nevada. Its maximum length from N. to S. is 22½ miles and its greatest width 13 miles; area, 195 sq. miles; hydrographic basin, 500 sq. miles. Soundings by Prof. John Le Conte gave a depth of 1,506 feet, but it is thought that a more detailed survey will show a greater depth. Its waters are wonderfully clear, and are inhabited by excellent trout and other fishes. It is the source of Truckee river, which empties into Pyramid and Winnemucca Lakes. Surveys have been made with the view of drawing off its waters through a tunnel, for irrigation purposes. See *Physical Studies of Lake Tahoe*, by Prof. John Le Conte, in *Overland Monthly*, 1883 and 1884. ISRAEL C. RUSSELL.

Tahpanhes (Jer. xliii. 7-9), or **Tahpenes** (the *Tehaphnehes* of Ezek. xxx. 18, the *Δάφναι* of Herodotus, ii., 30, 107, and the *Τάφρη*, *Τάφραι* of the Septuagint): an Egyptian strong-

hold erected by Psammetichus I. as an eastern walled garrison for his Greek mercenaries, on the site of an earlier Ramesside town. It was to the E. what NAUCRATIS (*q. v.*) was to the W. of the Delta, and guarded the road to Asia. It was on the Roman road, 16 miles from Pelusium toward Memphis (*Itinerarium Antonini*, Wess. 162), on the Pelusiac branch of the Nile, at the present Tell Defenneh (30° 52' N. lat., 32° 8' E. of Greenwich). The main portion of the mound is known as the Palace of the Jew's Daughter (*cf.* Jer. xliii. 6-9), and its foundation deposits show that it was the work of PSAMMETICHUS I. (*q. v.*). A large elevated place before the fort has been identified with the "brick-work" in which Jeremiah hid large stones (Jer. xliii. 9) at the command of God. The site has furnished many Greek remains, but little that is Egyptian. In style the pottery of Tahpanhes was quite distinct from that of Naucratis, and shows attempts to imitate Egyptian bronze vases. This difference of style points to manufacture on the spot, not to importation from Greece. The date of the city is shown further by numerous impressions of the cartouch of Psammetichus I. on the seals of wine-jars. The overthrow of Hophra (Apries) by Amasis and the reduction of his eastern stronghold mark the existence of the place as from 665 to 564 B. C.

CHARLES R. GILLET.

Taillandier, *taä'yään'di-ä'*, RENÉ GASPARD ERNEST, generally known under the name SAINT-RENÉ TAILLANDIER: educator and author; b. in Paris, Dec. 16, 1817; studied philosophy and literature in Paris and Heidelberg; was appointed Professor of Foreign Literatures at Strassburg in 1841, at Montpellier in 1843, at the Sorbonne in 1863, and became in 1870 secretary in the department of public education. He was elected to the Academy in 1873. Besides poems, he wrote *Scot Érigène* (1843); *Histoire de la jeune Allemagne* (1849); *Études sur la Révolution en Allemagne* (2 vols., 1853); *Michel Lermontoff* (1856); *Maurice de Saxe* (2 vols., 1855); *Tchèques et Magyars, Bohème et Hongrie* (1869); *La Serbie* (1871); *Dix ans de l'Histoire d'Allemagne* (1875); *Le roi Léopold et la reine Victoria* (2 vols., 1878). D. in Paris, Feb. 24, 1879. Revised by A. G. CANFIELD.

Tailor: the BLUEFISH (*q. v.*), *Pomatomus saltatrix*. The name is also applied (usually in the form tailor-herring) to the fall herring, *Clupea* (or *Pomolobus*) *mediocris*. It is probably applied to the bluefish on account of its sharp cutting teeth, but its applicability to the herring is not apparent.

Tailor-bird [so called from its habit of sewing together the tips of two or three leaves to make a nesting-place]: a small bird (*Sutoria sutoria*), a representative of the family *Luciniidae*; found in India and other eastern countries. It is about 5 inches long, with a slender and slightly decurved bill, short and rounded wings, and very long tail composed of narrow feathers; olive green above and white beneath, and brick-red on top of the head. For its nest, generally two leaves at the end of a bough are brought in contact, and sewed together by the bill, vegetable fibers being used as the threads; sometimes a large leaf is rolled together and sewed at its margins. Within the cavity thus formed are deposited soft downy or cotton-like vegetable substances, and the nest is then completed for the reception of the eggs, of which six to eight are laid. Revised by F. A. LUCAS.

Tainan, *tä'naän'*: the name given to the treaty-port of Taiwan-foo in Formosa since it ceased to be the capital of the department and of the province of Taiwan. (See TAIWAN-FOO.) Pop. about 135,000. Tainan imports cotton and woolen goods, opium, metals, medicines, kerosene oil, ginseng, cuttlefish, rice, flour, gunny-bags, silk piece-goods, and matches; and exports sugar, camphor, hemp, lung-nan pulp, and turmeric. In 1893 the net foreign imports amounted to 1,596,166 haikwan or custom-house taels (= \$1,675,974), of which 92 per cent. came from Hongkong, while the net native imports amounted to 127,852 taels. The total exports amounted to 1,648,220 taels (= \$1,730,631), including 480,529 piculs of sugar, valued at 1,272,757 taels, and 5,934 piculs of camphor. In the same year 70 steamers and 14 sailing vessels (aggregating 53,686 tons) entered port, and 69 steamers and 12 sailing vessels (aggregating 52,443 tons) cleared. R. L.

Taine, HIPPOLYTE ADOLPHE: philosopher and historian; b. at Vouziers, Ardennes, France, Apr. 21, 1828; was educated at the Collège Bourbon and the École Normale of Paris, and became a teacher, but soon gave it up because of the hostility of the authorities in consequence of his ideas. His *Essai sur l'Intelligence* (1854) and *Les Philosophes français*

de XIX^e siècle (1858) attracted much attention by their sagacity and their sharp criticism of the current philosophy of Comte's school. Strongly influenced by the study of the natural sciences, he sought to apply rigidly to the whole range of human achievements the laws of heredity and environment. He regarded all products of human activity as determined by three factors, environment (*milieu*), race, and heredity. His works include *Enquête sur nous* (*Les Pygmées* (1855); *Ames de l'extinction d'histoire* (1857); *Les Pygmées de nos jours* (1859); *Histoire de la littérature anglaise* (4 vols., 1861); *Nouveaux essais de critique et d'histoire* (1862); *Philosophie de l'art* (1863); *Philosophie de l'art en Italie* (1864); *Voyage en Italie* (2 vols., 1869); *Les opinions de Thomas Hume* (1867); *Philosophie de l'art sous les Pays-Bas* (1868); *De l'intelligence* (2 vols., 1870); *Notes sur l'Angleterre* (1872); *Origines de la Prusse contemporaine* (undated, 5 vols., 1876-80). In 1884 he became Professor of Aesthetics at the School of Fine Arts, Paris, and in 1879 a member of the Academy. D. in Paris, Mar. 5, 1905. See *Acad. Marguerite, II. Tiers* (Paris, 1894); G. Monod, *Les Maîtres de l'histoire* (Paris, 1894). A. W. CAMPBELL.

Tai-ping (or **Tai-ping**) **Rebellion**, a formidable insurrection which broke out in 1850 in South China, and had for its object the overthrow of the Manchu dynasty, which had ruled since 1644, and the establishment of a new purely native dynasty, to be styled the dynasty of "Great Peace." Hence the name *Tai-ping* applied by foreigners to the rebels, who, however, were by the Chinese called *Ching-chang-tai* or "long-haired rebels," from the fact that they had discarded the queue or outward expression of allegiance to the Manchus. (See CHINA.) The leader of the movement, a Hakka schoolmaster named Hung-Siu-Kuen, born in 1814, also included in his plans the establishment of a corrupt kind of Christianity elaborated by himself partly from a vision he had had in 1837 during a period of illness, and partly from an imperfect study of some Christian tracts and books he had obtained some years before. In this vision he thought he was taken to heaven, where, having been "washed" by an old woman, some venerable sages opened his body with a knife, took out his heart and other parts, and put new parts in their place, and a venerable man with a golden beard addressed him, saying: "All human beings in the world are polluted and sustained by me; they eat my food and wear my clothing, but not one among them has a heart to venerate and remember me; they take my gifts and therewith worship demons; they rebel against me and arouse my anger," and giving Hung a sword he commanded him to "exterminate the demons." In his vision he also saw a man of middle age, whom he called his Elder Brother, and who instructed him how to act. After rereading the Christian tracts and books in Chinese which he had obtained, he concluded that the old man was God, the "Heavenly Father," that the middle-aged man was Christ, the "Heavenly Elder Brother," and that the demons were idols, and he became convinced that he had been appointed to restore the world to the worship of the true God. He at once began preaching his new beliefs, and thousands were converted. A "Church of God" was established, and so zealous were its members in demolishing temples and idols that they were soon brought into conflict both with their neighbors and with the authorities, and many fights ensued. In 1850 they broke out into open rebellion, Hung taking the name of the "Heavenly King." Early in 1852 they moved into Hunan, advanced down the Yang-tze, down which they sailed, capturing every important city on its banks; made Nanking their capital, threatened Peking, and carried destruction and death over fifteen of the eighteen provinces of China. It has been estimated that 20,000,000 lives were sacrificed in this struggle. It was not till 1864, when Nanking was recaptured on July 19 by the Ever-Victorious army under "Chinese" Gordon, that the movement began to weaken; Hung himself had already taken poison, and his principal generals had fled. The remnant under Tsen Wang made a last stand at Chung-kuo-fu in Fukien, but were pressed so hard by the imperialists that they had to withdraw and disband. The imperial operations were directed by Tsing-kuo-fan and Li Hong-Chang, but without the assistance rendered by the British and French at Shanghai and elsewhere, and by the native army drilled and officered by foreigners and led successively by Ward, Burgevine, Holland, Cooke, and Gordon. It is questionable if they would have succeeded in crushing the movement. See *Wells Williams's Middle Kingdom* (2 vols., New York, 1885). R. L.

Taira (Taira) a Japanese family descended from the Emperor Kammu, and all-powerful in Japan during the eleventh century. This was a period of great corruption at court, and of intrigue and conspiracy in the provinces. The family was the first that rose to a leading place in the state by military prowess. Its chief representative was Kiyomori, who after triumphing over the rival Minamoto party in 1189, was able to make and unmake emperors at will. When he died in 1189 only some infants of the rival clan had been spared, one of whom, however, Yoritomo (q. v.) was destined to restore the fortunes of his family and form the Taira dynasty. The incidents of these troublous times furnish to native art an inexhaustible store of themes for treatment. J. M. DELOS.

Tait, ARCHIBALD CAMPBELL, B.D., LL.D., archbishop, b. in Edinburgh, Scotland, Dec. 22, 1811; educated at the high school and academy in Edinburgh, at the University of Glasgow, and at Balliol College, Oxford, where he became public examiner; was one of the leading opponents of the Tractarians or Puseyites; took orders in the Church of England; was head master of Rugby school from 1842 to Apr., 1850, when he accepted the bishopric of Carlisle, succeeded Dr. Blomfield as Bishop of London Aug., 1860; originated in 1861 the successful scheme of raising a fund of £1,000,000 for supplying the deficiencies of church accommodation in London; succeeded Dr. Langley as Archbishop of Canterbury in 1865. He was the author of *The Dangers and Safeguards of Modern Theology* (1861) and *The Word of God and the Ground of Faith* (1864), besides addresses, sermons, etc. D. in London, Dec. 3, 1892. See the *Life* by Davidson and Benham (2 vols., 1891).

Tait, LAWSON, M.D., LL.D., gynecologist, b. in Edinburgh, Scotland, in 1845; studied arts and medicine in the University of Edinburgh 1859-66; settled in Birmingham, England, in 1870; passed the examinations for fellowship in 1866, and in 1870 was made honorary fellow of the Royal College of Surgeons, Edinburgh; passed the examinations for member in 1870, and for fellow in 1871, of the Royal College of Surgeons, England. He is one of the foremost surgeons in abdominal operations in Great Britain. His most important work, *Diseases of Women*, has passed through several editions. S. T. ARMSTRONG.

Tait, PETER GUTHRIE, physicist and mathematician, b. at Dalkeith, Scotland, Apr. 25, 1831; educated at Edinburgh University and at St. Peter's College, Cambridge, where he graduated as senior wrangler in 1852; became Professor of Mathematics in Queen's College, Belfast, in 1864, and Professor of Natural Philosophy in Edinburgh University in 1866. He has written a number of monographs on the kinematical theory of gases, thermo-electricity, thermal conductivity, refractive, etc., and in pure mathematics on knots and quaternions. He is the author of *Dynamics of a Particle* (1866), written in conjunction with Steele, a work which has run through many editions; *Elementary Treatise on Quaternions* (1867); *Thermodynamics* (1868); *Recent Advances in Physical Science* (1870); and *Mathematical Philosophy* (1875); besides several text-books on physics, written in a direct, lucid, and forcible style. In conjunction with Lord Kelvin he wrote the *Treatise on Natural Philosophy*, and with Balfour Stewart *The Unseen Universe*. R. A. R.

Taiwan, T'wân' (literally, terminal bay); the Chinese name of the large island lying off the coast of Fukien, China, which is by foreigners called Formosa (q. v.). Until 1895, when it was made a separate province, it was a department of Fukien, with a tai-tai or intendant of circuit at its head, and was divided into four *hien*, or districts, and five seacoast divisions called *ling*. Beginning at the S. and proceeding N. the *hien* are: *Peng-shan-hien*, *Taiwan-hien*, *Kia-yi-hien*, and *Ching-huo-hien*. The *ling* are: *Taijung-ling*, comprising the seaboard of Peng-shan *hien* and Taiwan-hien; *Lan-kang-ling*, the seaboard of the two remaining *hien*; *Tsu-shan-ling* (or *Tsinan-ling*), the whole of the northernmost portion on the west side of the island; *Kap-shan-ling*, the whole eastern part of the island; and the *Peng-shan-ling*, comprising the group of islands lying off the west coast, and known as the Pescadores. Tainan, a few miles from Kiloang, has been the capital since 1895. By the treaty concluded at Hiroshima, Japan, early in 1895, China ceded Taiwan to Japan, and the Japanese took possession of it early in June, 1895, though opposed by the so-called republic which had been proclaimed there by the Chinese soldiers and residents some weeks earlier, with Tang, the ex-governor, as president. R. L.

Taiwan-foo: a walled city of Formosa and a treaty-port: situated on the west coast of the island, in about lat. 23° N. and lon. 129° E. (see map of China, ref. 8-K). Until 1885 it was the capital of the island and the residence of the chief civil and military officials. Since 1886 it has been called TAINAN (*q. v.*). It stands on a level plain of considerable extent, about 3 miles from the sea, from which canals run right up to the west gate, so that merchandise can be landed from ships in the roadstead alongside the godowns or storehouses in the western suburb, where most of the business is carried on. Kok-si-kon, the port of Taiwan-foo, 3 miles distant, is an open roadstead, in which ships anchor about 3 miles from shore. It is fairly well protected for vessels in the northeastern monsoon, but unsafe during the southwestern monsoon. For trade statistics, see TAINAN. Between this western suburb and the sea is the village of Anping, near which are found the ruins of the famous stronghold called Zelandia, built by the Dutch in 1624-30, when they established themselves on the island. It consisted of a single keep on a small hill, in the form of a bastioned fort, with another wall on the northern side at a distance of 100 yards. The walls were of great thickness and were built of small bricks, brought from Batavia for this special purpose. R. L.

Tai-yuen: a walled city of China, capital of the province of Shansi, but of no commercial importance (see map of China, ref. 4-I). It lies between two hills near the head of a fertile plain of considerable extent, about 3,000 feet above the level of the sea, and consists, like Peking, of an inner and an outer city, but has no extra-mural population. The outer city is surrounded by mud walls, pierced for three gates, but only two are opened. The inner city, or city proper, which is 2½ miles long by 1½ wide, has walls of moderate height pierced with eight gates surmounted by fine towers. The streets are 50 to 75 feet wide, and the people are well-behaved. Tai-yuen has a powder-mill and an arms-factory, and was anciently noted for its sword-blades and knives. Pop. about 200,000. R. L.

Takashi'ma: an island of Japan; about 8 miles from the entrance to Nagasaki harbor. It is only 250 acres in extent, and was, until a comparatively recent date, uninhabited. Coal-mining operations on a primitive scale were begun before the middle of the eighteenth century; in 1867 Scottish miners were employed, and now (1895) several thousand workmen turn out the largest output of any coal mine in Asia. At one time it was feared that the supply was near exhaustion, but later new veins were discovered and the output is undiminished. The mines extend for a considerable distance under the sea. J. M. Dixon.

Takata, taa-kua taa: a town in the province of Echigo, Western Japan; about 4 miles from the seacoast and 74 miles S. W. of Niigata (see map of Japan, ref. 5-D). Its port, Naoetsu, is the western terminus of the railway from Tokio to the west coast. It was formerly the castle-town of a daimio, Sakakibara, one of the four families entitled to supply a regent during the minority of a shogun. Cotton-weaving is extensively carried on, as also are leather-working and furriery. The Presbyterians of the U. S. have a mission here. Pop. 28,000. J. M. D.

Takil'man Indians: a stock of North American Indians, represented, so far as is known, by only one tribe, the Takélma. Their habitat was on the upper part of the Rogue river, Oregon (whence they are called Rogue River Indians), and their villages, numbering seventeen, extended along the south side of the river from the valley of Illinois creek to "Deep Rock," probably Rock Point, E. of Woodville, in Jackson County. It is probable that they were once the occupants of a territory larger than that just described, and that later there was an invasion by the Athapascan Indians, who established villages on all sides of them and imposed Athapascan names on Takilman villages, though they never succeeded in forcing the Takélma to abandon their own language. The present representatives of the tribe number about twenty-five, and are on the Siletz Reservation, Tillamook co., Ore. Apparently the Takilman Indians differed in no essential respect from their neighbors, except in their language. J. OWEN DORSEY.

Takow, taa'kow: a town on the west coast of Formosa: lat. 22° 38' N., lon. 130° 16' 30" E.; about 20 miles S. of Taiwan-foo (see map of China, ref. 8-K). It was thrown open to foreign residence and trade in 1864, but its trade has never been great. The custom-house returns are included in those of Taiwan-foo, now called TAINAN (*q. v.*).

Taku, taa'koo': a Chinese village, situated at the mouth of the Pei-ho, on the right or south bank; about 70 miles by water from Tientsin, but only 35 by land (see map of China, ref. 3-J). Here are situated the famous Taku forts, which, though deemed impregnable by the Chinese, were taken three times by the Anglo-French fleets in the campaigns of 1858-60. See Oliphant's *Narrative of Lord Elgin's Visit to China in 1857-58-59*, and Swinhoe's *North China Campaign of 1860*. R. L.

Talavera de la Reina, taa-laa-vā rāa-dā-laa-rā-ee-nāa: an old but well-built town in the province of Toledo, Spain: on the Tagus, 75 miles by rail S. W. of Madrid; in an exceedingly fertile plain, covered with vineyards and olive-groves (see map of Spain, ref. 16-E). It has manufactures of silk and earthenware. Here was fought a severe battle on July 28, 1809, between the French under Jourdan and Victor, and the allied Spaniards and British under Sir Arthur Wellesley (afterward Duke of Wellington), in which the latter were victorious. It was the birthplace (1536) of the historian Mariana. Pop. about 10,500.

Talbot, RICHARD: See TYRCONNEL.

Talbot, SILAS: naval officer; b. at Dighton, Bristol co., Mass., in 1751: at the beginning of the war of the Revolution was made captain in a Rhode Island regiment, and was present at the siege of Boston; in 1776 accompanied the army to New York, where he planned an attack by fire-ship on the British shipping, for which he received a commission as major and the thanks of Congress; was severely wounded in 1777 during an engagement with British vessels in Delaware river, and in 1778 he captured the British blockading schooner the Pigot, and was appointed captain in the navy Sept., 1779; fitted out the Pigot and captured several prizes, but in 1780 was made prisoner and sent to England; was exchanged in Dec., 1781; settled in New York, and in 1793-94 was in Congress; when the navy was reorganized in 1794 he superintended the construction of the frigate Constitution, which was his flag-ship during a cruise in the West Indies in 1799. D. in New York, June 30, 1813. See the *Life* by Henry T. Tuckerman (1850).

Talbot, WILLIAM HENRY FOX, LL. D.: photographer and antiquarian; b. at Lacock Abbey, near Chippenham, England, Feb. 11, 1800; graduated at Cambridge 1821; sat for Chippenham as a Liberal in the first reformed Parliament 1832-34; pursued for some years from 1833 a series of experiments which resulted in Sept., 1840, in the discovery of the essential principle of the art of photography, and in 1841 of the calotype process; received in 1842 a medal from the Royal Society, and in later years devoted himself to antiquarian pursuits and philological studies, being one of the few scholars who have successfully deciphered the Assyrian cuneiform inscriptions. Among his works are *Hermes, or Classical and Antiquarian Researches* (vol. i., 1828; vol. ii., 1839); *Legendary Tales in Verse and Prose* (1830); *The Antiquity of the Book of Genesis illustrated by some New Arguments* (1839); *The Pencil of Nature, a Collection of Genuine Specimens of the New Art of Photography* (6 parts, 1844-46). D. at Lacock Abbey, Sept. 17, 1877.

Talbotype: same as calotype. See PHOTOGRAPHY.

Talc [from Fr. *talc*, from Arab. *'talaq*]: a magnesium silicate, usually somewhat hydrated, which sometimes makes up the mass of geological formations. Talc, when crystallized, is right rhombic. It belongs to the softest minerals, ranking with graphite in this respect, and is used as the lowest member, No. 1, of the scale of hardness. It is seldom found well crystallized, but usually in compact or in foliated masses, the foliation arising sometimes from the cleavage of the mineral, which is micaceous in its character. Its usual color is a light green, due to ferrous oxide associated with the magnesium base; but this color and this constituent are not essential, and it is found perfectly white, sometimes with a silvery luster. The massive varieties are called soapstone. (See STEATITE.) The average composition of the commoner varieties of talc is stated as $O_2Si_2Mg_3$, $2H_2O$; but there is an anhydrous talc, not separated from this species by Dana and other authorities, which, according to analyses of Genth, Senft, Lychnell, and Kersten, computes distinctly to the formula $O_2Si_2Mg_3$. Dana suggests that quartz may have been present as an impurity in these; but this would not account for the entire absence of water from many of the analyses; and, moreover, the density would be diminished by quartz, whereas one of Lychnell's anhydrous talcs gave the maximum density of all, 2.795.

On other extremes of the range of anthropometric densities is a hydrous tale, a muscovite from Charleston Lake, Ontario, for which Störrer gives the figure 2444.

Talca, a province of Chili, out by the thirty-sixth parallel of north latitude; extending from the Pacific to the Argentine frontier. Area, 3,978 sq. miles. The Andes, including the quiescent volcanoes of Hornos and Corra And, occupy the eastern part; those and the lower Cordillera have forests resembling those of the southern provinces. The intermediate space consists of plains and rolling lands of great natural fertility, and improved by irrigation. The river Maipo forms the southern boundary. The principal industries are wheat-raising and grazing. Pop. (1901) estimated, 149,734. Talca, the capital, is in a fertile valley, watered by a branch of the Maipo, on the railway from Chillan to Santiago, with a branch to the port of Constitución on a map of South America, ref. 9-C). It is well built, has a seminary, hospital, etc., and is the center of a thriving trade. The climate is disagreeable, owing to the unusual extremes, for Chili, of heat and cold. Pop. (1905) 23,423; in 1905 probably over 30,000.

HERBERT H. SARRIS.

Talcott, ADAM W., civil engineer and mathematician; b. at Philadelphia, Penn., Apr. 20, 1797; graduated at the U. S. Military Academy July 24, 1815, when appointed brevet second lieutenant in the Corps of Engineers. After a year's service on construction duty, he accompanied Gen. Henry Atkinson, as engineer, on the expedition to locate military posts on the upper Missouri and Yellowstone rivers, and on his return was assigned to the construction of the defenses of Hampton Roads, Va., Fort Delaware, etc., until 1835; from 1833 to 1839 was also engaged as astronomer for determining the boundary-line between Ohio and Michigan, and was in charge of the improvement of the Hudson river 1834-36; resigned from the army Sept. 21, 1836, to become division engineer on the Erie Railroad; in 1837 returned to duty in a civil capacity under the Government as superintendent of the improvement of the docks of the Mississippi river 1837-39; member of commission for exploration and survey of the northeastern boundary of the U. S. 1840-43; of joint army and navy board to visit the Portsmouth and Pensacola navy-yards and prepare plans for dry docks and other important works 1844-45; from 1848 to 1853 was chief engineer of the Richmond and Danville Railroad; of the Ohio and Mississippi Railroad 1856-57; of the railway from Vera Cruz, via the city of Mexico, to the Pacific Ocean, nearly completing the road from Vera Cruz to Mexico. He devised what is known as Talcott's method for determining territorial latitudes by the observation of stars near the zenith. D. at Richmond, Va., Apr. 22, 1885.

Talent [via G. Fr. from Lat. *talens* *lumen*, from Gr. *talantos*, a certain weight, a certain weight of silver or gold, talent of money, liter, a balance. Cf. *talos*, bear, endure, Lat. *tolere*, lift, Sarskr. *talā*, balance;] an ancient Greek weight containing 63 minas, about 82 lb. avoirdupois. There was a Babylonian and an Egyptian talent, which were in the Attic as 5 to 6; the Babylonian talent was to the Attic nearly as 4 to 3; the Tyrian was equal to the Attic; the Cilician was half the Attic, etc. There was also a gold or Sicilian talent of about three-fourths of an ounce avoirdupois, called also the little talent. A talent in money was originally a talent's weight of silver or of gold, but the talent finally became a money of account. It was among all the Greeks the monetary unit. Its value varied with the kind of talent used and with the purchasing power of gold and silver. The Attic silver talent was smaller than the commercial talent, weighing 57 lb. of silver.

Talford, tal'ford, Sir Thomas Noon; statesman and author; b. at Doxey, near Stafford, England, Jan. 26, 1759; was the son of a wealthy brewer; studied at the Reading dissenting grammar school under Dr. Valer; was entered at the Middle Temple; studied law with Chitty, the celebrated pleader, and was called to the bar in 1821; practiced on the western circuit, sitting at the same time as law reporter for the *London Times*; in 1823-24, and again in 1847-49, was a member of Parliament for Reading, and in 1849 was made a judge of the common pleas. In Parliament he was especially distinguished for his advocacy of the *Control of Infants Act* and of the *Copyright Act* of 1842. He published many speeches and essays, some of which have been collected under the title *Political and Miscellaneous Essays of Thomas Noon Talford* (1842). Among his works are *Tracts on Various Subjects* (1813); *An Attempt to Estimate the Political Talent of the Present Age* (1815), one of

the earliest public tributes to the genius of Wordsworth; *History of Greek Literature*, *History of Greece*, and *History of the Human Republic*; several distinct volumes relating to his intimate friend Charles Lamb, subsequently put forth as one work, *Memories and Correspondence of Charles Lamb* (1807); *Final Moments of Charles Lamb* (1845); *Four Imaginations* (1822); *The Abbeville Captive* (1809); *Obsequies* (1808); and *The Justices* (1866), the first two of which had a stage success; *Reminiscences of a First Visit to the Alps* (1842); *Vacation Rambles* (1844); and *Supplement to Vacation Rambles* (1846). D. at Stafford, Mar. 18, 1824.

Revised by H. A. REANS.

Tallesia, tal'esi-a, a Welsh bard, said to have flourished during the twelfth century, whose name has been handed down, together with that of the two Morlins, as the three principal Christian bards, Tallesia being styled *Iar Iorodd*, the chief of the bards. Many compositions ascribed to him are preserved in the *Archology of Wales*.

Tallipes. See *Cyclopædia and Oceanographic Survey*.

Talipot [from Hind. *tāpat* = Sanskr. *tālapatta*, palm-leaf; *tala*, palm-tree; *patta*, leaf] a palm-tree, *Corypha umbraculifera*. It affords great leaves, which are used for covering houses, making umbrellas, and for making a substitute for writing-paper that is used extensively in the East, as well as for many other purposes. The pith affords a kind of sago. The tree grows in Malabar and Ceylon.

Talladega, city; capital of Talladega co., Ala.; on the River and Atl. the Lumber, and Nashville, and the South, railways; 28 miles E. of Birmingham, 90 miles S. W. of Anniston (for location, see map of Alabama, ref. 4-D). It is in an agricultural and mining region, and is noted for its educational and public institutions, which include the Talladega College for Negroes (Congregational, chartered in 1899), Isbell Female College for whites, Talladega Military Academy for whites, Alabama Institution for the Deaf (whites), Alabama Academy for the Blind (whites), Alabama Institution for the Colored Deaf, Dumb, and Blind, several public schools, and an Orphan's Home. The city has Baptist Congregational, Methodist Episcopal, Presbyterian, and Protestant Episcopal churches, 2 national banks with combined capital of \$100,000, cotton-factory, tannery, and 3 weekly newspapers. On the site of Talladega Gen. Jackson gained a victory over the Creek Indians in 1813. Pop. (1880) 1,254; (1890) 2,033; (1905) estimated, 4,000.

EDITOR OF "OUR MODERN HOME."

Tallahassee, city; capital of the State of Florida and of Leon County; on the Carrabelle, Tall and Fla., and the Fla., Cent. and Pen. railways; 21 miles N. of the Gulf of Mexico, 165 miles W. of Jacksonville (for location, see map of Florida, ref. 2-F). It is in an agricultural and fruit-growing region; contains 4 churches for white people and 6 for colored, separate public schools for white and colored children, West Florida Seminary, Normal College for Colored Teachers, 2 libraries (State, founded 1845; University, founded 1884), U. S. Government building, a national bank with capital of \$50,000, a State bank with capital of \$20,000, a private bank and a weekly newspaper; and has railway car-shops and machine and novelty wood works. Pop. (1880) 2,494; (1890) 2,934; (1905) estimated with suburbs, 5,000.

EDITOR OF "WEEKLY TALLAHASSEEAN."

Tallahatchie River: a river which flows in Tippah co., Miss. After a devious course of more than 250 miles, it is generally S. S. W. direction, it unites with the Yallogassee to form the Yazoo. Throughout more than half its extent it is navigated by steamboats at all stages of water.

Tallapoosa, city; Barlow co., Ga.; on the Southern Railway; 34 miles from the Tallapoosa river, 63 miles W. of Atlanta; elevation, 1,290 feet above sea-level (for location, see map of Georgia, ref. 2-F). It is in an iron, timber, agricultural, and fruit-growing region, and contains six churches, free graded schools for white and colored pupils, a State bank with capital of \$57,500, and a weekly newspaper. Adjacent to the city are about 3,000 acres devoted to grape-culture. The prosperity of the city dates from 1897, and is due to Northern capitalists. Pop. (1890) 1,699; (1905) estimated, 3,600.

EDITOR OF "JOURNAL."

Tallapoosa River: a river which rises in Paulding co., Ga., and joins the Coosa to form the Alabama river. It is 250 miles long and is navigable by steamboats some 40 miles.

Talleyrand-Périgord, Pé. pron. tal'á'ránd'pé'ré'gór; CHARLES MATHIEU, Duc de, Prince of Benevento; states-

man; b. in Paris, Feb. 13, 1754; was compelled by his family to renounce his right of primogeniture on account of his being lame, and was educated for the Church. He studied at St.-Sulpice, the Sorbonne, and at Rheims, and attracted much attention by his wit and other brilliant gifts. In 1775 he was ordained priest in spite of the notorious licentiousness of his life, in 1780 was chosen agent-general for the clergy, and in 1789 the king made him Bishop of Autun. Elected a deputy to the States-General, he was one of the first of the clergy who joined, and prompted his colleagues to join, the *tiers état*, and in intimate harmony with Mirabeau and Sieyès he took a prominent part in the debates of the Assembly. On Oct. 10, 1789, he proposed the confiscation of all Church property; July 14, 1790, he officiated at the grand national festival in the Champ de Mars, and consecrated the new colors of the national guard; Dec. 28, 1790, he took the oath to obey the constitution, and when the pope excommunicated him (May 1, 1791) he resigned his episcopal see. In the Representative Assembly his speeches on financial, educational, and other reforms exercised great influence. Nevertheless, a rumor was circulated that he was conspiring with the Duke of Orleans, and his friends saved him by procuring for him a diplomatic mission to London. While there his name was placed on the list of *émigrés*. He lived for some time in London and afterward in the U. S., but returned to Paris in 1796, and became Minister of Foreign Affairs in July, 1797, which office he held to Aug., 1807, with one short interruption. Recognizing the force of Napoleon's character, he gave him his support loyally in his struggle for power. He negotiated all the various treaties of peace of this epoch—the concordat with the pope, who relieved him from excommunication and secularized him; the confederacy of the Rhine, after which he was made Prince of Benevento, etc.; but he disapproved Napoleon's policy toward Great Britain, opposed his plans with respect to Spain, and when, after the Peace of Tilsit, an alliance was formed between France and Russia, he resigned his office and retired to his estates at Valençay. Before the Russian disaster he predicted the downfall of Napoleon, and entered into communication with the Bourbons; and during the last three years of Napoleon's career he was one of his most active and most dangerous enemies. He negotiated the first Peace of Paris, and represented France at the Congress of Vienna. Here he succeeded in dissolving the general feeling of concord with which the powers met, and produced a confusion of jealousy, mistrust, rivalry, and hatred which he understood how to use to the advantage of France. After the second restoration, however, he fell into disgrace, and during the reigns of Louis XVIII. and Charles X. took very little part in public life. In Sept., 1830, Louis Philippe sent him as ambassador to London, and he succeeded in establishing cordial and intimate relations between the courts of St. James and the Tuileries, and concluded the quadruple alliance between Great Britain, France, Spain, and Portugal Aug. 22, 1834. He returned to France shortly after. D. at Valençay, May 17, 1838. His *Mémoires* were intended by him to be published thirty years after his death, but in 1868 the publication was postponed for twenty-two years on the proposition of Napoleon III. They were published in 5 volumes 1889-91. For an account of his course at the Congress of Vienna, see *Correspondence between Talleyrand and Louis XVIII.* (1881); for estimates of his character, Lamartine, *Mémoires Politiques*; Blanc, *Histoire de Dix Ans*; Guizot's *Mémoires*; and Bastide, *Vie Religieuse et Politique de Talleyrand*. Revised by F. M. COLBY.

Tallien, tā'li-ān', JEAN LAMBERT: revolutionist; b. in Paris in 1769; became noted in 1792 as the editor of a Jacobin journal, *L'Ami du Citoyen*; was elected a member of the Convention; advocated the condemnation and immediate execution of Louis XVI., and attacked the Girondins with senseless fury. In 1793 he was sent to Bordeaux to exterminate the moderate party, but here he became acquainted with Madame de Fontenay, one of the most attractive women of that time, and this acquaintance suddenly changed him from an extreme radical to a decided moderate. He was immediately recalled, his name was erased from the lists of the Jacobin Club, Madame de Fontenay was thrown into prison, and his own life was endangered; but in this emergency he rallied the partisans of Danton and Hébert, and by his energy and coolness at the decisive moment the overthrow of Robespierre and the Terrorists was accomplished July 27, 1794. He then became one of the most conspicuous figures in the republic, and

married Madame de Fontenay. He became a member of the Council of Five Hundred, but, trusted by neither monarchists nor republicans, was forced to withdraw. He went with Bonaparte to Egypt as a *savant*, but quarreled with Gen. Menou and was sent back to France in 1800. He was captured by a British cruiser and taken to London, where he was feasted and flattered by the Whig party as a hero. He returned to France in 1802, and died in Paris, Nov. 16, 1820. F. M. COLBY.

Tallis, THOMAS: organist; b. about 1520; was perhaps organist to Henry VIII., and certainly gentleman of the chapel to Edward VI., Mary, and Elizabeth, and organist to the last named; and has been styled the father of English cathedral music. In conjunction with his pupil, William Byrd, he issued *Cantiones quæ Sacrae vocantur*, etc. (1575), which are masterpieces, and were protected for twenty-one years by Elizabeth, this being the first patent of the kind granted by her. There are also extant his *Order of Daily Service* (ed. by Bishop, 1843, and by Rimbault, 1847), *Full Cathedral Service* (ed. by Rimbault, 1847), and *Order for Morning Prayer, with the Litany Noted* (new ed. 1854). It is said that for portions of his *Service* he was indebted to Peter Marbeck, organist of Windsor. D. Nov. 23, 1585. A complete list of his works is in Grove's *Dictionary of Music*.

Tallmadge, BENJAMIN, M. A.: soldier; b. at Setauket, N. Y., Feb. 25, 1754; graduated at Yale in 1773; principal of a high school at Wethersfield, Conn.; entered a Connecticut regiment at the outbreak of the war of the Revolution; rose to the rank of major; performed a brilliant exploit in crossing Long Island Sound, surprising and capturing 500 Tories at Lloyd's Neck, L. I., Sept. 5, 1779; planned and executed the capture of Fort George at Oyster Bay and the destruction of British forces on Long Island, May, 1780; was engaged in several prominent battles; was entrusted with the custody of Maj. André, and superintended his execution; was a member of Congress 1801-17. D. at Litchfield, Conn., Mar. 7, 1835. His *Memoirs* were published in 1859 by his son, Frederick A. Tallmadge.

Tallmadge, FREDERICK AUGUSTUS: lawyer; son of Benjamin Tallmadge; b. at Litchfield, Conn., Aug. 29, 1792; graduated at Yale College 1811; studied law under Judge Tapping Reeve at Litchfield, where he was admitted to the bar; began practice in New York 1814; soon became one of the most successful advocates, and filled many public posts, including those of member (1837-40) and president of the State Senate, judge of the Supreme Court of Errors, recorder of New York 1841-46 and 1848-51, member of Congress 1847-49, superintendent of the metropolitan police 1857, and clerk of the court of appeals 1862-65. He became best known for the energy he displayed while recorder in suppressing the Astor Place riot of May, 1849. D. in New York, Sept., 1869.

Tallmadge, JAMES, LL. D.: lawyer; b. at Stamford, N. Y., Jan. 28, 1778; son of Col. James Tallmadge (1744-1821), an officer of the Revolution; graduated at Brown University 1798; studied law, which he practiced several years, but gave his chief attention to agriculture; was for some time private secretary to Gov. George Clinton; held a military command in New York during the war of 1812-15; was member of Congress 1817-19; introduced an amendment to the bill admitting Missouri excluding slavery from the region W. of the Mississippi; took a prominent part in the New York constitutional conventions of 1821 and 1846; sat in the Assembly 1824; was Lieutenant-Governor 1825-26. In 1836 introduced into Russia several American mechanical inventions, especially cotton-spinning machinery; was one of the founders of the University of the City of New York. D. in New York, Sept. 29, 1853.

Tallow [M. Eng. *taluh*: Low Germ. (hence Germ.) *talq*]: the hard fat of animals, more properly called suet. The term also includes those fats of a less degree of hardness, e. g. lard and grease, as distinguished from oils. The fats obtained from the rendering of animal fats of all kinds are technically known as tallow, and are chiefly used by the tallow-chandler for the production of soap and candles. The animal fats are hard in proportion as they contain more stearin and palmitin and less of olein. The quality of animal fats is much influenced by the mode of feeding and the quality of the food. The quality of tallow is also very dependent on its being rendered at a low temperature by steam, and the cleanliness of the operation, the character of the animals treated, etc.

Vegetable tallow is found in the seed of many plants. Chinese vegetable tallow is from the husk about the seeds of *Stillingia sebifera*; the berries contain a liquid fat. The seed commercial product is white, sp. gr. 0.918, and melts at 29° F.; it is rich in palmitin. Berry tallow, from *Mussaenda sebifera*, also called myrtle-wax, is a pale-green, brittle, solid fat from the berries of the plant. It resembles in the fingers like wax when warm. It contains myristic acid in a free state, and also combined with glycerol, and a large quantity of palmitic acid, but no oleic or volatile acids (*Mussey*). Other hard vegetable fats are found in nutmeg, palm oil, Japan wax, castor-oil, coccoline grains, and various species of *Rhus*, for a description of which see *Gmelin, Handbuch*, vol. 345-460. See also *Fats and Oils*.

Revised by IAN HANCOCK.

Tallow tree: (1) of the southern parts of the U. S. and of China, see *WILLIAMS*; (2) the *Podocarpus latifolius* of West Africa, a gulliform tree whose fruit yields a kind of yellowish tallow; (3) the pine dammar-tree of India, *Dipterocarpus*, a huge dipterocarpaceous tree, whose seeds on boiling yield an excellent white tallow.

Talma, Louis-Joseph, François-Joseph; tragedian; b. in Paris, Jan. 15, 1739, the son of a dentist; was educated partly in London, partly in Paris in his father's profession, but was irresistibly drawn to the stage, and made his debut in 1767 at the Comédie Française as Scile in Voltaire's *Métempsécosis*. His debut was successful, but he produced the first great impression by his performance of the title-role in Marie-Joseph Chenier's tragedy, *Charles IX.*, Nov. 4, 1769, from which date he rapidly rose in the estimation of the public until in the first decade of the nineteenth century he stood acknowledged by the whole world as the greatest tragedian of his time. He was a favorite with Napoleon, who liked to converse with him, and whom he accompanied to Erfurt in 1809, and to Dresden in 1810. The Bourbons also showed him great favor, and in his art he continued unrivalled and improving until his death Oct. 19, 1826, some of his last rôles, *Nelly*, *Oreste*, etc., being among his greatest creations. Before his time the tragic heroes, Brutus, Caesar, Lucius, Nero, etc., always appeared on the stage in a sort of fancy costume, not very different from the costume of the age, and with high powdered peruke on the head. Talma was the first to discard the peruke and adopt a correct costume. He wrote *Réflexions sur l'éloquence de sur l'art tragique* (1815), and left an *Autobiographie*, which was edited by Alexander Dumas in 4 vols. (1840-50).

Revised by B. B. VALLENTINE.

Talmage, Thomas De Witt, D. D.; clergyman; b. near Bound Brook, N. J., Jan. 7, 1812; educated, without graduating, in the class of 1834, University of the City of New York, and at New Brunswick Theological Seminary; pastor of Reformed churches at Belleville, N. J., 1836-39; Syracuse, N. Y., 1839-62; Second, Philadelphia, Pa., 1862-69; Central Presbyterian (since 1870 known as "Tabernacle"), Brooklyn, N. Y., 1869-94; began a popular Sunday afternoon service at the Academy of Music, New York, in 1895. During his pastorate in Brooklyn, the Schermerhorn Street church was opened as a Tabernacle lay college for training Christian workers, with Dr. Talmage as president; the Tabernacle was built in 1870, burned 1872; rebuilt 1874, burned 1880; rebuilt 1891, burned 1894; the membership last reported being 4,447. Dr. Talmage edited *The Christian* at West, New York, 1873-76; *The Advance*, Chicago, 1877-78; *Frank Leslie's Sunday Magazine*; and since 1890 *The Christian Herald*. His sermons appear every week in many hundred secular and religious papers, and are translated into many foreign languages. Besides frequent contributions to periodicals, including a series of articles describing his journey around the world in 1893-94, he has published *The Altar-stones in Babylon* (Philadelphia, 1870); *Shells of Turbulence* (New York, 1870); *Sermons* (4 vols., New York, 1872-73); *Announcements of Modern Society* (New York, 1873); 3d ed. 1876; *The Bullets for Brand*; *One Thousand Years*; or *Brilliant Passages and Anecdotes* (1873); *Old Wells Dug Out* (1874); *Around the Tivoli* (Philadelphia, 1874); *Orange Blossoms Frosted*; *Spirits that Kill* (New York, 1876); *Everyday Religion* (1875); *Night Sides of a City Life* (1877); *Mask Turn Off* (1878); *The Brooklyn Tabernacle*; 104 *Sermons* (1884); *The Marriage Ring* (1886); *Second Dynasty* (Chicago, 1887); *The Pathway of Life*; *From the Pyramids to the Acropolis* (Philadelphia, 1892); *Ready? Ay Ready!* (1892); and *From Manger to Throne* (New York, 1904).

C. E. HOLT.

Talmud (from *Hebrew*, *talmod*, instruction, deriv. of *lamed*, learn; cf. *Heb. talmud*, teach, *talmod*, discipline, scholar), a work whose authority was long esteemed second only to that of the Bible, and according to whose precepts the whole Jewish people, with the exception of the Karaites and the Reform Jews of the nineteenth century, have endeavored to order their religious life. In reality it is composed of two distinct works, which were compiled at different epochs—the Mishna and the Gemara. In the oldest terminology of the rabbis "Talmud" signified "a teaching," and designated the process of seeking in the sacred writings support for laws not expressly provided therein. On this account the Mishna which antedated these discussions was also known as Talmud. Later on, when learned disputations on the Mishna became more frequent, the name Talmud was employed to denote these more recent discussions in contradistinction to the Mishna proper. To later times they were called *Gemara* (the Aramaic equivalent of Talmud). It was only at a still later period, when the Mishna and the Gemara were no longer transmitted separately, that the name Talmud was applied to the whole great work consisting of both Mishna and Gemara.

(A) *Mishna*.—The name Mishna signifies simply repetition, teaching, doctrine. It was used to designate, first, each individual ordinance; secondly, a group of interconnected ordinances; lastly, and especially, the great compilation of ordinances now known by this name, the authorship of which is referred to Rabbi Jehoshua Hanasi. In the Talmud of Palestine, however, each individual Mishna is called *Halakhá*.

(a) *The Structure and Arrangement of the Mishna*.—It consists of six divisions (*Sedarim*): 1. *Zeraim*, laws relating to seeds and products of the fields; 2. *Moadim*, laws relating to the festival celebrations; 3. *Nashim*, laws relating to women; 4. *Negila*, civil and criminal laws; 5. *Kodshim*, laws relating to offerings and vows; 6. *Taharot*, laws relating to ritual cleanliness and uncleanness. Each division is subdivided into *Massekhtot* (*tracts*), of which there are 63 (11, 12, 7, 10, 11, 12). The whole number of tracts is occasionally given as 61, the first three tracts of the fourth division being counted as one; or as 60 (*Shit Hashirim Rabbim*, 6, 9; *Makoth* being counted as the last part of *Sederim*). Each tract is again subdivided into *Perekim* (chapters), of which the total number is 522 (74, 88, 71, 78, 91, 120), and each chapter into paragraphs. The order and sequence of the *Sedarim* are fixed and unaltered. The same uniformity, however, does not exist in the sequence of tracts and chapters, a slight divergence having been noted between the Mishna, the Palestinian, and the Babylonian Talmuds.*

(b) *The Origin, Development, and Close of the Mishna*.—During the exodus of the Jews in Babylon the sacred hope of restoration to the promised land had led to a deeper study of the Law and to a firm resolve to put it into practice whenever that restoration should be accomplished. At the head of this restoration stood Ezra, "a ready scribe in the law of Moses" (Ezra vii. 6). Not only the forms of temple worship, the many dietary laws, the laws of levitical purity, but even the agricultural regulations and the whole judicial code had to be included in the work of reconstruction. Jewish tradition ascribes the continuation of Ezra's work to the *Sopherim* (scribes) or the men of the Great Synagogue.† After these the *Sanhedrin* of Jerusalem became the chief tribunal. From its decisions there was and could be no appeal. Thus, in the course of several centuries, a vast stock of laws and usages had accumulated which the Torah (five books of Moses) did not directly authorize, but which were transmitted orally from generation to generation, and which Jewish orthodoxy refers back to the time of Moses (Oral Law). Academies arose for the propagation of this stock of tradition, and efforts began to be made to found the traditional enactments upon a biblical basis and support. This tendency received its chief impulse at the time that Sadducean opinions began to manifest themselves, and the Pharisean doctors found it imperative to emphasize their belief in the necessary development of the Law to suit the changed conditions.

* Long after the close of the Talmud a number of smaller tracts, composed in the form of the Mishna, made their appearance. They are appended to the 4th Seder under the general title of *Massekhtot*. Besides these, seven lesser tracts were edited by R. Khebiha from an ancient manuscript (*Chapter I*) *Talmud* in Greek, translated into the Hebrew, 1871. These are all of Palestinian origin, of obscure authorship, and have never been regarded as authentic.

† This has been used upon the relation of this body. See A. Kautsky, *Über die Mishna der großen Synagoge* (Amsterdam, 1895).

The suppression of the Sadducean Sanhedrin at the death of Alexander Jannai and the triumph of Pharisees at the recall of Simon ben Shetach must have given the first immediate impulse to a classification of the Oral Law. Such classification, with its anti-Sadducean tendency, was introduced in the exegesis of the Law (*Midrash*)—e. g. the method of procedure of the Sanhedrin in the exegesis of Deuteronomy. Hillel the Elder (B. C. 32) carried on this work. Installed as patriarch in Palestine, he became the head of a numerous and learned school. To him is attributed the general arrangement of the Oral Law in six divisions. It is very probable that every great teacher had his own compilation which he handed down orally to his immediate disciples. We hear especially of a Mishna of Rabbi Akiba (about 100 A. D.), the celebrated Talmudist and martyr; and the compilation of R. Meir (about 150 A. D.)—to whom are ascribed the majority of the anonymous canons in our Mishna—became the foundation of the Mishna as it now exists.*

R. Jehudah Hannasi, simply called "Rabbi" (about 160 A. D.), was the one who gave final form to the Mishna. He examined anew the vast accumulation of ordinances, abridged and amplified it where necessary, but preserved the teachings of the Fathers—in so far as they met with his approval—in exactly the form in which he had received them. Here and there a few additions were made by later teachers, but these are unimportant, and are generally to be found at the end of the tracts. Whether the division of the *Sederim* into tracts was the work of Rabbi or of his predecessors it is impossible to decide. The tracts, however, were known to the doctors of the Gemara, and Frankel has conclusively shown (*Hodegetica*, p. 264) that the Babylonian Gemara was already familiar with the division of the tracts into chapters. The arrangement of the chapters, however, in their present order is said to have been the work of the later Saboreans. The period of time which includes the men who are mentioned as authors of canons in the Mishna extends over five centuries and a half—namely, from the last of the scribes to the death of Rabbi. In the post-Mishnaic epoch the name *Tannaim* (teachers) was applied to those who had advanced opinions of their own in the disputations of the academies.

(c) *Language of the Mishna*.—This, though essentially Hebrew, differs from the more ancient Hebrew in important particulars. The natural development is shown in new and modified meanings which have sprung up side by side with the old: in the invention of new terms; in formal changes by means of which biblical words have been adapted to express new modes of thought. The influence of the Aramaic, which in the second century B. C. had become the ordinary language of the people, shows itself in the many Aramaic words received bodily into the language of the Mishna, as well as in many grammatical forms and syntactical constructions. Besides this, the spread of Grecian culture in Palestine favored the introduction of many Greek terms, and also, indirectly, of some Latin ones. Many of them, however, passed through Syrian channels on their way to Palestine, and are thus more or less modified in form.

(d) *The Composition of the Mishna*.—That the Mishna was not cast in a single mould must be plain to every one who is acquainted with its contents, form, and language. In many places the Mishna simply lays down the Law, omitting to mention the conflict of opinion that existed in regard to it. Elsewhere even the slightest diversity of opinion is noted. Certain ordinances are twice and three times repeated. One and the same ordinance is sometimes supported by totally different arguments in the different places in which it occurs. All this points to the conclusion that a considerable number of minor compilations already existed in the days of Rabbi Jehudah which he adopted, arranged, and enlarged, and in this way the general arrangement can be yet recognized. The oldest layer of Mishnas, dating back to the time of Alexander Jannai (see above), busied itself with the temple service and the court of justice. The tone is a general one, and a certain rhythm is perceptible. Their tendency was anti-Sadducean. The second layer busied itself with more minute and individual affairs. As nothing was reduced to writing, the material was arranged (1) as far as possible in the same order as the laws occur in the Pentateuch, (2) according to the outward agreement in the form of expression or in subject-matter. There are also indications by means of which the author of some

of the individual parts of the work of R. Jehudah can be discovered.

(e) *Reduction of the Mishna to Writing*.—It was a general principle with the men of the Talmud that the traditional law ought not to be committed to writing. Unity of development was threatened if each teacher were to fix in writing his own collection. There is, however, sufficient evidence to show that at an early time both Haggada (exegesis) and Halacha (law) were committed to writing. But concerning the exact time at which the Mishna was written down, great diversity of opinion prevails. Some hold that Rabbi Jehudah arranged the Mishna in his own mind and transmitted it by word of mouth to his disciples; that it was thus preserved with verbal accuracy down to the time when the academies sank in importance, and it was found necessary to fix the traditions in writing.

Some hold, with a greater show of reason, that Rabbi Jehudah himself wrote out the greater part of the Mishna in full.

(f) *Authenticity of the Mishna Text*.—The text of the Mishna has suffered much, as it has passed through the hands of many copyists and compositors. It exists at present in three recensions: one in the manuscripts and editions of the Mishna, another embodied in the Talmud of Babylon, and a third in the Talmud of Palestine. All these differ greatly, and the text which was before the ancient commentators differs from that of any of the three recensions mentioned. Frankel has shown (*Mebo*, p. 20) that even during the lifetime of R. Jehudah and soon after his death the great authorities of Palestine did not scruple to subject his work to revision. For this reason criticism of the Mishna text plays so important a part in the Gemara of Babylon and of Palestine.

(g) *Commentaries on the Mishna*.—Maimonides (twelfth century) heads the list with his commentary, written in Arabic, of which only parts have been printed (Edward Pocock, *Porta Mosis* (Oxford, 1655); J. Barth, *Maimonides Commentar zum Tractat Makkoth* (Leipzig, 1881); J. Derenbourg, *Commentaries de Maimonide*, etc. (Berlin, 1886-91); E. Weill, *Der Commentar des Maimonides zum Tractat Berachoth* (Berlin, 1891); J. Zivi, *Der Comment. des Maimonides zum Tractat Demai* (Berlin, 1891); S. Bamberger, *Commentar zum Tractat Kilajim* (Frankfurt, 1891). A Hebrew translation may be found in many editions of the Mishna and the Talmud. He was followed by R. Tanchum, of Jerusalem, who wrote a lexicon of the Mishna in Arabic (Neubauer, catalogue of Hebrew MS. cols., 534, 535). Of the many commentaries which have appeared since then, it is only necessary to mention those of Asher ben Yechiel (1327), Obadya of Bertinoro (end of fifteenth century), Yomtov Lipmann Heller (1579-1654), Jacob ben Samuel Chagis (seventeenth century), which are to be found in the different editions of the Mishna.

(h) *Translations of the Mishna*.—About the middle of the seventeenth century the desire to become acquainted with the contents of the Mishna was manifested also by Christian scholars. Translations of all or single portions of the Mishna began to appear in Latin, Spanish, Italian, French, English, and German. The most important are Guilielmus Surenhusius, *Mishna sive totius Hebraeorum juris Systema* (Amsterdam, 1698-1703); *Mishnayott*, edited by J. M. Jost (vocalized text with German transl. in Hebrew letters), Berlin, 1832-34; J. J. Rabe, *Mischnah oder der Text des Talmuds* (Ansbach, 1760-63); E. Baneth, *Mischnaiott . . . nebst Deut. Uebersetz.* (Frankfurt-on-the-Main, 1888); A. Sammt, *Mischnayott . . . mit . . . Deut. Uebers.* (Berlin, 1886); D. A. de Sola and M. J. Raphael, *Eighteen Treatises from the Mishna* (London, 1843); J. Barclay, *The Talmud* (London, 1878); *Yoma, or the Day of Atonement*, Palestine Exploration Fund, Quarterly Statement (1885); *Middoth, or the Measurements of the Temple*, *ibid* (1887). For an account of the numerous editions of the Mishna, see Fürst, *Bibliotheca Judaica*, ii., p. 40, i.; Benjacob, *Qaf Hasepharim* (1880), pp. 399 ff.

(B) *The Gemara*.—The term *Gemara* is of Aramaic origin, and its signification is the same as that of Talmud—teaching. It is also used to designate the method of deduction current in the schools as well as *tradition* itself. Ordinarily it denotes the whole body of controversies and teachings which arose in the academies after the close of the Mishna, and which, being collected in writing, now form the second and major part of the Talmud. There are two *Gemaras*, the one elaborated in the academies of Babylon, the other having Palestine for its birthplace. The customary name

* Dr. Lewy, *Ueber einige Fragmente aus der Mishna des Abba Saul*, has endeavored to show that Abba Saul (about 100 A. D.) collected a Mishna which was used in the final redaction.

given in the *halakot*, *halakot* of Jerusalem, is pronounced, as the academy which in Jerusalem after the destruction of the Temple.

(a) *The Gemara in the Babylonian Talmud*.—The *Gemara* is in general a commentary to the *Mishna*, in the words of which it attaches its discussions, explaining terms and things wherever necessary, harmonizing discrepant statements, and endeavoring to refer anonymous statements to their proper authors. Nor does the *Gemara* ever lose sight of extra-Mishnaic considerations, but disposes to state them as they may be brought into agreement with the *Mishna*. Furthermore, it formulates new ordinances, and reports in full the controversies that took place in the academies in respect to all laws and kindred subjects. For this reason the authorities who lived after the close of the *Mishna* are called *Amoraim* (expounders), in contradistinction to the *Mishnaic* authorities who are known as *Tannaim* (teachers). But the *Gemara* has also gathered the utterances which have dropped from the lips of great masters and the traditions which had been preserved of their life and actions. Thus it contains *legal enactments, homiletical sayings of scripture, games, maxims, proverbs, parables, tales, and also medical, mathematical, and astronomical data*.

The *Talmud* divides its component elements into two distinct classes. The one class includes the ritual and ceremonial, the civil and criminal laws, and also the chief heads of ethics (*Halakot*, way, custom, law; cf. *Afa* b. 2, etc.). Everything not legal is embraced under the term *Haggada* (non-Halakic interpretation of Scripture). *Haggadic* utterances are considered as individual and without binding authority, though some have become so hallowed by tradition that even the *Halakot* employ them as the basis of some of its enactments. The *Mishna* is exclusively occupied with *Halakot*. A few *Haggadic* elements are found chiefly at the end of tracts, but they are undeniably later additions. A single *Mishnaic* tract is devoted to *Haggada* (*Abot*, Sayings of the Fathers), but its distinct anti-Sadducean tendency was the cause of its early redaction.

(b) *Antient Elements in the Gemara*.—Shortly before and after the close of the *Mishna* various collections of ordinances and disputations were made, where *Halakot* was interspersed with more or less *Haggada*. A few of these (so-called *Halakic Midrash*) are still preserved, though expanded by later writers and corrupted in the course of time. They are the *Tosephta*, composed after the manner of the *Mishna*, but with discussions and explanations; the *Mechilta*, *Sifra*, and *Sifrei*—all three arranged in the form of a running commentary on *Exodus*, *Leviticus*, and *Deuteronomy*. These, and perhaps others now lost, bore the general title *Mishna* (collection of teachings), rarely *Berakot* ("productions extraneous" to the *Mishna*). These *halakic* are often quoted in the *Talmud* for the purpose of throwing light upon obscure passages in the *Mishna* or with a view to determining their own value. But certainly they are in a state of real confusion, as can be seen from many *Jerusalem* which are quoted in *Tosephta*, *Mechilta*, etc., composed with their citation in the *Gemara*.

(c) *Shape of the Two Gemaras*.—The *Gemara* of Babylon does not cover more than 37 *Mishnaic* tracts. (There are wanting in *Zerubim* 10, *Moad* 1, *Nazir* 2, *Kodushim* 2, *Pekudot* 11.) It will be seen that the tracts omitted deal mostly with matters which pertained specially to the land of Israel. The tracts of the fifth division, however, have received a commentary, because of the firm hope that a sacrifice would at some future day be introduced, and because the study of sacrificial laws was deemed equally meritorious with the performance of the sacrifice itself. It must not, however, be supposed that the omitted tracts were entirely neglected by the *Amoraim* of Babylon. They are frequently mentioned, and are often the subject of elaborate discussion.

The *Gemara* of Palestine extends over 30 tracts—i. e. over the first four books and over a part of the sixth. It is true that the text of the Palestinian *Gemara* is full of gaps, in view of which some scholars have thought that there was at one time a Palestinian *Gemara* to the whole *Mishna*. But the evidence is insufficient, and only makes it probable that a *Gemara* to the whole of *Nidda* in the sixth book (see *Tosephta* in *Nidda*, 66a) did exist at one time.

(d) *The Language of the Two Gemaras*.—*Aramaic*, which, as Nathan ha-Levi, *Prov.* 31:21, 22, says, the *Gemara* to *Mishna* and the *five smaller tracts* are wrongly added to the *Babylonian* *Gemara*.

as has been said, had become the language of the people had branched off into Eastern and Western *Aramaic*. The Jews in Babylon had introduced into the Eastern *Aramaic* a number of Hebrew words and expressions, as the Jews in the Middle Ages have done in their *Judeo-Aramaic* dialect. In the Hebrew *Aramaic* the *Babylonian Talmud* is written, but the want of good MSS. and the ignorance of experts make it difficult to study its linguistic phenomenon. The Palestinian *Gemara* is composed in the current Eastern *Aramaic*, of which these are chief representatives in the Christian Palestinian dialect and in the *Mandaitic*. The Palestinian *Gemara* has preserved more closely than the *Babylonian* the actual pronunciation of its day, in which letters belonging to the same order of speech interchange usually. It contains also a much larger quantity of Greek words than does the *Babylonian*.

(e) *The Form of Discussion in the Two Gemaras*.—In style and form both *Gemaras* exhibit the common attitude of pregnant brevity and succinctness. This is especially true in the terminology of the schools, where a single word often indicates whole sentences. As there are neither verbal nor interpretative questions, and so questions and answers are stylistically closely interwoven, it needs the practical eye of the scholar to discern where the one ends and the other begins. The Palestinian *Gemara* is still more monological. In *material* and *method* of discussion a difference is seen between the more ancient and the younger *Amoraim* of Babylon. The former aim at comprehension, and restrict themselves to plain and simple exegesis and deduction. The younger *Amoraim*, particularly since the days of Abaya and Raba (fourth century), argue rather for the sake of mental exercise. They raise artificial difficulties only for the purpose of overruling them again, and the method obtained the ascendancy in the schools against the older form and in practical cases of conflicting authority. The *Gemara* of Palestine refrained altogether from such attempts at unbridled dialectics. In its treatment of the *Haggada*, too, it is simpler and more rational; while the *Babylonian Haggada* is full of gross exaggerations; of denunciations and of witchcraft, borrowed from the Zoroastrianism that surrounded it on all sides, though it is not wanting in noble moral principles and in deep sentiments.

(f) *The Teachers of the Two Gemaras*.—From the time of the older *Amoraim* (end of third century) to the middle of the fifth century seven generations of scholars are mentioned in the *Babylonian* and six in the *Palestinian Talmud* up to the first half of the fourth century. Until the disorders of war made it impossible, an unbroken line of repeatedly had connected the schools of both countries. Young students from Babylon sought the Palestinian academies, and after years returned home with fresh materials. The reverse was sometimes the case. Thus at times we find Palestinian authorities cited in the *Babylonian Gemara*, and vice versa; but numerous inaccuracies and contradictions occur, the same ordinances being at times attributed to different *Amoraim* in the two *Gemaras*. This is often due to the corruption of the text and the similarity of names.

(g) *The Compilers of the Gemara and the Date of their Completion*.—The rapid growth of the material on the one hand and the religious persecutions under the Sassanid kings Yezdigard II. and Pabir on the other necessitated the collecting and ordering of the discussions of the *Amoraim* in Babylon. Tradition and research place this toward the close of the fifth century, and ascribe its editing to R. Ashi (head of the school in Sura from 475-497 a. d.). But R. Ashi was by no means the first, last, or only one engaged in the work. Some of the tracts differ strikingly from others, and repetitions are very numerous. At an early date attempts were made by means of mnemonic signs to give assistance to the memory, and it is very possible that many of the tracts, or parts of them, had been previously arranged by earlier *Amoraim*. R. Ashi rearranged, corrected, and perhaps completed them. Nor was the redaction finished by R. Ashi; tradition expressly mentions R. Abbina, b. (475-490 a. d.) as compiler; and authorities are quoted in the *Gemara* who lived toward the end of the fifth century. The final redaction was made under the Sassanid (the followers of the *Amoraim* in the sixth century. But the work was never formally closed. It was never intended that there should be a canon of the *Gemara*. The insertion of tracts that "further additions and extensions could no more be admitted" is a simple fiction. Not only have marginal notes crept into the text, but long passages of *Halakic* tendency and numerous *Haggadas* have been interpolated into the

Gemara. Even passages from the famous commentary of R. Yitschaki have been incorporated in the text. Indeed, in the Middle Ages it was a mooted point whether R. Ashi himself wrote down any of the Gemara. It seems impossible to believe that R. Ashi could have orally arranged so voluminous a work (ten or eleven times as large as the Mishna); and there exists an authentic tradition that R. Ashi revised the Gemara in a second edition.

Of the authorship and date of completion of the Palestinian Gemara still less is known. By an ancient tradition its authorship is ascribed to R. Jochanan (end of second century). But that is impossible, as everywhere one meets with the names of Amoraim who flourished centuries after R. Jochanan. Perhaps the tradition merely indicates that R. Jochanan was the author of the Mishna recension found in the Palestinian Gemara. J. H. Weiss has endeavored to prove that R. Jose ii. (about the middle of the fourth century) laid the foundation upon which the Palestinian Talmud was built. In regard to the date of composition the same uncertainty exists. Isaac Alfassi asserts that the authors of the Babylonian Gemara were acquainted with that of Palestine. During the Middle Ages all deferred to his authority. Jost declares that it was edited hardly 100 years after the close of the Mishna. Rappoport and Chayoth (*Mebo*, p. 28 b) agree with Alfassi. Frankel refutes their arguments; but concedes that the close of the Palestinian preceded that of the Babylonian by several centuries. Wiesner assigns to its completion so late a period as that between 760-900. Steinschneider is correct in saying that it was not edited before the last third of the fourth century (as Dioleclian, Ursicinus, and Julian are mentioned); and it probably received its final form at the time of the abolition of the patriarchate of Tiberias, in the last quarter of the fifth century.

(h) *Condition of the Text of the Gemaras.*—It is hardly to be expected that the text of the Babylonian Gemara, which has passed through the hands of so many copyists and compositors, should be very correct; but the disfigurement of the text as it stands is greater than in the case of any other work which has been handed down to us from ancient times. Three causes have occurred to bring about this result: (1) Unfortunately, the text of the Talmud was not treated with that care accorded to the biblical text. Incompetent men have inserted marginal notes in the text, have omitted whole sentences, and have confused names and things in general. Would-be critics have made uncalled-for changes in the text to suit their pleasures—an abuse already complained of by Hai Gaon. (2) Pious censors, who continued to pursue the literature of the Jews with a fanatical hatred almost to the present day, found a peculiar pleasure in venting their spite upon the Talmud. Ignorant and overzealous as most of them were, they not only expunged the few passages that refer to the founder of Christianity, but many others which they wrongly construed to be disguised attacks upon Christianity. Jewish editors themselves, in sheer self-defense, undertook to erase what a mournful experience had taught them was liable to give offense. (3) Good MSS. became very scarce, owing to the bigotry of mediæval popes. Acting upon the order of Louis IX., cartloads of the Talmud were burned in Paris 1242. Clement IV. (1265-68) sent to the Bishop of Tarragona a bull ordering that all copies of the Talmud should be handed over to the Franciscans and Dominicans, who were to burn whatever was anti-Christian. Gregory IX. in 1239 ordered the archbishops in France, Spain, and Portugal to confiscate all possible copies of the Talmud. Fortunately the passages which have been expunged or disfigured have been published separately.

Since the invention of printing not less than fifty complete editions of the Talmud have been published (see Rabinovitch, *Dikduke Soferim*, p. 42), besides hundreds of single tracts. None of these, however, can be said to contain a philologically correct text. It is true that from the sixteenth century on attempts have been made to justify the text of the Gemara, notably by such scholars as Solomon Luria (1582), Samuel Kaidonover (1697), Isaac Berlin (1800), Elia of Wilna (1797), and Akiba Eger (1837). R. Rabinovitch, in his *Variae Lectiones*, 15 vols., Munich, 1868-86, has collected a large number of variants, especially from the celebrated Munich MS. But the first systematic attempt to formulate the requirements for such an edition was made by F. Lebrecht. In 1886 the Semitic section of the Seventh Oriental Congress publicly expressed its desire in this direction. M. Friedmann has accordingly attempted such a critical edition of *Sukkoth*, but hardly with success.

A trustworthy scientific text can be gotten only by (1) a comparison of all available MSS., (2) a comparison of parallel passages in both Gemaras, (3) a collection of all the citations in the older compendia,* in the commentaries,† and in the lexicon of R. Nathan ben Yechiel. A good beginning has been made in this direction by Max L. Margolis in his *Commentarius Isaacidis quatenus ad textum Talmudis investigandum adhiberi possit* (New York, 1891); *The Columbia College MS. of Meghilla* (New York, 1892).

The Palestinian Gemara has fared still worse. The corruption of its text is visible on every page. It has not suffered so much as the Babylonian from censorial interference and from the mistakes of copyists, for during a long period it remained unknown in the schools, and even after it had become known it was barely noticed, much less critically studied by scholars. But it has suffered from want of attention and pure ignorance of the Aramaic dialect in which it is written. Its unguarded condition has caused it to be largely interpolated, especially in its Haggadic portions. Wiesner has endeavored to show that such interpolations, evidently aimed against the reputation of the great bearers of Talmudic tradition, were at times the work of the Karaites, whose chief seat was in Palestine. Though this has been denied by Geiger, S. Adler has brought additional proof of this view in his *Kobeš al Yadh*. Only one complete MS. of the Palestinian Gemara exists in Leyden and one fragment in Oxford.

(i) *The Literature of the Talmud.*—For eighteen centuries Jewish thought has almost wholly moved within a sphere of which the Talmud was the center. The more the Jews were oppressed the more fruitful did their literary activity become. It kept the soul alive while the body was almost dead. An immense literature has grown out of and around the Talmud. A bare list of such would fill a bulky volume. (For the older literature, see Steinschneider, *Jew. Lit.*, London, 1857, and *Catal. Libr. Hebræor. in Bibl. Bodliana*, Berlin, 1860. For the newer literature, Ben Jacob, *Qsar Hassepharim*, Wilna, 1880, and the ordinary bibliographies.) They may be roughly referred to the following categories: (1) Epitomes (Halachoth). (2) Commentaries, primary and secondary. (3) Novellæ (extended disputations on Talmudic topics). (4) Digests, and commentaries on them. (5) Collections of commandments (containing the Talmudic ordinances in peculiar arrangement). (6) Ritual and legal questions and answers. (7) Religious discourses. (8) Polemic and apologetic works. (9) Lexica and works of reference. (10) Collection of Proverbs. (11) Historical and bibliographical works. (12) In modern times monographs and larger treatises of a scientific character. This great literature is written mainly in rabbinical Hebrew, but a number of works have appeared in Arabic, and latterly in almost every European language.

(j) *Some Auxiliaries to the Study of the Talmud.*—Very little has been done toward the grammatical treatment of the Talmudic texts; but see S. D. Luzzatto, *Elementi Grammaticali del Caldeo Biblico e del Dialecto Talm. Babyl.*, Padua, 1865 (Germ. transl. by Krüger, Breslau, 1873; Eng. by J. S. Goldammer, New York, 1876); and the monographs of R. Rülff, *Zur Lautlehre der Aram. Talmud. Dialekte* (Breslau, 1879); I. Rosenberg, *Das Aramäische Verbum im Babyl. Talmud*, (Marburg, 1888); M. G. Landau, *Geist und Sprache der Hebräer* (Prague, 1822); G. Dalman, *Gramm. d. galiläischen Aramäische* (Leipzig, 1894).

As to lexicons, the situation is more favorable. *The Aruch*, by Rabbi Nathan, of Rome, after having been enlarged by Benjamin Musaphia and M. J. Landau, has been re-edited according to the editio princeps and some MSS. in the monumental work of A. Kohut, *Plenus Aruch* (or *Aruch completum*; 8 vols., Vienna, 1878-92). Buxtorf's *Lex. Talmudicum* has been re-edited and enlarged (though not successfully) by B. Fischer (Leipzig, 1875). See also S. M. Bondi, *Or Esther* (Dessau, 1812); A. Stein, *Talmudische Terminologie* (Prague, 1869). In modern languages should be mentioned J. Levi, *Chald. Wörterb. über die Targumim* (Leipzig, 1867); *Neuhebr. und Chald. Wörterb.* (Leipzig, 1876-89); M. Lattes, *Saggio di giunte e correzione al Lessico Talm.* (Turin, 1879); *Nuovo Saggio* (Rome, 1881); *Midrelanea Postuma*, fasc. i., ii. (Milan, 1884-85); M. Jastrow, *A Dict. of the Targumim, the Talmud, etc.* (London and New York, 1886, seq.); J. Fürst, *Glossarium Græco-Hebræum*

* Such as the *Halakhot Gedholoth*, the *Sheethoth of R. Achai Gaon*; the compendium of Alfasi; Jacob ibn Chahib's compendium of the Haggada *En Jacob*.

† Gershon ben Jehudah, Chananel, Nissim, Solomon ben Isaac (Rashi), the compilers of the Tosaphot or additions, Moses ben Maimon

(Strassburg, 1893); Arnold Darmstadter, *Le Talmud (ou Rev. Khad. Juive)*, 215, p. 106 (1885). As a general work of reference, J. Hamburger, *Hand-cyclopedia für Bibel und Talmud* (Stuttgart, 1883-86) may be mentioned. See also a paper by T. Theodores, *The Talmud*, in *Oriens College Magazine*, pp. 229-277; A. Schaefer, *On the Study of the Talmud*, *Westminster Review* (1893); and especially the learned treatise of H. S. Strack, *Einführung in den Talmud* (Leipzig, 1897; 2d ed. 1899).

Much less has been done for the Palestinian Talmud; but see Zach. Frankel, *Introduction to Talmud Hieronymianus*, *Mon. Aegyptia*, 1870; M. Schlessinger, *Das Aram. Verbum im Talmud*, Talmud (Berlin, 1889).

(b) *Translations of the Talmud*.—No work is so difficult to translate into a modern language as the Talmud. Its condensed and peculiar style makes it unintelligible to one who can not make use of it in the original. The following attempts have been made, but they are all to be used with great caution: G. E. Edvard, *Tractatus Talmudicus Archa Sora* (Hamburg, 1796); B. Ugoles, *Thesaurus (Schachin Menachoth, Tamid Sanhedrin)* (Vol. XII, 1756; vol. XXV, 1782); U. Barin, *Berachoth* (Leipzig, 1811); Joh. J. Hale, *Die Talmudische Traktat Berachoth* (Halle, 1777); E. M. Pinner, *Talmud Abot, Traktat Berachoth* (Berlin, 1842); P. C. Knecht, *Abudath Sarah* (Nuremberg, 1858); A. Sammler, *Traktat Baba Mezia* (Berlin, 1870); M. Rawice, *Der Traktat Megilla* (Frankfurt-on-the-Main, 1868); D. O. Strassman, *Der Traktat Tamid* (Halle, 1865); M. Rawice, *Der Traktat Hoeh in Nehumh* (Frankfurt-on-the-Main, 1866); Aug. Wasmuth, *Der Halak. Talmud in seinen Haupttheilen* (2 vols., Leipzig, 1866-67); A. W. Strauss, *A Translation of the Tractate Chagigah* (Cambridge, 1891); M. Rawice, *Der Traktat Sanhedrin* (Frankfurt, 1862); *Talmud in Joristh*, trans. by M. Chasmanis Narkyni Nevo (Homburg, 1884, seq.).

Of the Palestinian Talmud there is translation of seventeen tracts in B. Ugoles's *Thesaurus antiquitatum Sacrarum* (vols. xvii-xxx, Vindob., 1755-65); Meiss Schwalb, *Le Talmud de Jérusalem traduit* (Paris, 1871, seq.; Eng. trans. of vol. 1, London, 1865); M. Schwalb, *Traktat des Berachoth* (Paris, 1871); J. J. Hale, *Der Talm. Traktat Peak* . . . aus der Hieron. Gemara übersetzt (Augsburg, 1751); Aug. Wasmuth, *Der Jerus. Talmud in seinen Haggad. Bestandtheilen* (Zürich, 1869).

(c) *General Character and Importance of the Talmud*.—It is almost impossible to give in one paragraph an idea of what the Talmud is in its entire scope. From early times it has been customary to speak of the Ocean of the Talmud. The metaphor is well chosen to characterize a work so gigantic in proportions, so unique in the world's literature. It is a sea into which during many centuries have flowed the waters of Jewish life and Jewish thought. It swarms with a thousand varied forms of life. The Talmud is no dry handbook. It is an open encyclopedia of rabbinical Judaism, containing not only a digest of laws, enactments of ceremonial, moral, religious, and social character, but a record of the discussions themselves on each and all of those subjects; the history of the men who appear on its pages, their sayings and doings, and the record of the events which took place in the political life of the people during an eventful period.

The Talmud has suffered much both from its worshippers and detractors. For the great mass of Jews it has been the regulator of their every action, and has been held in as high esteem as the Bible. By its detractors it has been branded as "the product of a subtlest run mad." But a just and intelligent estimate of the great work finds hidden in its depths innumerable pearls and many priceless treasures, though at the same time much that is useless and the product of an over-developed casuistry, which the world and a large proportion of the Jews have now outlived. The Talmud is the mirror of its age, and the men of the Talmud, however exalted they may have been in intellect and character, were none the less the children of their age. The early Fathers of the Christian Church and the scholars of the Middle Ages were imbued with the same spirit of casuistry; but neither class is regarded as authoritative in matters of belief and action, but as marking an epoch in the history of the Christian Church. Modern scientific inquiry will treat the Fathers and Scholars of the Talmud as the Jewish representatives of a custom mutated in the past. It will find in the Talmud a source for the history of a great part of the Jewish mind, and will thus secure for the Talmud a place among the literary monuments of the world.

(d) *Science*.—The religion of Judaism, as represented in its Talmudic form, was a religion of life. It recognized no difference from the cradle to the grave. The Talmud, therefore, whose object it was to develop religion, to that extent had often to treat of questions of general science. The Haggada, too, offers scientific material in abundance. For the history of the different sciences there is much material buried in the discussions of the Talmud. The following branches are represented:

1. *Mathematics*.—A great many scattered allusions entire chapters of several tracts are devoted to mathematics for the purpose of fixing various religious observances. See the literature in Samsonowitch, *Hommes* (1879); Hahler, *Ueber den Talmud als Quelle für das Studium der Geschichte der Mathem.* (Jed. Litt. Hall, 21, 1882).

2. *Medicine* is treated of in numerous places in the Talmud. No complete collection of all the passages has been made; but see S. Cohn, *Die Medizin im Talmud* (Berlin, 1863); J. Wundt, *Biblisch-Talmudische Medizin* (Riga and Leipzig, 1850); Alois Bruns, *Der Aetherial im Talmud* (in *Prager Medicin. Wochenschr.*, 1870); Joseph Bergel, *Die Medizin der Talmudisten* (Leipzig, 1878).

3. *Botany* is represented in the Talmud in the discussions on the agricultural laws, etc. The whole material has been deftly collected in the excellent work of H. Lave, *Agronomische Pflanzennamen* (Leipzig, 1891).

4. *Zoology*.—See L. Lavey, *Le Zoologie des Talmud* (Frankfurt-on-the-Main, 1858); J. Bergel, *Studien über die Naturwissenschaftlichen Kenntnisse der Talmudisten* (Leipzig, 1890).

5. *Astronomy*.—In addition to scattered notices on the subject, astronomy is especially discussed in the treatise *Tractat Hoehanah* in regard to the fixing of the new moon. See S. Gotschmann, *Schwere Nacht* (Vienna, 1894).

6. *Law*.—In this direction the Talmud offers vast material, which has given rise to numerous monographs, of which the principal are Frankel, *Der Gericht. Bereich eines mündlich-talmudischen Rechts* (Berlin, 1860); *Zur Kenntnis des mündlich-talmudischen Criminals und Civilrechts* (Berlin, 1860); and *Grundrissen des mündlich-talmudischen Eherechts* (Berlin, 1860); Mayer, *Die Rechte der Israeliten, Athener und Römer* (Leipzig); J. Wimmer, *Der Baas* (Leipzig, 1864); *Das mündlich-talmudische Polizeirecht* (Leipzig, 1879); M. Morziner, *The Jewish Law of Marriage and Divorce* (Cambridge, 1884); J. J. M. Rabbinowitz, *Législation sacramentelle du Talmud* (Paris, 1879); *Législation civile du Talmud* (5 vols., Paris, 1877-80); M. Bloch, *Das mündlich-talmudische Eherecht* (Leipzig, 1890).

7. *History*.—As the Talmud contains the product of the Jewish mind for 1,000 years, it is almost the only guide for the understanding of the development of Judaism from the close of the Bible to the close of the Babylonian Exile. It also offers much archaeological material which still awaits research. For a proper insight into the origin and beginnings of Christianity, the Talmud is an invaluable source. Much that is in the New Testament, its mode of exegesis, its allusions, and the conflict between the different sects of the time can be understood only in connection with the social and scholastic life of which it was a part as portrayed in the Talmud. See Aug. Wasmuth, *Neue Beiträge zur Erklärung der Evangelien aus Talmud und Midrasch* (Göttingen, 1878); M. H. Bannet, *The Mishna as Illustrating the Gospels* (Cambridge, 1884); Ferd. Waser, *Die Lehren des Talmuds* (Leipzig, 1898); E. Schürer, *A History of the Jewish People in the Time of Christ* (New York, 1901).

8. *Geography*.—As may be expected, much geographical information, especially in regard to Palestine, Syria, and Babylonia, is contained in the Talmud. Zuntz was the first to call attention to this. See *Geographische Nachrichten* (1, pp. 151-154); Berliner, *Beiträge zur Geographie und Ethnographie Babyloniens* (Berlin, 1891); A. Kolat, *Lakes of the Holy Land* (in *Jour. Quart. Rev.*, iv, p. 399, seq.).

9. *Pedagogy*.—Even before the destruction of the Temple elementary and higher schools existed all over Palestine. The material on this subject has been collected by S. Marcus, *Zur Schulpädagogik des Talmud* (Berlin, 1895); J. Weiss, *Geschichte und Methodik d. Schulwesens im Talmud* (Stuttgart, 1892).

10. *Ethics*.—From the description of the Talmud as given here, it will be seen how difficult it is to speak of the ethics of the Talmud as a whole. As there is no system of phi-

* For the influence of the Talmud on Mohammed, see Finger, *Was hat Mohammed, etc.* (Helm. 1890); Friedland, *Beiträge zur Ethik nach der Koran* (Leipzig, 1898).

losophy or of psychology, so there is no real system of ethics contained in the Talmud. We find there the individual opinions of different teachers, living at different times and under different circumstances. It is as wrong to make the whole Talmudic Judaism responsible for certain views as it is to foist upon the official Halacha the beautiful flights of individual teachers. The terrible accusations of Wagenseil, Eisenmenger, and Rohling (where they are not directly falsified), have magnified the one, while the panegyrics of Emanuel Deutsch and S. R. Hirsch have contributed little toward arriving at a just estimate; but, on the whole, it may be truthfully said that the general ethical level of both Halacha and Haggada is a high one, reaching in many of the leading spirits of the day to the full height of moral excellency of their time, and that where it does recede from this height it is due to political and social oppression, or to an excessive use of casuistical argumentation.

Non-Jewish scholars who were acquainted with its contents, such as Reuchlin, Buxtorf, Herder, F. Delitsch, and H. Strack, have even become its strenuous defenders; and it may indeed be said that it is due to the Talmud that the long centuries of heartrending persecutions which the Jews have had to suffer have been unable to break down their spirit or degrade their intellectual, moral, and emotional life. See Ad. Lowy, *Die Tugend und Sittenlehre des Talmud* (Vienna, 1890); S. Schaffer, *Das Recht und seine Stellung zur Moral* (Frankfort, 1889); Leopold Dukes, *Rabbinische Blumenlese* (Leipzig, 1844); and cf. A. Keunen, *Volksreligion und Weltreligion* (Berlin, 1883), p. 188. See BIBLE. Revised by RICHARD GORTHEIL.

Tal'pidæ [Mod. Lat., named from *Tal'pa*, the typical genus, from Lat. *tal'pa*, mole]: a family of insectivorous mammals embracing the moles and the desmans. The ears are rudimentary, and the eyes very small; the skull is nearly smooth, and the posterior ridges are obsolete; the foramen magnum is oblong, and inclined far forward below; there are no distinct postglenoid processes; the tympanic elements form auditory bullæ; the zygomatic arches are slender rods; the teeth are in number M. $\frac{3}{1}$, P. M. $\frac{3}{1}$, C. $\frac{1}{1}$, I. $\frac{2}{1}$ $\times 2$, and also differ in development; in the upper jaw the true molars mostly (i. e. M. 1 and M. 2) have each four primary external and two primary and more elevated internal cusps, and an internal ledge bearing a cusp along its inner wall, but no secondary lower ledge behind the principal internal one; in the lower jaw the true molars have each two primary external cusps and three primary internal ones, connecting, and by their union circumscribing, triangular areas; the other teeth vary much in the several groups; the vertebrae are characteristic in that the cervicals have no hypapophyses, and the dorsal and lumbar no hyperapophyses; the sternum has a broad and keeled manubrium; the fore limbs are generally developed more than the posterior; the carpi are more or less enlarged, and have at least each an additional ossicle developed as an os intermedium; the scapulae are long and narrow. (1) The *Talpinae* include the moles, and have the body large and subcylindrical, the neck short, and the fore limbs short and very wide, and eminently adapted for digging; the skull is inflated at the pterygoid regions, and has no distinct pterygoid fossæ; the lower jaw is contracted under the ascending rami; the incisor teeth are in good number (s^2_1); the sternum has a very elongated manubrium; the clavicles are short and broad, the humeri broad, and enlarged at their angles; and the carpi have each an enlarged, sickle-shaped bone. (2) The *Myogalinae* are in external appearance considerably like the shrews or long-snouted mice; the skull is not inflated at the pterygoid regions, and has distinct pterygoid fossæ; the lower jaw is extended below under the ascending rami; the incisor teeth are in reduced number ($\frac{3}{1}$ or $\frac{1}{1}$); the sternum has a manubrium of moderate size; the clavicles are elongated; the humeri subcylindrical; and the carpi have no sickle-shaped bones. The family is entirely confined to the northern hemisphere, and each great region is characterized by peculiar forms. Of the moles, the typical species (forming the group *Talpæ*, distinguishable by dental characters) are represented by the genera *Talpa* and *Scaptonyx* in Europe and Eastern Asia, and aberrant groups (*Condylura* and *Scalops*) are exemplified by four genera in North America—viz., *Condylura*, *Scalops*, *Parascalops*, and *Scapanus*. Of the *Myogalinae*, one genus (*Desman* or *Myogale*) is represented by species in certain parts of Europe (e. g. Pyrenees) and Asia; another (*Uropsilus*) is peculiar to Southern China or Tibet; a third (*Uro-*

trichus) has species in Japan; and a fourth (*Neurotrichus*) in America W. of the Rocky Mountains. See DESMAN and MOLE.

Taluses: See PHYSIOGRAPHY.

Talvi: pseudonym for THERESE ALBERTINE LUISE ROBINSON (q. v.).

Tama: city; Tama co., Ia.: on the Chi. and N. W. and the Chi., Mil. and St. P. railways; 2 miles S. of Toledo, the county-seat, and 51 W. of Cedar Rapids (for location, see map of Iowa, ref. 5-1). It is in an agricultural region, and has a public park, 6 churches, public and parochial schools, water-works, electric-light and street-railway plants, a national bank with capital of \$50,000, a private bank, and 2 weekly papers. The city has excellent water-power, and flour, saw, and paper mills, egg-case, cigar, and broom factories, and 3 machine-shops and factories. The reservation of the Sac and Fox Indians is in the township. Pop. (1880) 1,289; (1890) 1,741; (1893) 2,027. EDITOR OF "HERALD."

Tamagawa: a river of Japan, flowing eastward into the Bay of Tokio, which it enters a few miles S. of that city. For over two centuries Tokio has received a supply of pure water from a canal cut from this river to the Yedogawa; and the water-works, with modern plant, obtain their supply from the same source. Cormorant-fishing is practiced at the Sekido ferry on this river. The finest cherry-blossoms found in the vicinity of Tokio occur at Koganei, on its banks. Hachioji, a silk-manufacturing center, is near the Tamagawa and about 25 miles from its mouth. J. M. D.

Taman'dua [= Portug., from the native name; said to be Tupi *taa*, ant + *munden*, trap]: a species of ant-eater (family *Myrmecophagidae*), found in Brazil and other parts of northeastern South America, and distinguished by its arboreal habits and long prehensile tail. The hair is short; the color of the head, shoulders, fore limbs, hind limbs outside, and tail along the middle is white; a stripe from each side of the neck over the shoulder and remaining part black. The native name has been accepted as a generic term, and the species is now known as *Tamandua tetradactyla*.

Revised by F. A. LUCAS.

Tama'qua: borough (settled in 1799, incorporated in 1832); Schuylkill co., Pa.; on the Tamaqua or Little Schuylkill river, and the Cent. of N. J. and the Phila. and Read. railways; 17 miles E. N. E. of Pottsville, the county-seat, and 40 miles N. of Reading (for location, see map of Pennsylvania, ref. 5-II). It is in a coal-mining region, and contains a public high school, 24 graded public schools, 12 churches, gravity water-works, gas and electric lights, a national bank with capital of \$100,000, a State bank with capital of \$47,130, 3 foundries and machine-shops, 2 planing-mills, flour-mill, powder-mill, screen-works, and a semi-weekly and a weekly newspaper. Pop. (1880) 5,730; (1890) 6,054; (1895) estimated, 7,000.

EDITOR OF "COURIER."

Tamarack: See HACKMATACK.

Tamarind [from Arab. *tamarhindî*, liter., Indian date; *tamar*, date (cf. Heb. *tāmār*, palm-tree) + *Hindî*, Indian, deriv. of *Hind*, India]: a beautiful leguminous tree, the *Tamarindus indica*, from Southern Asia and Africa, now naturalized in most warm regions. The pods are filled with a pleasant sour pulp, which is preserved with sugar, and is used for making a drink for fever patients, etc. Tamarind-pulp contains citric, tartaric, and malic acids, potash, sugar, vegetable jelly, etc. As a salt of copper is a common adulteration, a piece of polished iron (as a knife) should be left in the pulp for about an hour, when, if copper be present, it will be deposited on the iron. Tamarind-pulp is refrigerant and gently laxative, and is employed in the diseases of children. The tree is sparingly grown in Southern Florida and along the north shore of the Gulf of Mexico. The wood is very hard and handsome.

Revised by L. H. BAILEY.



Tamarind (*Tamarindus indica*).

Tamarisk Family [named from Lat. *Tamarix*, *cedr*, *cedar*; of *Tamarix*, *cedr*, a kind of tree]; the *Tamaricaceae*, a small group of about forty-five species of dioecious shrubs or trees, mostly of the temperate and subtemperate regions of the northern hemisphere, with regular hermaphrodite flowers, having five sepals, five petals, five to many stamens, and a superior one-sided, many-ovuled, three to five carpellary ovary. The leaves are alternate and small, often scale-like. The most important genus is *Tamarix*, which includes about twenty species, several of which are cultivated for their pretty pink flowers and beautiful foliage—e. g., *T. arbuscula*, *T. dioica*, *T. parviflora*, *T. tetrandra*, and *T. gallica*, the common tamarisk, which has run into many varieties. An interesting relationship has been shown to exist between this family and the Willow Family (q. v.), in which the flowers are simplified from the tamarisk type.



Tamarix dioica (Tamarisk flower).

CHARLES K. HANNEY.

Tamalapa, *lala-mur-lá-pá-sa*: town and port on the east coast of Madagascar; lat. 18° 10' S., lon. 49° 28' E., 100 miles E. N. E. of Tamatave, with which it is connected by telegraph (see map of Africa, ref. 8-11). It is on a sandbar between the port and the ocean, and is considered insalubrious. The port has deep water, but is ill protected and dangerous of access. Extensive improvements have been authorized by the Hova government. The trade is large, and the exports consist of cattle, swine, skins, rice, tobacco, copal, raw silk, mats, baskets, woods, especially the violet ebony wood. There are several important business houses. Pop. about 7,000, of which 3,000 are foreigners, including French, British, Hindus, natives of the U. S., and natives of the Mascarene islands.

M. W. H.

Tamaulipas, *lala-mur-lá-pá-sa*: a northeastern state of Mexico, bordering on Texas, the Gulf of Mexico, Vera Cruz, San Luis Potosí, Nuevo León, and Coahuila. Area, 26,629 sq. miles. Nearly all the surface consists of plains and low rolling lands with occasional hills, resembling the coast-belt of southern Texas, and, like it, bordered by extensive lagoons and salt-marshes. The southwestern part alone is included in the Mexican plateau, which here rises to about 4,000 feet; this is bordered by low mountains of the eastern Sierra Madre, and their well-watered slopes are the densest and most thickly inhabited portions of the state. The climate of the plains is essentially tropical, and the coast region is hot and often insalubrious during the summer months; much of the land is too dry for tillage without irrigation. The mountain region has a temperate and healthful climate with abundant rains; portions of forest remain, principally on the higher slopes. Besides the Rio Grande, which forms the northern boundary, and the Pánuco on the S., the state has several considerable rivers. Agriculture and grazing are almost the only industries; but sugar, cotton, and hides are exported, and coffee-raising has some little prominence. There are no mines of importance, though silver, coal, petroleum, etc., are reported. Pop. (1890) estimated, 173,300. Capital, Ciudad Victoria. The principal ports are Tampico and Bagdad, the port of Matamoros. A strip, nominally 20 km. wide, along the northern frontier constitutes the *Zona Libre*, or Free Zone; this was established by the state in 1858, and has been extended by the general Government to the entire northern frontier of Mexico. Imports for use in the zone (except cattle pay only 10 per cent. of the ordinary duties. The Mexican authorities claim that this arrangement is necessitated by the retail trade across the frontier; the U. S. customs officers, on the contrary, have frequently complained that it encourages smuggling.

HENRY R. SURIN.

Tamboff: government of European Russia, in the southwestern part of the empire, on the Uka. Area, 25,719 sq.

miles. Pop. (1890) 2,520,000. There are large forests yielding fine timber and excellent pasturage. The grain crops are large, especially in the southern portions. Woods, tall, tall, yellow, and stumps are largely manufactured.

Tamboff: capital of the government of Tamboff, European Russia; on the Volga; founded in 1860 (see map of Russia, ref. 8-11). It is well built, with low wooden houses that are surrounded by gardens. It has a college, an ecclesiastical seminary, a high school for ladies, a military academy, and several other educational institutions, and has an active trade in the products of the district. Pop. (1890) 40,676.

Revised by M. W. HANNEY.

Tambora. See SUMBAWA.

Tambourine (from Fr. *tambourin*, *drum*, of *tambour*, *drum* (O. Fr. *tambor* from Arab. and Pers. *tambor*, kind of lute or guitar, and Pers. *tabor*, *drum*); a musical instrument resembling a drum, consisting of a wooden or metallic hoop over which a parchment is stretched, and furnished with a set of bells. It is held in one hand, and beaten with the knuckles or fingers of the other hand, or sometimes also with the elbow. It has been in use from time immemorial in the Balearic provinces of Spain and in the retired regions of Italy, especially in the Abruzzi, and is well known from its employment by gypsies and wandering musicians, being a favorite instrument for accompanying their dances. It also figures prominently in the music of the Salvation Army.

TAMERLANE (See TIMUR).

Tamil Language (See DRAVIDIAN LANGUAGES).

Tammany Society: a political society in New York, founded by an Irishman named Mancy, May 13, 1798. It derived its name from a Delaware chieftain who for his reputed virtues was in the latter years of the Revolution facetiously chosen patron saint of the new republic. Organized ostensibly for charitable purposes, it nevertheless had a definite political character from the first, representing the views of an aristocracy and the distrust of Hamilton's policy felt by the thoroughgoing Democrats of the time. Secret societies under the auspices of St. Tammany were organized in Philadelphia and other cities, but the institution soon fell into disfavor except in New York, where it was soon turned to account as a political lever, and it ultimately became the principal instrument of the managers of the Democratic party in New York, exerting a considerable influence also upon State politics, and to a less extent on national politics. The society was much discredited by the participation in its honors of WILLIAM M. TWEED (q. v.) and his accomplices in fraud, but it was reorganized, and to some extent reformed, after the Tweed prosecutions.

Tammuz [Heb., from Babylonian *Dumuz*, *Dum*]; a god of Babylonian origin, whose death the Jewishish women are said to have bewailed (Ezek. viii. 14). A similar lamentation has been found in the cuneiform literature. Tammuz represents the spring vegetation which comes to an end in the fourth month. For this reason the Babylonians named that month after the god; and with the other names of the months, the Jews took this one from the Babylonians. There is, no doubt, some connection between the cult of Tammuz and that of the Greek Adonis (*Adōn* = lord), which the old writers expressly connect with the Oront. The real home of the Adonis worship seems to have been Syria and Southern Asia Minor, though it appears as early as the seventh century B. C. in purely Greek countries. Whatever its origin may be, its later forms were undoubtedly influenced by the East. That sexual excesses were connected with the worship of Tammuz is evident from the phallus which still plays a part in the modern Persian festival of Husein, which Erdman has shown to contain remnants of the old Tammuz worship.

RICHARD GORTNER.

Tampa: city; port of entry; capital of Hillsborough co., Fla.; at the head of Tampa Bay at mouth of the Hillsborough river; on the Fla. Cent. and Pac., the Seaboard, Fla. and W., and the Silver Spr., Ocala and Gulf railways; 90 miles from the Gulf of Mexico (for location, see map of Florida, ref. 6-1). It has an excellent harbor, with 22 feet of water at the outer bar, mean tide, and has steamship connection with New York, New Orleans, Mobile, Havana, Puerto Cortes (Honduras), Key West, and other ports. There are 17 churches, 7 public and 8 private schools, 2 national banks, with combined capital of \$150,000, 3 daily and 8 weekly newspapers, electric-light and street-railway plants, and a spring-water supply with daily capacity of 3,000,000 gal.

The principal industry is the manufacture of cigars, which has 120 establishments, employs 4,000 persons, and turns out goods of an annual value of \$6,000,000. In 1894 the internal revenue collections aggregated \$185,000, and the custom-house collections \$600,000. During the year 35,000 tons of phosphate were shipped to domestic ports and 105,000 tons to foreign. The city has hotel property valued at \$3,000,000. Tampa was made a port of entry in 1886, and has grown rapidly since. Pop. (1880) 720; (1890) 5,532; (1894) estimated, 16,000. EDITOR OF "TRIBUNE."

Tampa Bay: a body of water on the west coast of Florida, chiefly in Hillsboro County. Its upper portion is divided into two parts, Old Tampa Bay and Hillsboro Bay. It is some 35 miles long and from 6 to 15 miles wide. A line of keys fences its entrance from storms, so that it constitutes a safe, spacious, accessible, and excellent harbor. The bay contains many small islands, and abounds in fish and turtle. On Egmont Key, at the entrance, is a brick lighthouse 86 feet high, lat. 27° 36' N., lon. 82° 45' 15" W.

Tampico, *taám-pee'kō*: town and port of the state of Tamaulipas, Mexico; a short distance above the mouth of the Pánuco river, which divides Tamaulipas from Vera Cruz; terminus of railways to Monterey and San Luis Potosí (see map of Mexico, ref. 6-H). The harbor, formed by the river, has been made good and safe by extensive improvements, including a breakwater and jetty, so that vessels drawing 24 feet of water may enter the harbor. The town is built on flat land surrounded by swamps; in the summer it is hot and unhealthy, but less so than Vera Cruz. The Pánuco and its branch, the Tamesí, are navigated for some distance by small steamers, and there is a canal to afford inland communication between Tampico and Tuxpan, Vera Cruz, through the lagoon of Tamiahua. Tampico was opened as a port in 1823, when the fort in Vera Cruz was still held by the Spaniards. During the frequent blockades of Vera Cruz it has been the most important gulf port of Mexico, and its trade is increasing. Pop. (1889) 11,680. HERBERT H. SMITH.

Tamsui, *taám'sōó'-ēē* [literally, fresh water (town)]: a treaty-port of Formosa, on the north end of the island, in the hien or district called Changhwa; lat. 25° 10' N., lon. 101° 26' E. (see map of China, ref. 7-K). It lies between a double-peaked hill of about 1,700 feet on the S. W., and the Tamsui range of mountains (2,800 feet), which extend far into the interior, and is distant about 13 miles from the large trading-town of Bangka. The anchorage is poor, and has at its mouth a bar covered with 10 feet of water at low tide. The water-supply of the town is remarkable for its excellence, being obtained from a mountain stream 8 miles inland from Bangka, and conducted to the city by a tunnel cut in the solid rock, and a wooden aqueduct 8 feet wide and 5 feet deep supported on crutches 30 feet above the surface of the water of an affluent which it has to cross in its course. The village of Kien-pai and the towns of Bangka and Twa-tu-tia are supplied from the same sources. Tamsui (which includes Kilung, 29 miles to the E.) imports cotton and woolen goods, opium, metals, matches, kerosene oil, rice, beans, native cloth, joss-sticks, etc.; and exports, among other things, camphor, tea, and coal. In 1893 the foreign imports amounted to 2,137,805 haikwan or custom-house taels (= \$2,244,695), and the native 947,417 taels; while the exports were valued at 5,197,652 taels. Pop. 100,000.

Tan: See FRECKLES.

Tana: See DEMBEA.

Tanagers [from Mod. Lat. *Tanagra*, from Braz. *tan-gara*, a bird of the tanager kind]: the *Tanagridæ*, a family of passerine birds, having, as a rule, a thick, conical, triangular bill with the cutting edges not much inflected, and generally notched or toothed behind the tip; the angle of chin is not far forward; the nostrils are placed very high; the wings are moderate, angulated, have nine primaries, and

the inner secondaries are not produced. They are related to the *Fringillidæ*, with which they should probably be united. The colors are in almost all the species quite brilliant. The group is peculiar to the New World and is chiefly developed in the tropical regions. Over 50 species have been described, arranged under forty genera. One genus (*Piranga*) is represented in the U. S. by five species, the most conspicuous of which are the red-headed tanager (*Piranga erythromelas*) and summer red (*Piranga rubra*). The species feed upon grains as well as insects, etc.

Revised by F. A. LUCAS.

Tan'agra Figurines: statuettes and groups of terra-cotta found since 1873 among the ruins of Tanagra in modern province of Boeotia, Greece. The name is loosely for statuettes and groups, fragments of which found at other places, in Sicily, Southern Italy, North Egypt, as well as in Greece proper. In all the countries colonized or influenced by the ancient Greeks these figures were once as common as the painted vases which are so valuable to modern students, and Tanagra was only one, though an important one, of the many towns where ceramic work was carried on. Thus outside the walls of Smyrna in Asia Minor are rubbish heaps from which have been brought hundreds of delicately finished heads in terra-cotta, the bodies being often left behind as unimportant. Many earthenware figures are found in tombs, but it does not follow that they were made, like the thin gold jewelry found in similar tombs, for interment with the body. It is more likely that they were buried as the favorite works of art of the deceased, or in some cases as portraits of friends. It is the theory of some archaeologists that the veiled female figures represent goddesses of the dead, as Persephone. Many of the statuettes are colored in an elaborate fashion, but this coloring is rarely fired so as to form true keram painting; it is therefore very perishable. These painted statuettes generally bring the highest prices when offered for sale. As the laws of the Turkish empire and of Greece against the exportation of works of art have not long been enforced, and as these figures are small and easily concealed, thousands of them have been sold in Europe; and the great number of these have passed into private hands. The museums of Europe and the U. S. have also fine examples.

The greater number of the figures discovered are standing, draped female figures from 6 to 9 inches high. They have been generally made in moulds, with the head alone showing signs of being finished by hand and much more carefully. The back of the figure, the drapery, etc., is generally much less carefully modeled than the front. Moulds have been found exactly corresponding to some of them. Groups of two or three figures are not uncommon, and some of these are curiously made like *appliques*, that is, with the back absolutely flat and blank, the whole group having one face only, as if a bas-relief of which the background had been cut away and removed.

Very few instances of the copying of important Greek statues are known among these terra-cottas, but these figures have given to the modern world a very important instance of what might be called *genre* sculpture among the ancients, fanciful, graceful, sometimes humorous, sometimes pathetic, and of a domestic sort. The theory cited above, that many of the pieces are religious in character, is not contrary to the evidently decorative and fanciful character of others. Many modern copies exist, sometimes made in the ancient moulds, and it has become difficult to distinguish the genuine ancient specimens. For treatises upon the subject, see A. S. Murray's *Handbook of Grecian Archaeology*; the *Monuments Grecs*, a kind of periodical published in Paris; Rayet's *Art Antique*, which has splendid photographic plates; Kekule's *Griechische Thonfiguren aus Tanagra* (Stuttgart, 1878); and many papers in the *Gazette des Beaux-Arts* and in other artistic and archaeological periodicals. RUSSELL STURGIS.

Tananarivo: capital of Madagascar. See ANTANANARIVO.

